SCOTTISH HOSPITALS INQUIRY

Bundle of documents for Oral hearings commencing from 19 August 2024 in relation to the Queen Elizabeth University Hospital and the Royal Hospital for Children, Glasgow

Bundle 25 – Case Note Review Expert Panel, Additional Reports, and DMA Canyon

SCOTTISH HOSPITALS INQUIRY

Table of Contents

Review of NHSGG&C paediatric haemato-oncology data

Health Protection Scotland

Report date
October 2019

This is management information and not official statistics

This is a Management Information publication

Published management information are non-official statistics which may be in the process of being transitioned into official statistics. They may not comply with the UK Statistics Authority's Code of Practice with regard to high data quality or high public value but there is a public interest or a specific interest by a specialist user group in accessing these statistics as there are no associated official statistics available.

Users should therefore be aware of the aspects of data quality and caveats surrounding these data, all of which are listed in this document.

Find out more about Management Information publications at:
https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/06/National-Statisticians-Guidance-Management-Information-and-Official-Statistics.pdf

Contents

Introduction

Health Protection Scotland (HPS) supported NHS Greater Glasgow and Clyde (NHSGG&C) with a recent water related incident (March 2018 – September 2018) investigating and managing a contaminated water system across the Queen Elizabeth University Hospital (QEUH) and Royal Hospital for Children (RHC) with probable linked cases of bloodstream infections associated with wards 2A/2B RHC. Yorkhill Hospital (YH) relocated into the RHC in June 2015. Wards 2A/2B within RHC houses the haemato-oncology unit, also known as Schiehallion, the National Bone Marrow Transplant (BMT) Unit and the Teenage Cancer Trust (TCT). In September 2018, to allow remediation works to be undertaken in 2A/2B, patients were transferred to QEUH ward 6A and three rooms were allocated within the adult BMT of ward 4B for the paediatric BMT unit. To accommodate this move, adults from 6A were transferred to Gartnavel General. A **summary report** of the initial incident (Jan –Sept 2018) is available from Scottish Government web page.

Whilst a suspected increase in environmental Gram-negative blood cultures within ward 6A is investigated, admissions have been restricted since 1st August 2019.

The aim of this report is to review NHSGG&C paediatric haemato-oncology data and investigate the suspected increase in environmental Gram-negative blood cultures in the paediatric haemato-oncology population.

The objectives of this review are to:

- To describe the differences in the datasets currently being used to investigate cases of bacteraemia in patients cared for the in paediatric haemato-oncology wards in NHSGG&C.
- To review the environmental Gram-negative blood cultures in the paediatric haemato-oncology population.
- To identify whether there is a change in the type of reported environmental Gram-negative blood cultures in the paediatric haemato-oncology population.

Methods

The following data sets were provided for the review by NHSGG&C, further details can be found in Appendix 1 – Background information.

NHSGG&C data sets:

NHSGG&C CLABSI surveillance data

An extract was provided from the central line associated bloodstream infection (CLABSI) surveillance system for date range January 2015 –September 2019. CLABSI uses Centers for Disease Control (CDC) classification

> *'A CLABSI is a primary BSI in a patient that had a central line within the 48-hour period before the development of the BSI and is not bloodstream related to an infection at another site. However, since some BSIs are secondary to other sources other than the central line (e.g., pancreatitis, mucositis) that may not be easily recognized, the CLABSI surveillance definition may overestimate the true incidence of CRBSI'*

Paediatric haematology oncology patients were identified using theatre management system 'Opera' to obtain information on all patients who received a new central venous device at NHSGG&C and combining haematology oncology diagnosis via the Clinical Portal. This data was de-duplicated on a 7 day case definition per organism. Exclusion criteria include patients who have their central venous device inserted at another hospital even if the majority of their care was at RHC or if the patient was transferred to RHC with a CLABSI.

NHSGG&C ECOSS extract

Gram-negative extract was provided for data obtained locally from Electronic Communication of Surveillance in Scotland (ECOSS) for date range July 2013 – September 2019.

NHSGG&C Microbiology laboratory information management system (LIMS) Surveillance data

Microbiology laboratory information management system (LIMS) extract for date range June 2014 – September 2019. The dataset had been de-duplicated at species level by NHSGG&C. This is a dataset obtained through 'Telepath' the LIMS using a named consultant therefore linking cases from other hospitals/outpatients/previous admission/or coded elsewhere in the hospital which are linked to the unit through the consultant in charge of their care.

HPS dataset - ECOSS extract

A data extract from ECOSS system of all blood samples in children less than 18 years of age from 2013 to present was obtained the 7th October 2019. The following fields were used to assign the location of the samples. NHS Health Boards are coded by the location of the submitting laboratory. Additional hospital/ward data was derived from the ECOSS Unit Location field, or where incomplete free text within the medical specialty and requesting location fields were used to generate a final hospital list to be mapped against the total occupied bed days to generate hospital level rates.

For NHSGG&C hospitals, the free text within the unit location, medical specialty and requesting location fields are used to derive a location and ward within the hospital where the positive blood culture aspirated was associated, to find any specimens with a connection to wards 6A and 4B in the QEUH, ward 2A or 2B within RHC, or the equivalent within Schiehallion ward in Yorkhill hospital. In ECOSS the reporting laboratory codes for wards 6A and 4B were coded to RHC following the move to QEUH.

Positive blood cultures of the following micro-organisms were grouped. A full breakdown of the grouping is detailed in the Appendix 1:

- **Gram-negative bacteria**
- **Gram-positive bacteria**
- **Environmental bacteria group** all species of the following: *Achromobacter; Acinetobacter; Aeromonas; Brevibacillus species; Brevundimonas; Burkholderia; Cedecea; Chryseobacterium; Chryseomonas; Clavibacter; Comamonas; Cupriavidus; Delftia acidovorans; Elizabethkingia; Flavimonas; Gordonia; Pseudomonas; Pseudoxanthomonas; Psychrobacter; Ralstonia; Rhizobium; Rhodococcus; Roseomonas; Sphingomonas; Stenotrophomonas and atypical mycobacteria).*
- **Environmental including Enteric (ENT) group** - Environmental bacteria including following enteric organisms which as well as the environmental list above includes species of the following *Citrobacter; Enterobacter; Klebsiella; Pantoea; Serratia.*

Fungi (all species of the following: Candida; Rhodotorula) were excluded as it could not be established if all positive fungi blood cultures were being processed through ECOSS.

The following organisms grouped by genus, were previously isolated in water samples from ward 2A/2B: *Acinetobacter; Burkholderia; Chryseobacterium; Cupriavidus; Delftia acidovorans; Elizabethkingia; Pantoea; Pseudomonas; Rhizobium; Stenotrophomonas*.

The following organisms grouped by genus, were previously isolated in drain samples from ward 2A/2B: *Citrobacter; Cupriavidus; Delftia acidovorans; Enterobacter; Klebsiella; Pantoea; Pseudomonas; Serratia; Stenotrophomonas.*

Case definition

The trends in bacteraemia in this patient population were assessed using the HPS ECOSS data extract of positive blood cultures.

The study population includes patients less than 18 years of age cared for in the paediatric haematology oncology specialty in NHSGG&C (including new and existing patients).

A species level case definition was used in previous investigations and this was repeated for this review in order to make comparisons with the NHS GG&C datasets.

In order to account for the diversity of organisms likely to be identified if there is an environmental source and to account for polymicrobial episodes, case definitions were developed at group level. These groups are defined as an environmental bacteria group, environmental including enteric bacteria group and Gram-negative group. These groups are not mutually exclusive; therefore the trends analysis should be interpreted as such. A case definition for Gram-positive bacteraemia was also developed to provide context to the trends in the other groups.

From this population the proposed case definition of a case is defined as a patient with:

1) A positive blood culture of a single organism that has not been previously isolated from the patient's blood within the same 14 day period (i.e. 14 days from date last positive sample obtained).
2) A positive blood culture for any organism defined as environmental bacteria group (detailed above) that has not been previously isolated with same or other environmental bacteria group organism in the patient's blood within the same 14 day period.
3) A positive blood culture for an environmental including enteric bacteria group (detailed above) that has not been previously isolated with same or other environmental including enteric bacteria group organism in the patient's blood within the same 14 day period.
4) A positive blood culture where Gram-negative bacteria has been isolated in 14 day period that has not been previously isolated with same or other Gram-negative organism within the same 14 day period.
5) A positive blood culture where Gram-positive bacteria has been isolated in 14 day period that has not been previously isolated with same or other Gram-positive organism within the same 14 day period.

As per the case definition and to align with other national bacteraemia surveillance, a standard 14 day rolling deduplication was applied to the HPS ECOSS dataset. All positive blood cultures were included with the exception of post mortem blood, any quality test samples, foetal samples or non-human samples.

Denominator data

HPS use extracted data from ISD(1) provided by Information Services Division (ISD) for routine published reports. Due to unavailability of data for September 2019 data from August 2019 were used as a proxy.

Full details of ISD data collection can be obtained from **http://www.isdscotland.org/Products-and-Services/Data-Support-and-Monitoring/ISDS1/**

The activity data extract provided information on occupied bed days and bed occupancy of haematology and oncology from July 2013 to August 2019. In addition, it provided data on combined haemato-oncology day cases and outpatient appointments. The outpatient figures included patents who did not attend (DNA).

Incidence Rate

Rate per 1,000 total occupied bed days (TOBDs) = (Number of cases of positive blood culture of given case definition in hospital(s) or speciality /TOBDs in hospital(s) or speciality x 100,000). Incidence rates for the whole of RHC (including positive blood cultures and bed days of wards 6A and 4B following the move to QEUH) were compared with combined rates from the Royal Hospital for Sick Children in Lothian and the Royal Aberdeen Children's Hospital in Grampian. R was used to calculate rate ratios (RR) with corresponding exact 95% Confidence Intervals (95%CI).

SPC Charts

Hospital and specialty data were analysed using Byars method for statistical process control (SPC) U-charts using the rules detailed in Table 1. The mean, trigger/warning (+2 standard deviations) and upper control limits (+3 standard deviations) are presented. These control lines vary by month due to variations in the TOBD denominator. The mean was calculated from the data prior to the move to RHC when available (HPS and NHSGG&C Gram-negative data). Further information on SPC charts can be found at : **http://www.isdscotland.org/Health-Topics/Quality-Indicators/Statistical-Process-Control/**

Table 1: Statistical Process Control (SPC) rules.

Rule	Description	Marker
Outlier	Data point(s) exceeding the upper or lower control limit (as 3 standard deviations)	Red diamond
Trigger point	Data point(s) exceeding the upper or lower warning limit (as 2 standard deviations)	Yellow triangle
Shift	A run of 8 or more consecutive data points above the centreline	Circle drawn round points
	A run of 6 or more consecutive data points either increasing or decreasing.	N/A

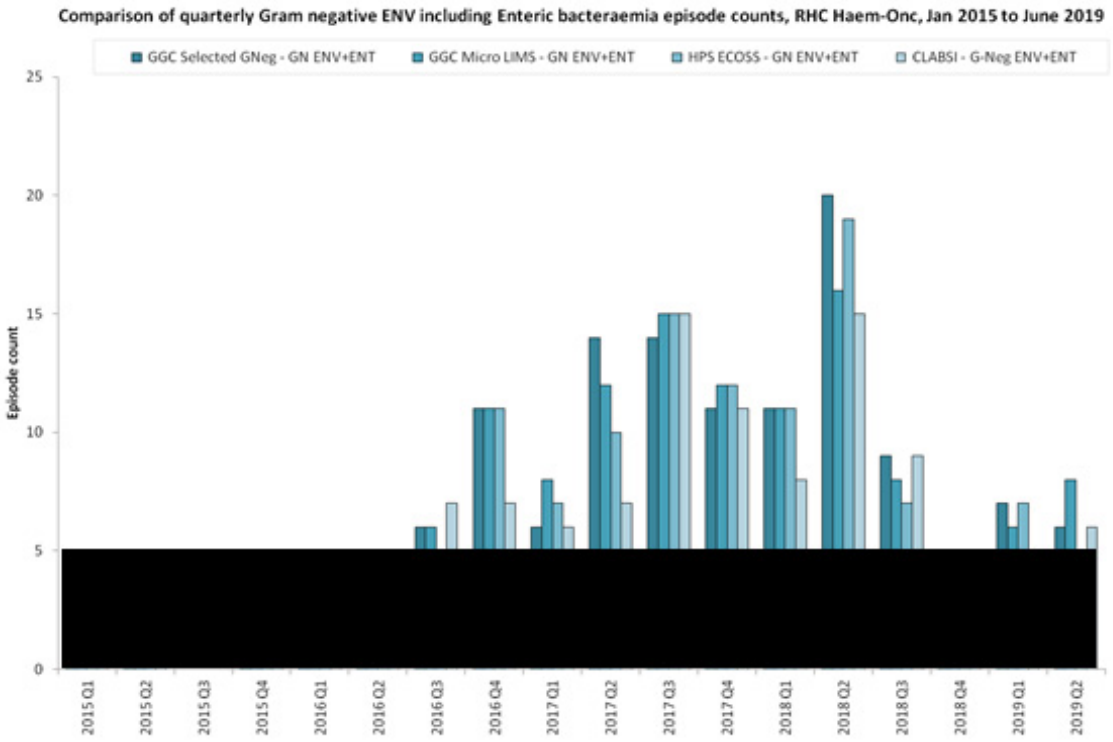
Results and Commentary

Comparison of datasets (species level)

In order to validate the datasets provided by NHSGG&C they were compared with an extract taken by HPS (ECOSS extract) a single organism at species level case definition (**1**) was used so all isolates could be compared. The datasets that were provided all contained data covering the period from January 2015 to June 2019. Figure 1 shows the differences between the datasets when selected environmental Gram-negative organism were compared. The main difference found between the datasets are detailed in Table 2 and Table 3.

It is important to note that each dataset used different case definitions and methods to identify patients who had samples taken or treatment in RHC haemato-oncology unit which accounts for most of the discrepancies identified between datasets.

Figure 1: Comparison of NHSGG&C selected Gram-negative quarterly counts of species level case definition (1) for NHSGG&C and HPS datasets from 2015 Quarter 1 to 2019 Quarter 2.



1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS), NHSGG&C central line associated bloodstream infection (CLABSI) surviellance system, and NHSGG&C laboratory information management system (LIMS).

Table 2: NHSGG&C CLABSI surveillance data and possible reasons for dataset not matching for the time period January 2015 and September 2019.

HPS episodes without corresponding NHSGG&C episode (n=118, 20.8%)	NHSGG&C episodes without corresponding HPS episode (n=56, 12.4%)
Possible contaminants (n=48, 40.7%) (only one result available for common skin contaminants coagulase-negative staphylococci, *Micrococcus spp., Propionibacterium acnes, Bacillus spp., Corynebacterium spp*.)	Location mapping 53.6% (n=30) could not be identified as belonging to the RHC haematology oncology cohort based on the details of their ECOSS result.
Differences in inclusion and exclusion criteria in CLABSI data - 48.3% (n=57) were either known pathogens or had more than one positive and were included in the other NHSGG&C datasets.	Using de-duplication of 7 rather than 14 days - 23.2% (n=13)
Using de-duplication of 7 rather than 14 days - [redacted]).	Missing in ECOSS [redacted]) of results were not in ECOSS but were included in the NHSGG&C Micro LIMS dataset.
Location errors [redacted]) were not included in any of the NHSGG&C datasets therefore it is likely that they were not part of the true RHC Haem-On cohort.	18 years of age or above excluded by HPS – [redacted])

1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) and NHSGG&C central line associated bloodstream infection (CLABSI) surviellance system.

Table 3 NHSGG&C Microbiology LIMS surveillance data and possible reasons for dataset not matching for the time period June 2014 and September 2019.

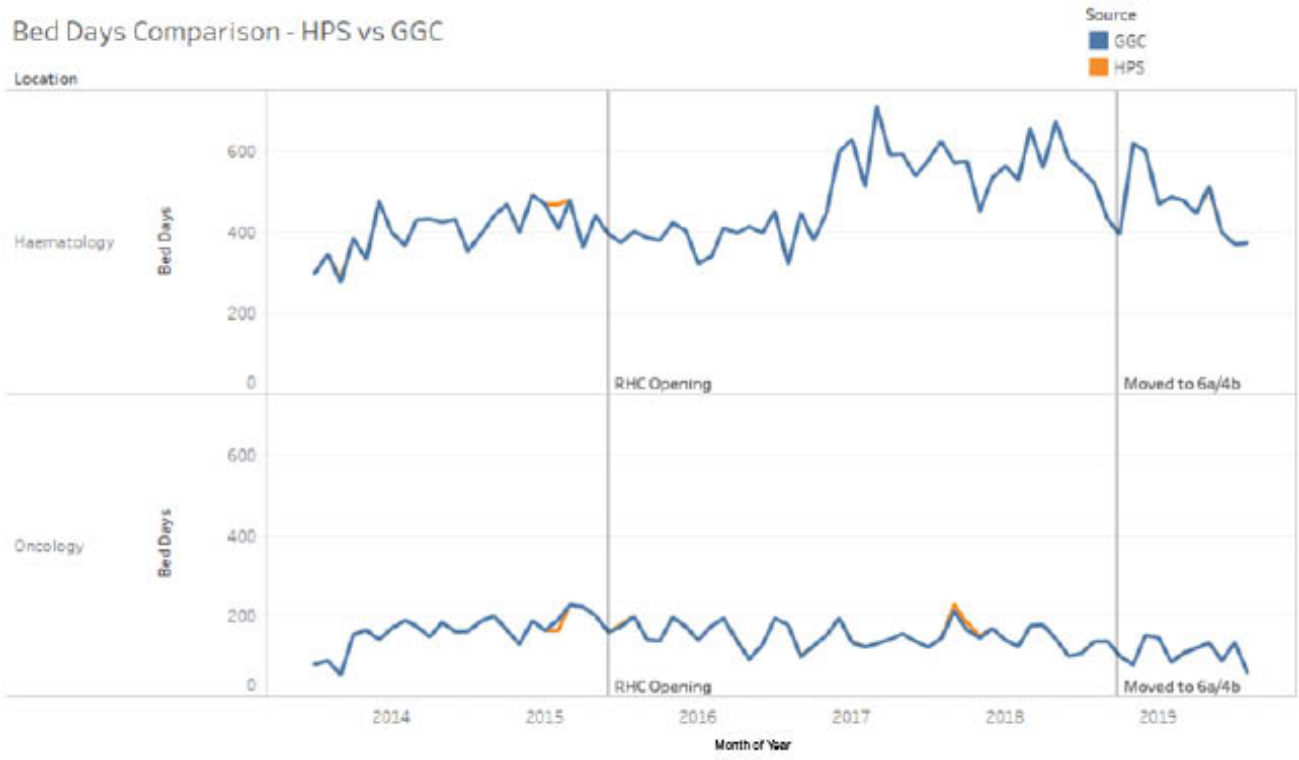
HPS episodes without corresponding NHSGG&C episode (n=42, 6.8%)	NHSGG&C episodes without corresponding HPS episode (n=85, 12.9%)
HPS episodes with corresponding results listed in NHS GGC CLABSI dataset but missing in Micro LIMS data (n=25, 59.5%)	Micro LIMS data included 24 (28.2%) episodes that should have been excluded using the 14 day species de-duplication rule.
Episodes missing from both the NHSGGC Micro LIMS and CLABSI datasets (n=15, 35.7%). [redacted] of these specimens were not collected from haem-oncology wards so were unlikely to be part of the true RHC Haem-Onc cohort and can be excluded from surveillance. [redacted] were possible contaminants with only one result available in ECOSS and can be excluded from surveillance. [redacted] were known enteric pathogens and aspirated in haem-oncology wards. [redacted] was an environmental organism which was also included in the NHSGGC selected Gram-neg dataset.	Location mapping 29.4% (n=25) could not be identified as belonging to the RHC haematology oncology cohort based on the details of their ECOSS result. Ten of these patients had their start of episode specimens taken in different hospitals across six health boards.
ECOSS result not updated with species name, these should be excluded as episodes during deduplication [redacted]	18 years of age or above excluded by HPS – [redacted]
	Non-blood culture specimens excluded by HPS – [redacted] This included four bone marrow specimens and one pus.
	Missing in ECOSS -30.6% (n=26) of results were not in ECOSS. Of these 10 were included in the NHSGG&C CLABSI dataset.

1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) and and NHSGG&C laboratory information management system (LIMS).

Review of denominator data

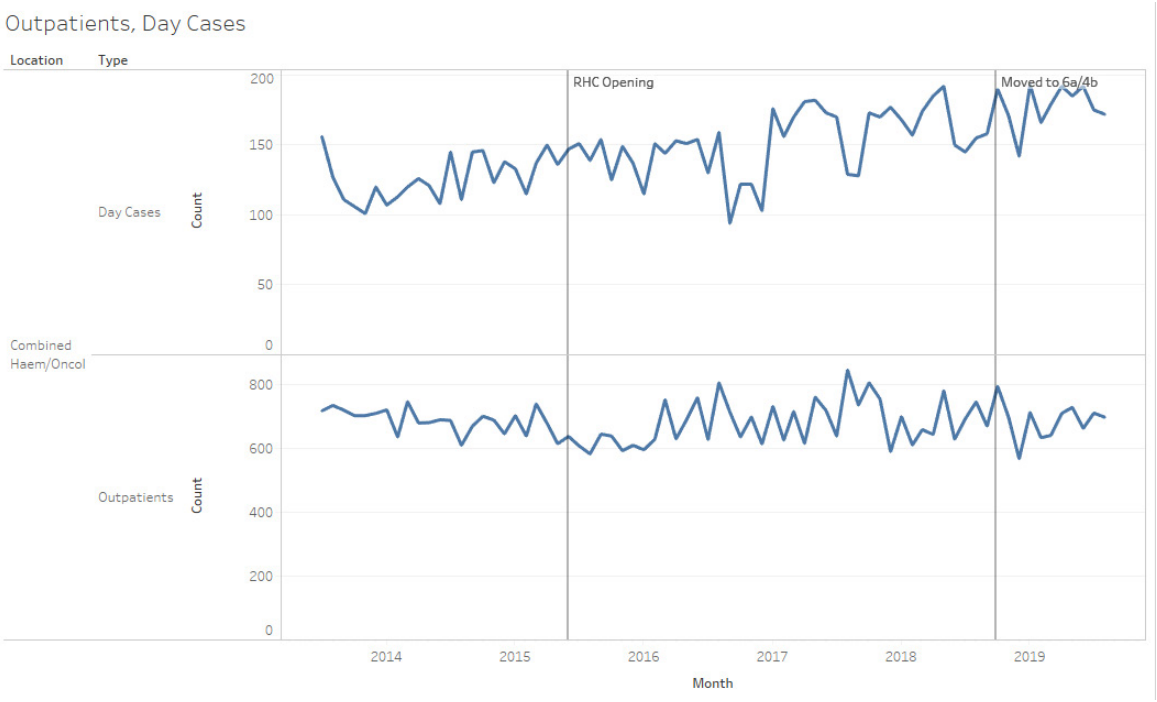
The NHSGG&C activity data was also validated by comparing it to data held by HPS provided by Information Services Division (ISD) and only minor differences were shown (Figure 2). An increase in occupied bed days' activity occurs in haematology in December 2016 which was not mirrored in the oncology figures. Activity data for day cases and outpatients including patients that did not attend (DNA) is shown in Figure 3 showing a gradual increase in day cases following the move to RHC.

Figure 2: Review of total occupied bed days by haematology and oncology specialities for the time period July 2013 to August 2019.



1. Total occupied bed days: Activity data (provided by NHSGG&C) & Information Services Division ISD(S)1 (HPS).

Figure 3: Day cases and outpatient appointments (including did not attend) of combined haematology and oncology activity from July 2013 to August 2019.



1. Activity data provided by NHSGG&C.

Case level data

From the data obtained by HPS from ECOSS there were 688 positive blood culture episodes at species level (case definition 1) for under 18 paediatric haematology oncology population in NHSGG&C linked to RHC between July 2013 and September 2019. From the 688 species level cases, 167 episodes were classed as environmental including enteric group from 97 different patients. Approximately one third (33.5%, n=56) of the species episodes reported formed part of polymicrobial environmental gram negative bacteraemia episodes.

For case definition 2, there were 70 cases of environmental organisms, and when expanding this group to include enteric organisms (case definition 3), there were 132 cases.

When deduplicating at Gram-stain level (case definitions 4 and 5), there were 390 cases of Gram-positive group organisms and 176 cases of Gram-negative group organisms.

Using the Gram-negative case definition an upward shift with a run of ten data points above the mean was observed from March to December 2017, with the upper warning limit (UWL) breached in August 2017, March 2018, May 2018 and again in September 2019 (Figure 4).

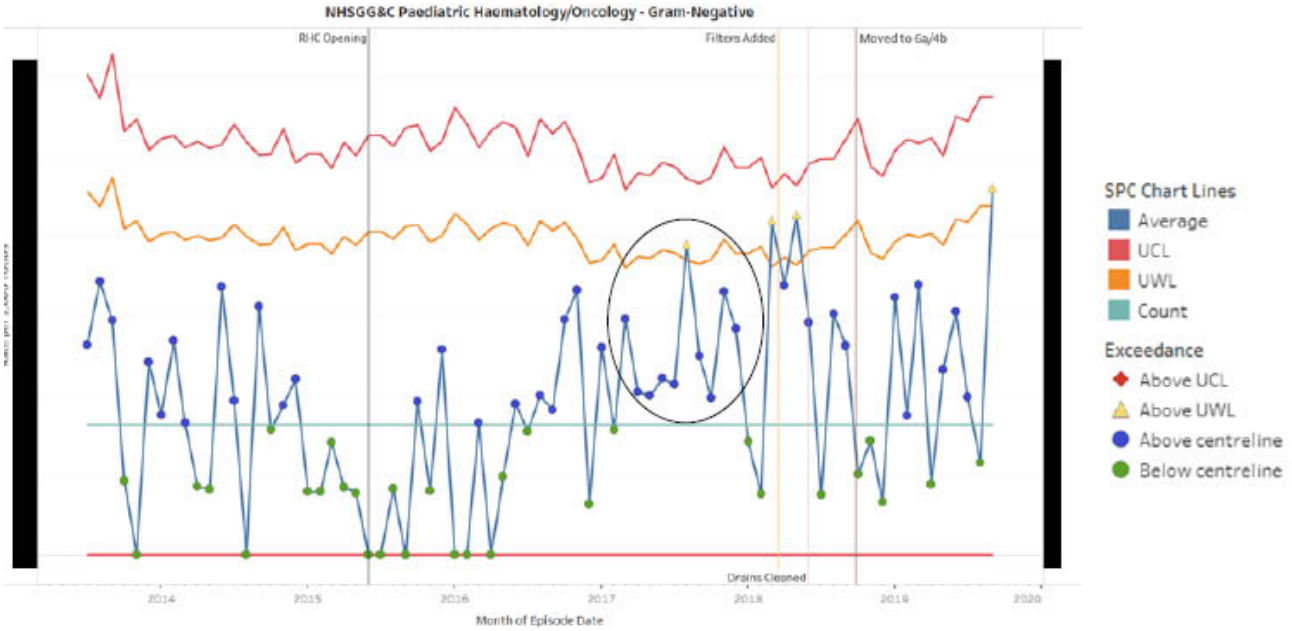
Figure 5 shows the SPC chart for the environmental group case definition. The UWL was breached in June 2018. The environmental group was extended to include selected enteric organisms such as species of *Enterobacter; Klebsiella* that were linked with drain contamination. The environmental including enteric group is described in Figure 6, showing the UWL was breached in March 2018 and March 2019.

Figure 7 describes the incidence of Gram-positive blood cultures in paediatric haematology oncology population. There was no upward shift in rates following the move to RHC however the upper control limit (UCL) was breached in January 2016, January 2017, April 2017 and June 2017. With rates above the UWL July 2016, May 2017, November 2017 and December 2017. Following the increase in activity at the RHC shown in Figure 7 with six out of twelve data points in 2017 breached a trigger limit (UWL or UCL). The rate now appears to be similar to that observed prior to the move to RHC with seven out twelve data points having a rate below the mean rate in the last year.

A summary of the SPC shifts and triggers shown in Figure 4 to Figure 7 is provided in Table 4.

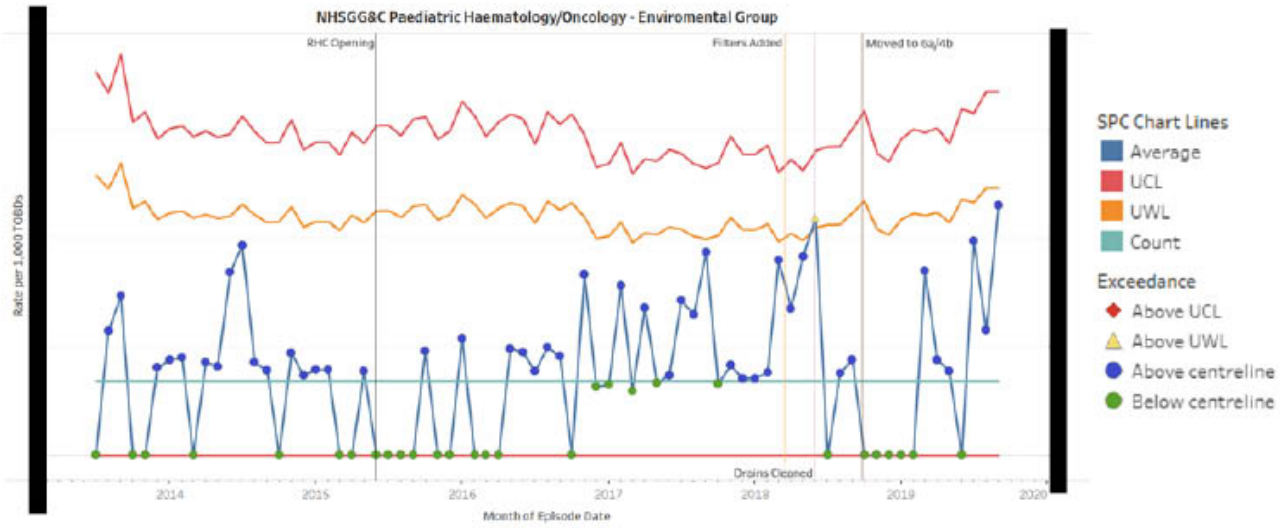
No change was observed when crude comparisons were made between the rates with the exception of the Gram-positive group ($p=0.04$) which significantly decreased when comparing the overall incidence before and after the move to RHC.

Figure 4: SPC chart using the Gram-negative case definition for HPS data from the July 2013 to September 2019.[1]



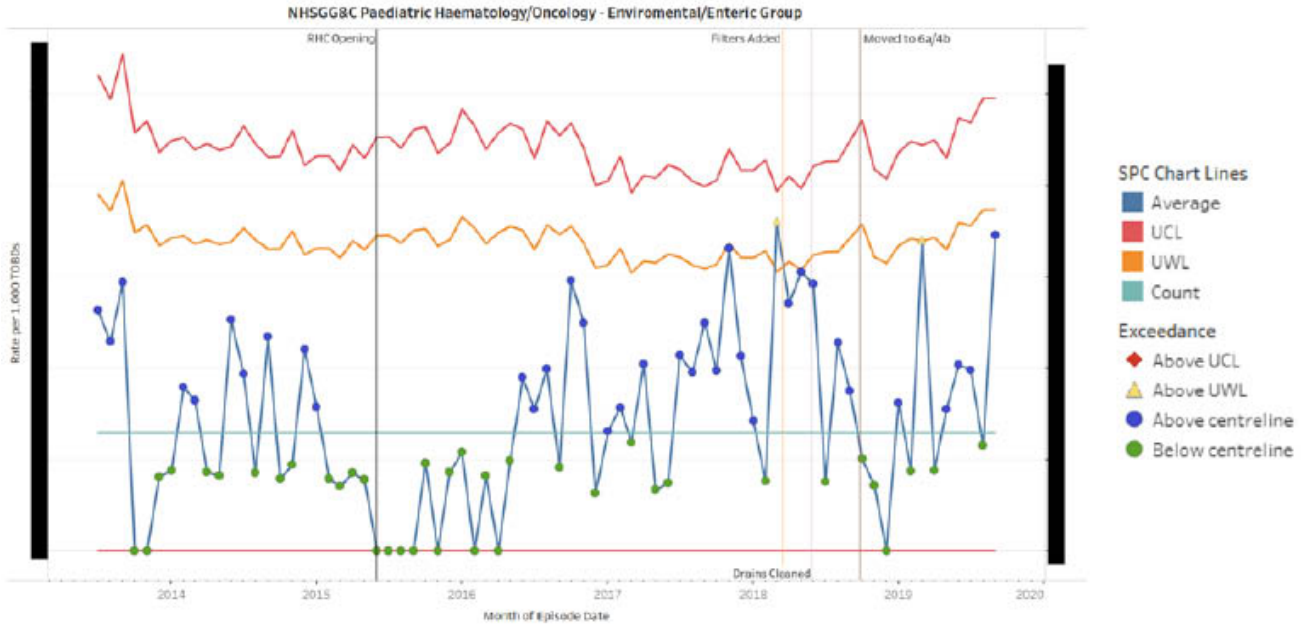
1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) & Total occupied bed days: from activity data provided by NHSGG&C.

Figure 5: SPC chart using the environmental group case definition for HPS data from the July 2013 to September 2019.[1]



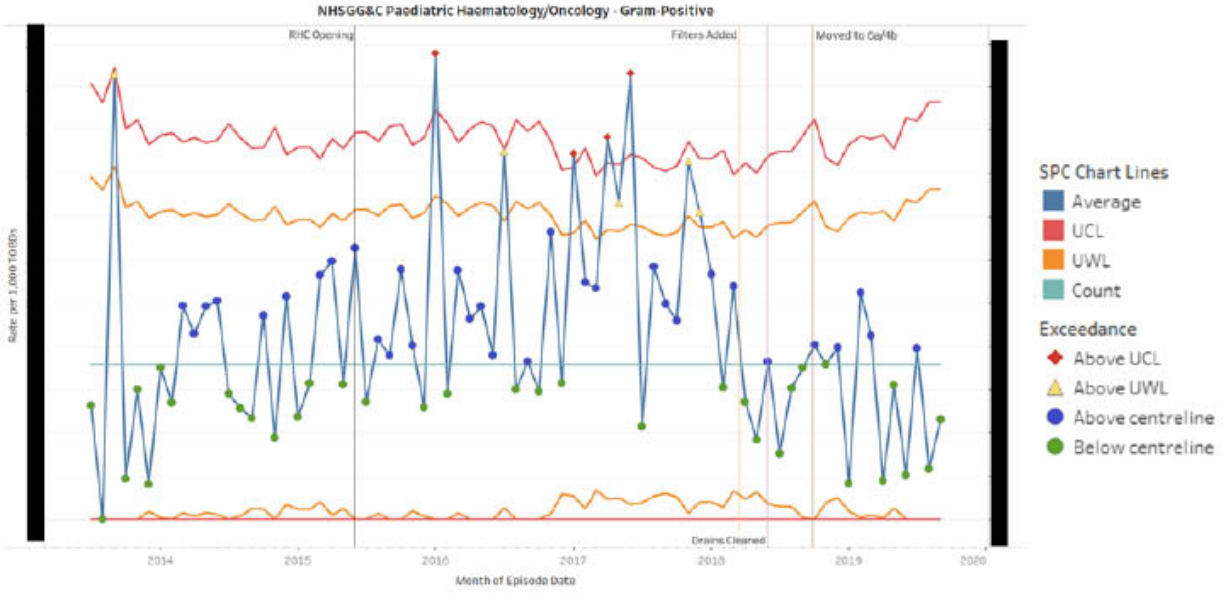
1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) & Total occupied bed days: from activity data provided by NHSGG&C.

Figure 6: SPC chart using the environmental including enteric group case definition for HPS data from the July 2013 to September 2019.[1]



1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) & Total occupied bed days: from activity data provided by NHSGG&C.

Figure 7: SPC chart using the Gram-positive case definition for HPS data from the July 2013 to September 2019.[1]



1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) & Total occupied bed days: from activity data provided by NHSGG&C.

Table 4: Summary table listing SPC shifts, trigger points (UWL breach) and outliers(UCL breach) following the move to RHC using HPS data from July 2013 to September 2019.[1]

Year	Gram-positive	Gram-negative	Environmental	Enviro/Enteric
2015				
2016	Jan 2016 (UCL)			
	July 2016 (UWL)			
2017	Jan 2017 (UCL)	Upward shift (Mar 2017 – Dec 2017)		
	April 2017 (UCL)	Aug 2017 (UWL)		
	May 2017 (UWL)			
	June 2017 (UCL)			
	Nov 2017 (UWL)			
	Dec 2017 (UWL)			
2018		March 2018 (UWL)	June 2018 (UWL)	March 2018 (UWL)
		May 2018 (UWL)		
2019		Sept 2019 (UWL)		March 2019 (UWL)

1. Source of data is Electronic Communication of Surveillance in Scotland (ECOSS) & Total occupied bed days: from activity data provided by NHSGG&C.

Comparison with other health boards

When comparing the overall hospital rate of positive blood cultures since the move to RHC (June 2015 to September 2019) to the combined rate of the other two Scottish children's hospitals (Royal Aberdeen Children's Hospital (NHS Grampian) and Royal Hospital for Sick Children (NHS Lothian)), the incidence of positive blood cultures, using the case definitions 2 to 5, was higher in RHC for environmental including enteric group (RR= 1.86 95%CI 1.42-2.47, p<0.001), but lower for Gram-positive group (RR=0.76, 95%CI 0.70-0.83, p<0.001). There was no difference in the rates of Gram-negative group (RR=1.18, 95%CI 0.96-1.42, p=0.07) or environmental group (RR=1.42, 95%CI 0.94-2.16, p=0.11).

When compared over two years (October 2017 to September 2019), the rate of positive blood cultures was higher in RHC for environmental including the enteric group (RR=1.70, 95%CI 1.17-2.53, p<0.005) and Gram-negative group (RR=1.31, 95%CI 1.00-1.73, p=0.05) but lower for the Gram-positive group (RR=0.74, 95%CI 0.66-0.84, p<0.001). There was no difference in the rates of the environmental group (RR=1.36, 95%CI 0.77-2.52, p=0.39).

In the last year following the move to QEUH (October 2018 to September 2019) there was no difference in the rate for Gram-negative group (RR=1.23, 95%CI 0.85-1.80, p=0.30), environmental including the enteric group (RR=1.26, 95%CI 0.74-2.18, p=0.44) or environmental group (RR=0.93, 95%CI 0.41-2.23, p=1) however the rate was lower for the Gram-positive group (RR=0.77, 95%CI 0.64-0.93, p=0.005).

Diversity of Environmental Organisms

The diversity of organisms isolated in the haemato-oncology unit prior and post move to RHC for the environmental group and the environmental including enteric group are shown in Figure 8 and Figure 9.

Caveats

There are a number of limitations associated with the use of ECOSS blood culture data. Blood samples are non-validated records. The cases may include interim results, contaminants, and may include non-blood cases which are incorrectly mapped to a blood sample within either the laboratory system or within ECOSS. Location mappings within ECOSS records may also be prone to error and it may be difficult to capture all haemato-oncology patients admitted to other RHC or YH wards who subsequently had a positive blood culture. Gram-negative blood culture data may be incomplete for September 2019 and non tuberculous mycobacteria data may be incomplete from July 2019 onward as samples are still to be reported. Due to uncertainty over positive fungal blood samples coming into ECOSS they were excluded from this review.

Improvements in speciation, for example using MALDI-TOF technologies, may change the identification over time. Species level case definitions may result in a patient having more than one episode of positive blood culture in a 14 day period.

Environmental bacteria grouping include bacteria commonly found in the environment however they may also be associated with normal human microbiome and laboratory surveillance is unable to distinguish.

It is not possible to determine whether changes in episodes are confounded by changes in the patient population and their underlying medical conditions.

The rates used to compare the overall rate at RHC following the move to QEUH to the combined rate of the other two Scottish children's hospitals used an estimated denominator (Total Occupied Bed Days) for September 2018 by taking the proportion of days following the move.

In the monthly analysis of environmental bacteria positive blood cultures, the numbers are small and should be treated with caution.

The main reasons documented about discrepancies in the review of datasets were only the most likely reason and due to time constraints were not further investigated.

Summary and Recommendations

This report provides a review of datasets currently being used in NHSGG&C and HPS to support the investigation of this incident; an updated description of trends in positive blood cultures; and a description of the diversity of organisms.

One of the key objectives of this review was to assess the NHSGG&C datasets and provide assurance that the data provides an accurate reflection of the current epidemiological situation in this patient population and where differences exist, to understand reasons and assist with the interpretation. The results from this exercise suggest that the datasets currently used by NHSGG&C provide important intelligence that is aligned with the microbiological data held nationally in ECOSS. There are pros and cons to each of the datasets. The ECOSS and LIMS microbiology datasets do not provide clinical information relating to the cases, without this it is difficult to ensure that the blood cultures are true cases of clinical bacteraemia and there is limited epidemiological and clinical information to support investigation. The CLABSI dataset includes clinical information but has strict case definitions that may exclude cases of bacteraemia associated with the haemato-oncology specialty including those presenting in the first 48 hours of admission and those where the line was inserted in another unit.

Reviewing monthly SPC charts has been shown to be an appropriate method in identifying triggers and outliers when a stable period can be used to set the mean. In this review, the crude incidence rates before and after the move did not reflect the variation in incidence over time within this population. The changes in activity, in particular the occupied bed days, have highlighted the importance of considering activity when interpreting charts and where possible to use incidence rates in SPC charts. The use of grouped case definitions have allowed the data to be reviewed without reporting bias of selecting significant organisms or over reporting when multiple organisms are isolated from the one patient.

The SPC charts included in this report describe that there has been instances of variation outside what would normally be expected in this patient population, the latest was a breach of an upper warning limit for Gram-negative blood culture episodes in September 2019. The characterisation of these cases alongside understanding in the context of environmental microbiology is critical to understanding and managing risk.

The purpose of developing triggers that identify areas where the number of cases is out with what would normally be expected due to random variation, is to identify when it is appropriate to instigate a local investigation into the possible increase in cases. In order to ensure that appropriate action is taken, high sensitivity where there is a high degree of suspicion for increased number of cases is important, particularly in such a vulnerable population. For this reason, the use of microbiological laboratory data rather than the CLABSI data would provide a more sensitive measure for identifying areas for local investigation.

Triggers for areas where there is a need to monitor infectious agents with a possible environmental source that are based on groups of organisms rather than single species triggers likely provides a better measure. This is due to the complex microbiology of

environmental sources. The data presented in this report provide a starting point for supporting the development of appropriate triggers for environmental pathogens. The organisms included in the environmental category can be reviewed following the comprehensive literature reviews being undertaken by HPS for Chapter 4 of the National IPC Manual.

These analyses also indicate that approximately a third of cases of positive blood culture of environmental organisms had a polymicrobial episode. This observation provides an indication of the complexity of the interpretation of microbiology data in the absence of clinical data for this patient population. In addition, there were patients who had multiple episodes of positive blood cultures with different organisms over extended periods of time. Again, the interpretation of the data requires clinical data collected systematically to support interpretation of both unusual clinical pictures and breaches in the limits in SPC charts. The microbiological and clinical data should also be set in the environmental context including the environmental microbiology results such as water and ventilation sampling.

The data presented in this report do not provide evidence of single point of exposure and there is a need to continually monitor the risk in this patient population. There is no immunity to the organisms under investigation, therefore all patients within this cohort are at risk from developing gram negative bacterium due to their co morbidities and treatment plan. The control measure of restricting clinical services for newly diagnosed patients over existing patients should now be reconsidered.

The following recommendations should be considered:

- NHS GG&C should systematically collect clinical data on cases to describe risk in this patient population and ensure ongoing monitoring is in place.
- NHS GG&C should further characterise of cases in terms of “person” and “place” to support understanding when there are more cases than normally expected.
- NHS GG&C should consider the epidemiological characterisation of cases in the context of environmental risks and incidents e.g. water testing results, ventilation testing results.
- NHS GG&C should consider the data provided in the context of the findings from the action plan
- NHS GG&C should consider current control measures around restriction on services for newly diagnosed patients as there is no evidence from the HPS review of the data that supports the continued restriction of services.
- HPS will review the categorisation of environmental organisms following the literature reviews for Chapter 4 of the **National Infection Prevention and Control Manual**.
- HPS will further support the development of an appropriate trigger for ongoing monitoring.
- HPS should consider these findings when developing methods to support other boards in monitoring infection risk associated with environmental organisms.

Glossary

BMT	Bone Marrow Transplant
CDC	Centers for Disease Control
CLABSI	Central line associated bloodstream infection
CI	Confidence intervals
DNA	Did not attend
ECOSS	Electronic Communication of Surveillance in Scotland
ENT	Enteric
HPS	Health Protection Scotland
ISD	Information Services Division
LIMS	Laboratory information management system
NHSGG&C	NHS Greater Glasgow and Clyde
QEUH	Queen Elizabeth University Hospital
RR	Rate ratios
RHC	Royal Hospital for Children
SPC	Statistical Process Control
TOBD	Total occupied bed days
UCL	Upper control limit
UWL	Upper warning limit
YH	Yorkhill Hospital

List of Tables

List of Figures

[redacted]

Contact

[redacted]

Email: [redacted]

Further Information

Further Information can be found on the HPS website.

Rate this publication

Please provide feedback on this publication to help us improve our services.

Appendices

Appendix 1 – Background information

NHS GG&C supplied methods statement for Royal Hospital for Children Blood Stream infections for HPS review.

CLABSI

CLABSI data is prepared according to the following protocol, agreed by the RHC CLABSI Quality Improvement Group:

The QI group refer to CLABSI as defined according to the CDC classification as:

> *'A CLABSI is a primary BSI in a patient that had a central line within the 48-hour period before the development of the BSI and is not bloodstream related to an infection at another site. However, since some BSIs are secondary to other sources other than the central line (e.g., pancreatitis, mucositis) that may not be easily recognized, the CLABSI surveillance definition may overestimate the true incidence of CRBSI'*

The data includes all patients within the haemato-oncology cohort, so inclusive of those cared for at home by the outreach nurses, those attending day care and those who are inpatients in ward 2A including Bone Marrow Transplant, and teenage cancer patients.

CLABSI Data Collection Process:

1) ALL patients receiving a new central venous device at Yorkhill/Glasgow Royal Hospital for Children between January 2015 and July 2019 were collated (using Opera data to look at every operation done in every theatre every day in the Children's Hospital)

2) Out of this group, only the haematology/oncology patients were kept (searching for and confirming a diagnosis via Clinical Portal)

3) The total line day data was obtained by counting the number of days each line was in situ

4) Each patient was analysed monthly or twice monthly looking at positive microbiology culture results from either a central line or a peripheral venous sample whilst a central line was in situ (via Clinical Portal)

5) Any positive microbiology result with a concurrent illness (IE chest infection or urinary tract infection) was excluded (again via Clinical Portal and the electronic notes)

6) If a culture positive result occurred repeatedly in the 7 days following the first positive culture and the organism was the same, this was excluded (IE a patient with a Staph Aureus infection on 5/9/18 and a subsequent culture positive Staph Aureus on 7/9/18 was only counted as ONE infection); a second Staph Aureus infection on 13/9/18 would be counted as TWO infections in total as one would presume that a week of treatment should have effectively treated the first organism.

7) If, however, a second culture positive result occurred in the 7 days following the first positive culture and the organism was different, this was included (IE a patient with a Staph Aureus infection on 5/9/18 and a subsequent culture positive pseudomonas infection on 7/9/18 was counted as TWO infections in total).

8) Patients receiving their Hickman/Broviac Line, Port, or Haemodialysis line in a unit other than the Royal Hospital for Children in Glasgow were excluded. This point was discussed at the first CLABSI QI meeting and it was felt that these (few) patients that had lines inserted elsewhere but were treated in Glasgow could not be analyzed in the same fashion as those receiving the majority of their care (from line insertion to treatment to line removal) here in Glasgow.

9) Patients shared care in local district general hospitals who presented locally initially with a CLABSI and were subsequently transferred to Glasgow did not have that single line infection counted for similar reasons (we would be looking at the management of care in the district general hospital and thus would not be able to analyze them in the same methodology).

To produce the total CLABSI/Gram negative CLABSI chart as shown in the presentation, each line was checked to assign he organism to either gram positive, gram negative or fungus. The same denominator (line days) was used.

Where there were multiple organisms in a single line, the first named organism was used for classification. One organism was not classified, as it can exist as gram positive, gram negative or gram neutral.

CLABSI funnel plot

The funnel plot was produced using the PHE fingertips funnel plot for rates tool. The data used was the gram negative counts, and line day denominator used in the other CLABSI charts. The plot was produced using the instructions included in the tool. As there is no long term stable average, and in recognition of the quality improvement project, the central line was set to the aim of 1 per 1000 line days.

Epicurves

The ECOSS system was queried to obtain data on positive blood cultures for selected gram negative organisms reported from the GLA:SGH or GLA:GRI laboratories, age <16. The initial extract (during the water/drains incident 2018) was for date of report from July 2013 to June 2018. Further extracts were made periodically. The list of gram negatives was provided by the NHS GGC lead Infection Control Doctor, and is contained in the appendix to this document. This list is based on organisms identified during the water/drains incident. Following further discussion since the initial extract, *Citrobacter* and Aeromonas were added

to that list. To increase sensitivity, data were pulled from ECOSS on basis of genus, rather than species.

Following extraction, the following exclusions were applied:

- Results from neonatal, maternity and pathology removed
- Results from areas not part of RHSC/RHC

During initial screening, laboratory GLA:RAH was also included, however as no relevant results noted, this parameter was removed from the query.

CHI numbers were replaced with new unique ID, and patient identifiers deleted. It is therefore not possible to directly link more recent cases to those form previous extracts. To ensure that the rules below could be applied, and to capture any late inclusions in the ECOSS data base, the 3 months data prior to the new months was also extracted and cases cross checked. One additional late inclusion was detected in this way.

Each case was assigned to a specialty based on the following data points included in the ECOSS reports –

1. Ward sample was taken
2. Diagnosis/clinical history recorded on lab request
3. Requesting consultant.

If it was not possible to identify a specialty from information contained in the ECOSS report, then speciality was confirmed using electronic patient records.

Two separate counts were calculated, based on methodologies described by PHE and CDC:

- Organism count: Number of positive blood cultures per calendar month. Results within 14 days of a previous positive for the **same** organism in the same patient excluded.
- Case count: Number of positive blood cultures per calendar month results within 14 days of previous positive for **any** organism in the same patient excluded (ie only one positive per patient per 14 days)

In both cases the date of result was counted as day one.

Rates were then calculated using activity data produced by NHS GGC acute service information team.

Division of organisms between “environmental” and “non-environmental” was based on advice from GGC mcirobiologists.

Non-environmental: *Citrobacter*, *Enterobacter, Klebsiella, Pantoea, Serratia.*

Environmental: All other organisms.

All gram negative positive blood cultures chart

An extraction from ICNet of blood cultures from RHSC Schiehallion, RHSC Schiehallion DCU, RHC 2A, RHC 2B & QEUH 6A, for patients under 18 years at time of BC aspiration for dates 01/11/2014 – 19/09/2019 (date of data extraction) was carried out by GGC IPCT surveillance team. Blood cultures were de-duplicated by 14 days i.e. new case on day 15 from previous isolate of the same organism in the same patient. More than one organism may have been isolated in the same blood culture specimen.

The counts were converted to rates using the occupied bed day data from NHS GGC acute services information team.

NHSGG&C Appendix: list of selected gram negative organisms

Achromobacter xylosoxidans	Morganella morganii
Acinetobacter lwofii	Pantoea agglomerans
Acinetobacter ursingii	Paracoccus sp
Brevundimonas versicularis	Pseudomonas chlororaphis
Burkholderia cepacia	Pseudomonas fluorescens
Cedecea lapagei	Pseudomonas oryzihabitans
Chryseobacterium indologenes	Pseudomonas putida
Commamonas testosterone	Pseudoxanthomonas mexicana
Cupriavidus gilardii	Ralstonia picketii
Cupriavidus pauculus	Rhizobium radiobacter
Delftia acidovorans	Serratia fonticola
Elizabehtkingia meningospetica	Shewanella puterfaciens
Enterobacter cloacae	Sphingomonas species
Klebsiella pnuemoniae	Stenotrophomonas maltophilia

Organism comparison list

Table 5 and Table 6 detail the organisms isolated in the positive blood cultures and the groupings used in this report.

Table 5: Organisms isolated from positive blood samples included in environmental groupings during the time period reviewed.[1]

NHSGGC CLABSI surveillance	NHSGGC ECOSS selected Gram-negative organisms (GGC Selected GNeg)	NHSGGC Microbiology LIMS Surveillance	HPS ECOSS Under18 bloods RHC HaemOnc
Gram Negative Environmental (GN ENV)	**Gram Negative Environmental (GN ENV)**	**Gram Negative Environmental (GN ENV)**	**Gram Negative Environmental (GN ENV)**
Achromobacter spp.	*Acinetobacter baumannii*	*Achromobacter sp*	*Achromobacter spp.*
Acinetobacter baumannii	*Acinetobacter ursingii*	*Acinetobacter baumannii*	*Acinetobacter spp.*
Acinetobacter ursingii	*Aeromonas hydrophila*	*Acinetobacter ursingii*	*Aeromonas hydrophila*
Aeromonas hydrophila	*Brevundimonas spp.*	*Aeromonas spp*	*Brevundimonas spp.*
Burkhold cepacia	*Burkholderia cepacia*	*Brev. spp.*	*Burkholderia cepacia*
Chryseomonas indologenes	*Chryseobacterium indologenes*	*Burk. cepacia group*	*Chryseobacterium indologenes*
Chryseob. spp	*Chryseobacterium spp.*	*Chryseob. spp.*	*Chryseobacterium spp.*
Cupriavidis pauculus	*Cupriavidus pauculus*	*Chryseobacterium indologenes*	*Cupriavidus pauculus*
Eliz. meningoseptica	*Delftia acidovorans*	*Chryseomonas spp.*	*Delftia acidovorans*
Elizabethkingia spp.	*Elizabethkingia meningoseptica*	*Cup. pauculus*	*Elizabethkingia meningoseptica*
Delftia acidovorans	*Elizabethkingia spp.*	*Del. acidovorans*	*Elizabethkingia miricola*
Pseudomonas spp.	*Pseudomonas spp.*	*Delftia spp.*	*Elizabethkingia spp.*
Rhiz. radiobacter	*Rhizobium radiobacter*	*Elizabethkingia. spp.*	*Pseudomonas spp.*
Roseomonas mucosa	*Sphingomonas paucimobilis*	*Herbaspirillum sp*	*Raoultella planticola*
Sphingomonas spp.	*Steno. maltophilia*	*Pseudomonas spp.*	*Rhizobium radiobacter*
Steno. maltophilia		*R. planticola*	*Roseomonas mucosa*
		R. radiobacter	*Sphingomonas paucimobilis*
		R. mucosa	*Steno. maltophilia*
		Sph. paucimobil	

		Steno. maltophilia	
Gram Negative Enteric /Environmental (GN ENT/ENV)	**Gram Negative Enteric /Environmental (GN ENT/ENV)**	**Gram Negative Enteric /Environmental (GN ENT/ENV)**	**Gram Negative Enteric /Environmental (GN ENT/ENV)**
Citrobacter spp. *Enterobacter cloacae* *Klebsiella spp.* *Pantoea spp.* *Serratia liquefaciens* *Serratia marcesens*	*Citrobacter spp.* *Enterobacter spp.* *Klebsiella spp.* *Pantoea spp.* *Serratia liquefaciens* *Serratia marcescens*	*Citrobacter spp.* *Enterobacter spp.* *Klebsiella spp.* *Pantoea spp.* *Ser. liquefac.* *Ser. marcescens*	*Citrobacter spp.* *Enterobacter spp.* *Klebsiella spp.* *Pantoea spp.* *Serratia liquefaciens* *Serratia marcescens*
Gram Positive Environmental (GP ENV)	**Gram Positive Environmental (GP ENV)**	**Gram Positive Environmental (GP ENV)**	**Gram Positive Environmental (GP ENV)**
Gordonia polyisoprenivorans	N/A	*Gordonia polyisoprenivorans*	*Gordonia bronchialis*
Acid Fast Environmental (AF ENV)	**Acid Fast Environmental (AF ENV)**	**Acid Fast Environmental (AF ENV)**	**Acid Fast Environmental (AF ENV)**
Mycobacterium chelonae	N/A	*Myc. chelonae group* *Myco fortuitum* *Mycobacterium chelonae*	*Mycobacterium chelonae* *Mycobacterium spp.*
Fungi Environmental (Fungi ENV)	**Fungi Environmental (Fungi ENV)**	**Fungi Environmental (Fungi ENV)**	**Fungi Environmental (Fungi ENV)**

1. May not include every organism of interest if no cases were found during the time period.

Table 6: Organisms isolated from positive blood samples included in non-environmental groupings during the time period reviewed.[1]

NHSGGC CLABSI surveillance	NHSGGC ECOSS selected Gram-negative organisms (GGC Selected GNeg)	NHSGGC Microbiology LIMS Surveillance	HPS ECOSS Under18 bloods RHC HaemOnc
Gram Negative Non-environmental (GN NON-ENV)	**Gram Negative Non-environmental (GN NON-ENV)**	**Gram Negative Non-environmental (GN NON-ENV)**	**Gram Negative Non-environmental (GN NON-ENV)**
Escherichia coli *Fusobacterium nucleatum* *Proteus mirabilis*	N/A	*Bact. uniformis* *Cap. sputigena* *Escherichia coli* *Fuso. nucleatum* *Haemophilus influenzae* *Mor. catarrhalis* *Moraxella nonliquefaciens* *Moraxella osloensis* *Neis. subflava* *Proteus mirabilis*	*Bacteroides uniformis* *Capnocytophaga sputigena* *Escherichia coli* *Escherichia fergusonii* *Fusobacterium nucleatum* *Haemophilus influenzae* *Moraxella spp.* *Neisseria spp.* *Ochrobactrum anthropi* *Proteus mirabilis*
Gram Positive Non-environmental (GP NON-ENV)	**Gram Positive Non-environmental (GP NON-ENV)**	**Gram Positive Non-environmental (GP NON-ENV)**	**Gram Positive Non-environmental (GP NON-ENV)**
Aerococcus viridans *Clostridium spp.* *Corynebacterium spp.* *Dermacoccus nishinomiyaens* *Diphtheroids* *Enterococcus spp.* *Gemella Sanguinis* *Gordonia polyisoprenivorans*	N/A	*Aerococcus viridans* *Alpha strep* *Bacillus spp.* *C. perfiringens* *Coag Neg Staph.* *Corynebacterium spp* *Derm. nishinomiyaens* *Diphtheroids* *Enterococcus spp.*	*Abiotrophia defectiva* *Aerococcus viridans* *Bacillus spp.* *Clostridium perfringens* *Clostridium septicum* *Corynebacterium spp.* *Dermacoccus spp.* *Enterococcus spp.* *Gemella sanguinis*

Gram +ve bacilli *Gram Pos B* *Gram Pos C* *Gran Adiac* *Granulicatella adiacens* *Kocuria rhizophilia* *Lactobacilus* *Micrococcus spp.* *Paenibacillus durus* *Propionibacterium acnes* *Rothia mucilaginosa* *Staphylococcus spp.* *STCNS* *Streptococcus spp.*		*Gemella.sanguinis* *GPC-Strep* *Gram +ve bacilli* *Gram positive cocci* *Gran. adiacens* *Kocuria rhizophilia* *Lactobacillus spp* *Micrococcus spp.* *Paenibacillus spp.* *Propionibacterium acnes* *Rothia mucilaginosa* *Staphylococcus spp.* *Streptococcus spp.*	*Granulicatella adiacens* *Kocuria spp.* *Lactobacillus spp.* *Lactococcus lactis* *Leuconostoc lactis* *Micrococcus spp.* *Paenibacillus spp.* *Propionibacterium spp.* *Rothia spp.* *Staphylococcus spp.* *Streptococcus spp.*
Acid Fast Non-environmental (AF NON-ENV)	**Acid Fast Non-environmental (AF NON-ENV)**	**Acid Fast Non-environmental (AF NON-ENV)**	**Acid Fast Non-environmental (AF NON-ENV)**
Nil	N/A	Nil	Nil
Fungi Non-environmental (Fungi NON-ENV)	**Fungi Non-environmental (Fungi NON-ENV)**	**Fungi Non-environmental (Fungi NON-ENV)**	**Fungi Non-environmental (Fungi NON-ENV)**
Candida spp. *Yeasts*	N/A	*Candida spp.*	*Candida spp.*

1. May not include every organism of interest if no cases were found during the time period.

Appendix 2 – Publication Metadata

Metadata Indicator	Description
Publication title	**Review of NHSGG&C paediatric haemato- oncology data**
Description	This management report provides information on paediatric haematology oncology related in NHS Greater Glasgow &Clyde (NHSGG&C)
Theme	Infections
Topic	Paediatric haematology oncology
Format	Management report and supplementary excel document
Data source(s)	Electronic Communication of Surveillance in Scotland (ECOSS) Total occupied bed days: Information Services Division ISD(S)1 Data provided by NHSGG&C
Date that data are acquired	ECOSS extract 07/10/2019
Release date	25 October 2019
Frequency	Ad hoc
Timeframe of data and timeliness	NA
Continuity of data	NA
Revisions statement	Case definitions have changed since previous reports (refer to methods section)
Revisions relevant to this publication	NA
Concepts and definitions	Covered in methods section.
Relevance and key uses of the statistics	NA
Accuracy	Laboratory data that has not been validation so treated with caution.
Completeness	Data not been validated
Comparability	Comparisons have been made to other Children's hospitals in Scotland however there may be differences in patient population so comparisons should be treated with caution.
Accessibility	It is the policy of HPS to make its web sites and products accessible according to **published guidelines**.
Coherence and clarity	NA
Value type and unit of measurement	Rate per 100,000 total occupied bed days (TOBDs) = (Number of cases of positive blood culture of given case definition in hospital(s) or speciality /TOBDs in hospital(s) or speciality x 100,000).
Disclosure	NA
Official Statistics designation	NA
UK Statistics Authority Assessment	NA
Last published	NA
Next published	NA
Date of first publication	NA
Help email	**mailto:NSS.HPSHAIIC@nhs.net**
Date form completed	25/10/2019

Appendix 3 – HPS and Official Statistics

About HPS

HPS is a division of NHS National Services Scotland which works at the very heart of the health service across Scotland, delivering services critical to frontline patient care and supporting the efficient and effective operation of NHS Scotland.

HPS was established by the Scottish Government in 2005 to strengthen and coordinate health protection in Scotland. It is organised into three specialist groups with expertise provided by a multi-disciplinary workforce which includes doctors, nurses, scientists and information staff, all of whom are supported by core business and IM&T teams. The specialist groups are:

- Healthcare Associated Infections and Infection Control;
- Blood Borne Viruses and Sexually Transmitted Infections, Immunisation, and Respiratory and Vaccine Preventable Diseases;
- Gastrointestinal and Zoonoses Travel, and Environmental Public Health.

Official Statistics

Our official statistics publications are produced to a high professional standard and comply with the Code of Practice for Official Statistics. The Code of Practice is produced and monitored by the UK Statistics Authority which is independent of Government. Under the Code of Practice, the format, content and timing of statistics publications are the responsibility of professional staff working within NHS National Services Scotland.

Our statistical publications are currently classified as one of the following:

- National Statistics (ie assessed by the UK Statistics Authority as complying with the Code of Practice)
- National Statistics (ie legacy, still to be assessed by the UK Statistics Authority)
- Official Statistics (ie still to be assessed by the UK Statistics Authority)
- other (not Official Statistics)

Further information on NHS National Services Scotland's statistics, including compliance with the Code of Practice for Official Statistics, and on the UK Statistics Authority, is available on the ISD website.

1
2

Queen Elizabeth University Hospital and Royal Hospital for Children

Case Note Review Overview Draft Report

February 2021

A49585984

Contents

3

4

Foreword

Will be added at later date.

Executive Summary

Will be added at a later date.

Glossary

Will be added at a later date.

1. BACKGROUND TO THE CASE NOTE REVIEW

The events that have occurred since the move of the Children's Hospital from its previous site at Yorkhill, to its new home on the QEUH campus in the summer of 2015 have been numerous and complex. The concern that infections in children and young people under the care of the Paediatric Haematology Oncology service have arisen from microbiological contamination of the hospital environment is a story that derives from many interwoven threads. It is not our task to create a comprehensive historical account but we are cognisant that much of what has gone before bears on the presentation and interpretation of the data we have sought to evaluate in the course of our Review.

Section 1.1 is a timeline of key dates that led up to, and through, the period of the Review.

We also recognise that blood stream infection in Paediatric Haematology Oncology patients is a known hazard that derives from several factors relating both to disease and its treatment. It seemed relevant, therefore, that we should incorporate a brief summary from published literature to set the scene about what is already known and understood in this area. This is set out in section 1.2.

1.1 Timeline of key dates leading up to the Case Note Review

27 January 2015	Handover of QEUH and RHC buildings to NHS GGC
10 June 2015	Move from Royal Hospital for Sick Children (Yorkhill) to Royal Hospital for Children (Govan)
February 2016	Infection of a child with *Cupriavidis pauculus*[1]. Investigation linked the infection to a sink in the aseptic pharmacy suite
March 2017	Concern emerging within NHS GGC about increased bacteraemia rates in Paediatric Haematology Oncology patients. The first PAG for a Gram-negative environmental bacteraemia is convened. Concern also emerged about incidence of *Aspergillus* spp. infections at the same time. Quality improvement group established to work on reducing CLABSI (Central Line Associated Blood Steam Infection) rates
September 2017	Microbiology staff raised concerns about the facilities in the QEUH and RHC and the structure of IPCT Service in NHS GGC. (SBAR in October 2017). An action plan was agreed to address these issues

[1] Both the 2018 HPS report and the 2020 Independent Review report state that this child was a patient on Ward 2A, in which case he/she would have been included in our Review. This was not the case and ARHAI have since confirmed that this child was not a patient on Ward 2A.

March 2018	Health Facilities Scotland (HFS) and Health Protection Scotland (HPS) were asked by NHS GGC to investigate ongoing issues with the water supply
2 March 2018	Water Incident Management Team IMT convened
26 September 2018	All services from RHC Wards 2A and 2B are transferred to QEUH Ward 4B and Ward 6A due to concerns over facilities
Autumn /Winter 2018/19	Additional chlorination of the water supply implemented
December 2018	Health Protection Scotland publish its report: Summary of Incidents and Findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children Water Contamination Incident and Recommendations for NHS Scotland
January 2019	Paediatric Haemato-Oncology patients transferred out of Ward 6A due to concerns relating to Cryptococcus and the sealant used in the ensuite shower rooms
22 January 2019	The Cabinet Secretary for Health and Sport announced in Parliament plans for an Independent Review
March 2019	Health Facilities Scotland finalised (although never published) its report: Water Management Issues Technical Review: NHS Greater Glasgow and Clyde - Queen Elizabeth University Hospital/Royal Hospital for Children
5 March 2019	Drs Fraser and Montgomery appointed to lead the Independent Review
20 May 2019	Ward 6A re-opened to admissions
2 August 2019	Admissions to Ward 6A restricted and new patients diverted to other NHS Boards due to concerns over facilities
29 August 2019	SBAR issued by Consultant Microbiologists raising persisting concerns about the microbiological safety of Ward 6A
September 2019	Facebook group established for patients and families associated with the Paediatric Haematology Oncology service
October 2019	Health Protection Scotland published its report: Review of NHS GG&C Paediatric Haematology Oncology Data
21 November 2019	Ward 6A re-opened to new admissions

22 November 2019	Scottish Government's Health and Social Care Management Board escalated NHSGGC to 'Stage 4' of its escalation ladder and a new Oversight Board, led by Chief Nursing Officer, Professor Fiona McQueen, was established
28 January 2020	The Cabinet Secretary for Health and Sport announced in Parliament the plans for a Case Note Review
24 February 2020	The Case Note Review commenced
June 2020	Independent Review report published
15 June 2020	Terms of Reference published for the Independent Inquiry into the construction of the Queen Elizabeth University Hospital Campus (QEUH), Glasgow and the Royal Hospital for Children and Young People and Department of Clinical Neurosciences (RHCYP/DCN), Edinburgh.
December 2020	The Queen Elizabeth Hospital/NHS Greater Glasgow and Clyde Oversight Board published its Interim Report
January 2021	Expert Panel Review completed
March 2021	Expert Panel Report and The Queen Elizabeth Hospital/NHS Greater Glasgow and Clyde Oversight Board Report both published

1.2 Blood Stream Infections in Paediatric Haematology Oncology patients

Long-term survival of children with cancer has improved dramatically due to multiple medical advances, including the delivery of intensive chemotherapy. This aggressive therapy alongside disease-related bone marrow aplasia, prolonged courses of high-dose steroids, treatment induced mucositis and the requirement for long-term central venous access, puts children with cancer at increased risk of blood stream infections (BSI) and severe sepsis. Sepsis is the leading cause of Paediatric Intensive Care Unit (PICU) admission, morbidity and mortality among children with cancer[2,3,4].

[2] Pizzo PA. Management of Patients With Fever and Neutropenia Through the Arc of Time: A Narrative Review. Ann Intern Med. 2019 Mar 19;170(6):389-397. doi: 10.7326/M18-3192. Epub 2019 Mar 12. PMID: 30856657.
[3] Aljabari S, Balch A, Larsen GY et al. Severe Sepsis-Associated Morbidity and Mortality among Critically Ill Children with Cancer. J Pediatr Intensive Care. 2019; 8(3): 122-129. doi: 10.1055/s-0038-1676658
[4] Levene I, Castagnola E, Haeusler G. Antibiotic-resistant Gram-negative Blood Stream Infections in Children with Cancer: A Review of Epidemiology, Risk Factors, and Outcome. The Paediatric Infectious Disease Journal: 2018; 37(5): 495-498. doi: 10.1097/INF.0000000000001938

Overall mortality from febrile neutropenia (the commonest side effect after most forms of chemotherapy) is frequently quoted as less than 1%[5]. Bacteraemia is, however, identified in 5-38% of all paediatric cancer patients with febrile neutropenia and the early use of broad-spectrum antibiotics is crucial to prevent harm[6,7,8]. The mortality rate from severe sepsis in children with cancer ranges from 8% to as high as 41%, reported in a recent multinational study[9].

One study demonstrated that 45% of all Paediatric Haematology-Oncology patients required at least one admission due to concerns about sepsis and 8% of those admitted required paediatric intensive care of whom, 34% of those with severe sepsis developed multiple organ dysfunction and/or died. Children with leukaemia and related diagnoses were more likely to require intensive care treatment than those with other types of cancer, however the type of diagnosis did not affect the ultimate outcome[3].

Other studies have demonstrated a lower overall intensive care mortality rate but also showed that this was significantly higher in patients with a history of haematopoietic stem cell transplantation (HSCT) and varied depending on the causative pathogen, greater for fungal sepsis than for Gram-negative bacterial sepsis[10 11].

Blood stream infections in Paediatric Haemato-Oncology patients are most commonly associated with indwelling central venous access devices, most commonly Hickman lines. Prospective surveillance studies report overall incidence rates for central-line associated infections per 1000 central venous catheter (CVC) days, and rates of about 1 BSI/1000 CVC days are where best practice should aim to lie[12]. Peripherally inserted central catheters have been shown to have lower infection rates compared with other central venous lines.

Bacterial BSI are also more common in those who have undergone HSCT, occurring in 20 to 45% of patients in some series, with the majority of infections occurring prior to engraftment[13]. Post transplant BSI remains a risk and may be associated with a higher

[5] Hann I et al. "A comparison of outcome from febrile neutropenic episodes in children compared with adults". British Journal of Haematology, vol. 99, no. 3-I, December 1997, pp. 580-588

[6] Asturias EJ, Corral JE, Quezada J et al. Evaluation of six risk factors for the development of bacteraemia in children with cancer and febrile neutropenia. Curr Oncol. 2010; 17(2): 59-63. doi: 10.3747/co.v17i2.453

[7] Al-Mulla NA, Taj-Aldeen SJ, Shafie S E et al. Bacterial bloodstream infections and antimicrobial susceptibility pattern in pediatric hematology/oncology patients after anticancer chemotherapy. Infect Drug Resist. 2014; 7: 289-299 doi:10.2147/IDR.S70486

[8] Duncan C, Chisholm JC, Freeman S et al. A prospective study of admissions for febrile neutropenia in secondary paediatric units in South East England. Pediatr Blood Cancer. 2007; 49(5):678-81.doi: 10.1002/pbc.21041.

[9] Weiss SL, Fitzgerald JC, Pappachan J et al. Sepsis Prevalence, Outcomes, and Therapies (SPROUT) Study Investigators and Paediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network. Global epidemiology of paediatric severe sepsis: the sepsis prevalence, outcomes, and therapies study. Am J Respir Crit Care Med. 2015;191(10):1147-57. doi: 10.1164/rccm.201412-2323OC.

[10] Fiser RT, West NK, Bush AJ et al. Outcome of severe sepsis in pediatric oncology patients Pediatr Crit Care Med. 2005;6(5):531-6. doi: 10.1097/01.pcc.0000165560.90814.59.

[11] Akinboyo IC, Young RR, Spees LP, Heston SM, Smith MJ, Chang YC, et al. Microbiology and Risk Factors for Hospital-Associated Bloodstream Infections Among Pediatric Hematopoietic Stem Cell Transplant Recipients. Open Forum Infect Dis. 2020;7(4):ofaa093

[12] Simon A, Fleischhack G, Hasan C et al. Surveillance for nosocomial and central line-related infections among pediatric hematology-oncology patients. Infection Control and Hospital Epidemiology 2000;21:592-6

[13] Youssef A, Hafez H, Madney Y et al. Incidence, risk factors, and outcome of blood stream infections during the first 100 days post-pediatric allogenic and autologous hematopoietic stem cell transplantations. Pediatr Transplant. 2020; 24(1):e13610

mortality depending on confounding factors such as the presence of graft versus host disease and extended use of steroid therapy.

The profile of microorganisms causing BSI in children with cancer has evolved over the years. In the early years of modern therapies, Gram-negative organisms were the predominant concern. This was followed by a sustained increase in Gram-positive infections but, more recently Gram-negative organisms are re-emerging, accounting, in some reports, for approximately half of all BSI.

Gram-negative bacteria are associated with significantly higher mortality rates and there is growing concern about antibiotic resistance[14]. Particular concerns have been raised in several studies about extended-spectrum β-lactamase (ESBL) producing Enterobacteriaceae, fluoroquinolone-resistant Gram-negative bacteria, carbapenem-resistant Pseudomonas aeruginosa and multidrug resistant organisms [4,12].

A systematic review of risk factors in the development of antibiotic resistant Gram-negative bacteriaemia in children with cancer concluded that hospitalisation for 48 hours or more increases the probability of antibiotic resistance as does recent antimicrobial exposure, including prophylaxis with ciprofloxacin, which may increase the risk of developing antibiotic resistant Gram-negative bacteraemia[14]. Consensus guidelines about antibiotic prophylaxis in this setting have recently been published[15].

Antimicrobial resistance and the paucity of new antibiotics could be a particular threat to Paediatric Haematology Oncology patients with severe sepsis in future. Prevention remains key and it is recommended that infection control 'bundles' are adapted alongside the careful oversight of antibiotic use. Knowledge of the local epidemiology of pathogens and patterns of antibiotic resistance is essential to guide management.

[14] Haeusler GM, Levene I. Question 2: What are the risk factors for antibiotic resistant Gram-negative bacteraemia in children with cancer? Archives of Disease in Childhood 2015;100:895-898

[15] Lehrnbecher T, Fisher BT, Phillips B, Alexander S, Ammann RA, Beauchemin M, Carlesse F, Castagnola E, Davis BL, Dupuis LL, Egan G, Groll AH, Haeusler GM, Santolaya M, Steinbach WJ, van de Wetering M, Wolf J, Cabral S, Robinson PD, Sung L. Guideline for Antibacterial Prophylaxis Administration in Pediatric Cancer and Hematopoietic Stem Cell Transplantation. Clin Infect Dis. 2020;71(1):226–36. https://doi.org/10.1093/cid/ciz1082.

2. TERMS OF REFERENCE AND MEMBERSHIP OF THE EXPERT PANEL

This chapter presents the Terms of Reference for our Review as written for, and agreed by the Core Project Team and the Queen Elizabeth University Hospital/NHS Greater Glasgow and Clyde Oversight Board in March 2020. We have added notes to indicate where we have made adjustments to the original text and have added links to other sections of our report where appropriate. Other than those with overall leadership and accountability, who are named in the text, the names of all those who contributed to the Case Note Review are given in the Acknowledgements section elsewhere in this report.

2.1. Introduction

As a result of continuing problems arising from infection incidents on the Queen Elizabeth University Hospital (QEUH) campus, on 22 November 2019, the Scottish Government's Health and Social Care Management Board escalated NHS Greater Glasgow and Clyde to 'Stage 4' of its escalation ladder. That stage represents a level where there are "*significant risks to delivery, quality, financial performance or safety, and senior level external transformational support [is] required*." As a result, a new Oversight Board under the chair of the Chief Nursing Officer, Professor Fiona McQueen, has been set up to address two specific sets of issues that led to escalation: infection prevention and control and associated governance with respect to the QEUH; and communications and engagement with affected families.

As part of the work of the Oversight Board, the Cabinet Secretary for Health and Sport set out plans for a Case Note Review in a Parliamentary statement on 28 January 2020. The Case Review team would review the case notes of Haemato-Oncology paediatric patients in the Royal Hospital for Children (RHC) and the QEUH from 2015 to 2019 who have had a Gram-negative environmental pathogen bacteraemia (and selected other organisms) identified in laboratory tests. The following sets out the Terms of Reference for this work, specifically:

- its purpose and authority;
- the outputs/deliverables;
- key elements of its methodology, particularly the identification of cases for review, the use of the Paediatric Trigger Tool and the epidemiological review;
- communications and engagement of the Review and its outputs;
- key responsibilities;
- timelines for different phases of work; and
- risk management.

2.2 Purpose

The Case Note Review will review the medical records of all children diagnosed with qualifying infections (see definition below) and who were cared for at RHC between 1.5.15 and 31.12.19[16] to establish several key issues: the number of children – in particular, immunocompromised children – who were likely to have been put at risk because of the environment in which they were cared; and how that infection may have influenced their health outcomes. Such work will be vital in determining the number and nature of the children

[16] We have only included infections that arose after attendance/ admission to the new QEUH/RHC site.

affected, providing assurance and identifying improvement actions, not just for NHS GGC, but more widely across NHS Scotland, including Health Protection Scotland (HPS), and the Scottish Government. It is also an important element in improving the communications and engagement with families and affected patients.

The Review will consider the following set of specific questions:

- How many children in the specified patient population have been affected, details of when, which organism etc?
- Is it possible to associate these infections with the environment of the RHC and the QEUH?
- Was there an impact on care and outcomes in relation to infection?
- What recommendations should be considered by NHS GGC – and, where appropriate, by NHS Scotland, more generally – to address the issues arising from these incidents to strengthen infection prevention and control in future?

Through Professor Marion Bain (Director of Infection Prevention and Control NHS GGC and Senior Medical Consultant, NHS National Services Scotland (now Deputy Chief Medical Officer)) the Review will report directly to Professor Fiona McQueen as Chair of the Oversight Board.

2.3 Outputs/Deliverables

There are two specific sets of outputs, described in more detail below:

- reporting to the Oversight Board; and
- specific feedback to patients and families.

2.3.1 Reporting to the Oversight Board

The Expert Panel (see section 2.9) will be responsible for providing a Final Report to Professor Bain and the Oversight Board, which should include:

- a description of the approach and methodology to the Review;
- a description of the patients included in the Review;
- a description of the cases according to specified data types;
- analysis to answer the questions set out in the Purpose section above; and
- recommendations for NHS GGC and NHS Scotland, based on this analysis.

Individual case details will not be set out in the Report and the cases will be anonymised. The Final Report will be provided to the Cabinet Secretary for Health and Sport thereafter. The Final Report will be published by the Scottish Government.

Reporting on progress to the Oversight Board will be undertaken by Professor Marion Bain, which may include the provision of an interim report, subject to agreement between her and the Chair.

2.3.2 Reporting to Patients and Families

The Expert Panel will provide individual reporting to patients and families that request a description of the results of their individual patient case review[17]. Patients and families will be invited to take up the offer of engagement with the Panel through Professor Craig White, Chair of the Oversight Board's Communications and Engagement Subgroup. The format of reporting will accommodate, as far as practicable, the wishes of the family, and will be decided in conjunction with the Expert Panel. All reporting will be carried out within three months of the submission of the Final Report to the Oversight Board.

Arrangements for engaging with patients and families, the format of individual reporting and the timetabling of any meetings will be determined by the Expert Panel with Professor Bain and Professor White.

2.4 Methodology

In its overall approach to developing a methodology for the Case Note Review, these terms of reference set out key elements for how the Review should be conducted. Its overarching principles will be:

- respect and sensitivity to individual patients and their families in the handling of data and the conduct and reporting of results;
- rigorous handling, recording and storage of data, respecting patient confidentiality and family sensitivity; and
- use of internationally-respected and clearly-explained methodological tools and data sources, which will be documented for the Final Report.

A range of information will need to be gathered for the Expert Panel analysis and reporting. This includes several key elements, described in more detail below:

- the epidemiological and clinical outcomes review;
- the use of the Paediatric Trigger tool; and
- the gathering of other key data.

2.4.1 Identification of Cases

Health Protection Scotland (HPS) [18] has undertaken an analysis of a variety of options to define the sample. The Expert Panel has agreed the following cohort definition, but will continue to review the sample as the Review progresses.

- The cohort currently consists of 85 patients[19] (and a larger number of infection episodes):
- patients with blood cultures of a Gram-negative environmental pathogen (including enteric pathogens associated with the environment) (there are 81 patients that meet this inclusion criteria);
- patients with a M. chelonae (Acid Fast Environmental) infection (there are 3 patients that meet this criteria –2 with bacteraemia, and 1 with a skin infection); and

[17] We will issue individual reports to all families
[18] This involved staff from National ARHAI Scotland, NSS
[19] This was the initial cohort – see Chapter4, section 4.1 for detail of subsequent exclusions

- patients included for other reasons: this includes one child with a Gram-negative infection (not blood stream detected) and Aspergillus

2.4.2 Epidemiological and Clinical Outcomes Review

An epidemiological and clinical outcomes review of the cases is required to collect patient, outcome and risk data systematically using agreed definitions and for the findings to support the incident investigation. The objectives of this epidemiological investigation are to:

- determine a timeline for each of the cases;
- characterise the cases in terms of time, place and person:
    - time: describe the episodes of blood stream infection (BSI) over time and create a timeline for outbreak, including plotting of control measures against number of cases,
    - place: describe the location of patients (hospital, ward, bed/bay) and describe their movements in the hospital, and
    - person: characterise the patients with infection in terms of intrinsic and extrinsic risk factors; outcomes; antimicrobial prophylaxis and treatment; and individual infection prevention and control measures in place; and
- describe the cases in the context of environmental risks and incidents (where possible).

The epidemiological components of the review will be carried out by HPS staff and data items to inform clinical outcomes will be extracted in collaboration with the Clinical Team responsible for the Paediatric Trigger Tool work (see below). A full description of the agreed data set is provided in the separate Epidemiological and Clinical Outcomes Protocol[20].

2.4.3 Paediatric Trigger Tool

The review of the case notes is set against the background of Healthcare Improvement Scotland's document, 'Learning from adverse events through reporting and review – A national framework for Scotland: July 2018'. The aims of the national approach to learning from adverse events are to:

- learn locally and nationally to make service improvements that enhance the safety of the care system for everyone;
- support adverse event management in a timely and effective manner;
- support a consistent national approach to the identification, reporting and review of adverse events, and allow best practice to be actively promoted across Scotland;
- present an approach that allows reflective review of events which can be adapted to different settings; and
- provide national resources to develop the skills, culture and systems required to effectively learn from adverse events to improve health and care services across Scotland.

The national approach seeks to ensure that no matter where an adverse event occurs in Scotland:

[20] See Appendix D for the full dataset

- the affected person receives the same high quality response;
- organisations are open, honest and supportive towards the affected person, apologising for any harm that occurred;
- any staff involved are supported in a consistent manner;
- events are reviewed in a consistent way; and
- learning is shared and implemented across the organisation and more widely to improve the quality of services.

The intention of using an adapted Paediatric Trigger Tool (PTT) in the study of NHS GGC is not to determine preventable or non-preventable harm but to create opportunities to learn from the triggers and adverse events identified. It forms only part of the overarching case review process and it is anticipated the information from the PTT will underpin the epidemiological and clinical outcome review and the contextual organisational data and reports. The PTT methodology will examine harm in the processes of healthcare in the group of patients selected for Case Note Review and its objectives are to contribute to the overall aim of the Case Note Review by:

- identify all triggers and adverse events in the cohort of patients identified by the epidemiological review using an adapted PTT; and
- describe the rate and severity of harm occurring in hospitalised children in the cohort group.

The PTT would be amended for use for this patient population[21].

2.4.4 Other Data Collection

The Epidemiological and Clinical Outcomes Review and the PTT may not provide all the data that the Expert Panel requires to conduct its work. The Expert Panel will review its data requirements on a continuing basis and request these through the Clinical and Support Team leads as well as Professor Bain as required.

2.5 Communications and Engagement

Communications and engagement is distinct from reporting, as described above. There are key 'audiences' whose communication needs should be supported through the work of the Case Note Review. Key among these are:

- patients and families, both those who will be part of the Case Note Review and those who may want to know more, or feel they should be part of the Review; and
- the staff of the relevant parts of the RHC and the QEUH.

More detailed work on communications and engagement will be reflected in the Programme Plan for the work.

Patients and Families: Initial communication with patients and families – setting out which cases would be reviewed has now taken place. That set out the purpose and details of the Case Note Review, and invited any questions and issues to be raised through the signatories

[21] See section 3.4.3

of the letters[22], Professor Bain and Professor McQueen.

Progress reporting on the Case Note Review as a whole will be conducted through the NHS GGC web pages and the 'closed' Facebook page to the affected families.

Specific engagement with families wishing to discuss their particular cases will be handled on a case-by-case basis through Professor Bain and Professor White.

Staff: The medical, nursing and other relevant staff of the relevant parts of the RHC and the QEUH (including the NHS GGC Board and relevant committees) will want to be kept appraised of the progress of the Review. Professor Bain will organise:

- an initial overview session of the methodology/approach of the Review to reviewing the cases;
- regular progress reports from representatives of the Expert Panel, ideally delivered in face-to-face meetings; and
- a final 'debrief' of the key results and recommendations of the Final Report.

2.6 Key Responsibilities

As Executive Lead for Infection Prevention and Control within NHS GGS, as appointed by Professor McQueen, Professor Bain will have oversight of the project as a whole. She will be responsible for its progress and reporting to Professor McQueen, including advice – provided by the Expert Panel and other members of the team below – for any necessary change in key elements of these Terms of Reference.

2.6.1 The Expert Panel

The Expert Panel will be responsible for:

- agreeing, within the scope of these Terms of Reference, the definitions used to select patients for the review; the scope and direction of the data collection; and the methodological tools required;
- overseeing and interpreting the analysis of data obtained and developing the Final Report (and, in discussion with Professor Bain, the provision of any agreed interim reporting);
- progress reporting to relevant audiences, including the RHC/QEUH staff; and
- providing reporting to individual patients and families.

2.6.2 Clinical Team

The Clinical Team[23] will be responsible for:

- undertaking the data collection, storage and submission of Case Note Review material to the Expert Panel;
- resolving data/sampling issues with Professor Bain, the Support Team and the Expert Panel; and
- supporting the analysis and reporting of the Case Note Review through the Expert Panel.

[22] These letters were sent on 4th March 2020

[23] This implies both the clinical and epidemiological team. See the detail of our approach in section 3.6

All handling of patient data will be covered by relevant data-sharing agreements and protocols.

2.6.3 Support Team

The Support Team will be responsible for:

- resolving practicalities and resourcing issues
- undertaking key communication and engagement functions;
- developing and maintaining the Review workplan;
- providing secretariat and related functions to the Expert Panel;
- ensuring submission of Final Report to the Cabinet Secretary and publication.

2.7 Timelines

The timelines for the Review will be reviewed on an ongoing basis by Professor Bain in conjunction with the heads of the Expert Panel, the Clinical and Support Teams, and Professor McQueen. They will be encapsulated in the workplan to be developed and maintained by the Support Team. The Review is currently anticipated to provide a final report to the Oversight Board in summer 2020[24], but timelines will necessarily continue to be reviewed in light of the impact of COVID-19.

2.8 Risk Management

Risks will be identified and actively managed by the Programme Manager on an ongoing basis and discussed regularly with Professor Bain.

2.9 Members of the Expert Panel:

Professor Michael Stevens (Emeritus Professor of Paediatric Oncology at the University of Bristol), who will be Head of the Expert Panel and report to Professor Bain.

Gaynor Evans (Clinical Lead for the Gram-negative Bloodstream Infection Programme at NHS Improvement/England).

Professor Mark Wilcox (Professor of Medical Microbiology at the University of Leeds).

[24] This was an ambitious target, declared before the full complexity of the task and the impact of the COVID-19 pandemic were apparent. See section 3.1 for detail of the constraints on the progress of the Review

3. METHODOLOGY

In this chapter we set out the approach we developed to access, collect and assess the data we believed were necessary for us to address the terms of reference governing our Review.

Data systems within NHS GGC were identified, access was negotiated and sources of other potentially important information sought and requested. Two data collection teams were formed to work in a complementary way to identify and extract different components of the clinical and microbiological information required to create a detailed timeline of clinical care for each eligible bacteraemic episode for every patient included in the Review. We created processes for documenting, collating and summarising data from multiple sources so as to inform the Panel discussions which assessed and determined outcomes.

Section 3.1 presents an overall timeline and also describes some of the constraints we encountered in our work. Sections 3.2 to 3.6 describe each of the steps in our processes and section 3.8 describes our approach to communication with stakeholder groups.

3.1 Overall timeline for the work undertaken for the Case Note Review

The overall process of the Review and the work of the Panel is summarised in the diagram provided as Appendix A.

There was an early assumption that the overall timeline to complete the work for the Case Note Review would begin in March 2020 and end in the summer of 2020. This view was held not only before the impact of COVID-19 became apparent but also before data collection commenced and we had begun to understand the challenges that lay ahead.

Communication and engagement with NHS GGC, requesting critical data for Panel consideration, began on 8.4.20 and continued until a final set of data was received on 21.12.20. A final meeting with NHS GGC was held on 4.2.21 to discuss late concerns about the data available to us.

Throughout the Review our aim was to communicate progress, and delays, to stakeholders by means of written updates and virtual meetings. The timeline illustrates these occurrences from March 2020 to February 2021 however the communication element of the Review will continue beyond publication of this report, particularly with patients and families (discussed further in Chapter 7).

3.1.1 Constraints on the work of the Panel

In planning for this Review, in February 2020, a number of individuals were being identified to work directly on aspects of the work but, by the end of May 2020, as a result of the competing demands of the COVID-19 pandemic, the number of those still available for the Review Team was significantly reduced. The 3 members of the Expert Panel had also each identified reduced capacity because of varying commitments to support COVID-19 related work in NHS England. At this point, the Review had reached a critical point: data extraction had been successfully established and Panel reviews of patient records were just starting. The last full meeting of the Panel had been on 26.5.20 when the issue was discussed by the Core Project Team on 2.6.20. It was decided at that meeting to pause further Panel meetings for a period of time, but that data extraction could continue.

Panel meetings recommenced on 29.7.20 although initially without full membership and by the time of the next meeting on 6.8.20, the extent of data not yet available from NHS GGC

to support the Review process was becoming fully apparent. This was discussed at the Core Project Team on 11.8.20 and a mitigation plan agreed that resulted in the Panel scheduling Review meetings every week from 25.8.20 to 15.12.20. Engagement with NHS GGC was increased to reinforce and clarify previous requests for data (see also section 8.1).

The Panel completed its primary review of all cases on 15.12.20 but, by then, the need for a second review to assimilate late data received from NHS GGC had become apparent. This was completed in January 2021, but concerns emerged at the end of that month that there might be additional, potentially relevant data held by NHS GGC to which the Panel had not had access. Although this was subsequently not felt to be the case in relation to our ability to assess individual patients and episodes of infection, progress on the completion of the report was affected whilst this was investigated; a further additional short delay in the publication of this Report was therefore agreed with the Core Project Team on 10.2.21.

3.2 Selection criteria for inclusion of patients in the Review

The selection criteria for cases to be included in the Review were drafted and agreed by the Core Project Team after also inviting parents of the children and young people in the Review to comment on the proposals. These were approved by the Oversight Board and set out in a protocol document[25]. This defined that the study population should include all patients cared for in the Paediatric Haematology Oncology service at the Royal Hospital for Children, NHS GGC who met one of the following criteria between May 2015 and December 2019:

- at least one positive blood culture of a Gram-negative bacterium associated with the environment (Group 1)
- at least one positive culture of an atypical *Mycobacterium* spp. (acid-fast environmental bacteria (Group 2).

It was nevertheless agreed that a flexible approach should be retained, and one patient who did not meet these criteria, but who nevertheless experienced severe infection with a Gram-negative environmental microorganism, although without proven bacteraemia, was included at the request of the family (Group 3).

All families were informed, in a letter from NHS GGC on 4.3.20, of the inclusion criteria agreed by the Panel. All except one confirmed that they wanted their child to be included in the Review.

3.2.1 Datasets and definitions used to identify patients for inclusion in the Review

The combined dataset used in a previous review by staff in Health Protection Scotland (HPS) published in October 2019[26] (and now ARHAI Scotland) formed the basis by which patients were identified to be included in the Review. For the HPS work, qualifying infection episodes were extracted from the following datasets:

- HPS dataset - Electronic Communication of Surveillance in Scotland (ECOSS) extract
- NHS GGC Central Line Associated Bloodstream Infection (CLABSI) Surveillance System

[25] Case Note Review. Paediatric Haemato-Oncology Patients, Royal Hospital for Children NHS Greater Glasgow and Clyde. Epidemiology and Clinical Outcomes Protocol; April 2020 v1.0

[26] Review of NHSGG&C Paediatric Haemato-Oncology Data. Health Protection Scotland; October 2019

- NHS GGC ECOSS extract
- NHS GCC Microbiology laboratory information management system (LIMS)

The data extract utilised for the previous HPS publication was extended to December 2019 and the final patient/episode list was cross-checked with NHS GGC before the start of the Review.

Positive blood cultures were identified for micro-organisms from the environment including enteric bacteria group. This included all species of the following: Achromobacter; Acinetobacter; Aeromonas; Brevibacillus; Brevundimonas; Burkholderia; Cedecea; Chryseobacterium; Chryseomonas; Citrobacter; Clavibacter; Comamonas; Cupriavidus; Delftia acidovorans; Elizabethkingia; Enterobacter; Flavimonas; Gordonia; Klebsiella; Pseudomonas; Pantoea; Pseudoxanthomonas; Psychrobacter; Ralstonia; Rhizobium; Rhodococcus; Roseomonas; Serratia; Sphingomonas; Stenotrophomonas and atypical mycobacteria.

A full breakdown of the grouping is detailed in Appendix B.

3.2.2 Case definition

In order to consider the diversity of bacteria likely to be identified if there is an environmental source, and to account for polymicrobial episodes, the following case definitions were used:

At the Species level - a positive blood culture of a single bacterium that has not been previously isolated from the patient's blood within the same 14-day period (i.e. 14 days from date last positive sample obtained).

At the Episode level - a positive blood culture for an environmental including enteric bacteria group that has not been previously isolated with same or other environmental including enteric bacteria group organism in the patient's blood within the same 14 day period.

In line with the case definition, and to align with other national bacteraemia surveillance, a standard 14 day rolling deduplication was applied to the HPS ECOSS dataset, and these episodes were cross-checked with NHS GGC data sets supplied.

All positive blood cultures were included with the exception of post-mortem blood, any quality test samples, foetal samples or non-human samples.

3.3 Epidemiology data collection

3.3.1 Objectives

The objectives of the epidemiological investigation were to:

- Determine a timeline for each of the cases identified for review
- Characterise the cases in terms of time, place and person
    - Time: describe the episodes of bloodstream infection over time and create a timeline for outbreak, including plotting of control measures against number of cases
    - Place: describe the location of patients (hospital, ward, bed/bay) and describe their movements in the hospital

- Person: characterise the patients with infection in terms of intrinsic and extrinsic risk factors; outcomes; antimicrobial prophylaxis and treatment; and individual infection prevention and control measures in place

- Describe the cases in the context of environmental risks and incidents including the use of environmental microbiological data and HAI-SCRIBE/other facilities data provided by NHS GGC.

3.3.2 Data extraction

A data extraction form was created to capture the data fields identified in a dataset agreed by the Core Project Team[27] (this is shown in Appendix D).

Dates of inpatient, outpatient and day care attendance were provided by the NHS GGC Trakcare system, including bed location and movement data for inpatient stays. Extracts were linked with patient infection episodes and species level data and a bespoke MS Access database was built which incorporated these datasets.

Patient data were reviewed through direct access to NHS GGC Clinical Portal providing information from medical notes, nursing notes and observation charts, surgical procedures, drug charts, laboratory information and correspondence.

The process by which more detailed extraction of clinically relevant information required by the Panel, and by which the Paediatric Trigger Tool was implemented, is described in section 3.4.

Microbiology management data and infection control actions were separately obtained from the NHS GGC Telepath and ICNet systems (section 3.5).

Although the time period of the Review was from May 2015 to December 2019, when necessary, patient records were reviewed outwith this period in order to obtain diagnostic information and other clinical details relevant to the Review, including accessing electronic notes that had been scanned into the patient record at a later date.

Data from the database were extracted and processed using R software (v 3.5.1 (2018-07-02) The R Foundation for Statistical Computing) to generate a report for each patient for review by the Panel.

3.3.3 Timelines

Timelines were created using data visualisation software (Tableau 2019.1). These were viewed via an online platform called Eviz, a secure Tableau server web space managed by National Services Scotland. Panel members were provided with individual password protected log-in details for access.

The timelines created were used to display:

- Patient admission/bed location with infection episodes. This allowed the species level microorganism list to be filtered so that all or only selected bacteria could be reviewed. Patients could be searched individually or collectively and locations of care could be separated by ward and room

[27] Expert Panel Dataset v1.0. 17.04.20

- Environmental water sample data provided by NHS GGC. This allowed the results to be filtered by positive and negative findings, by all or selected microorganisms and, where available, location could be searched to room level
- Environmental 'hard surface' (this includes surfaces on items such as medical equipment, bathroom fittings and drains, air conditioning units) sample data provided by NHS GGC. This allowed the results to be filtered by positive and negative findings, by all or selected organisms and, where available, location could be searched to room level
- Facilities maintenance data provided by NHS GGC. This allowed maintenance activity to be viewed by clinical area, down to room level where available, and by type of work.

Time filters allowed data to be reviewed for the entire period of the Case Note Review or for selected periods within this.

3.4 Adverse Events and the Paediatric Trigger Tool

3.4.1 Background to national and NHS GGC Policy

It is internationally recognised that between 10-25% of episodes of healthcare (in general hospital, community hospital and general practice) are associated with an adverse event[28].

Since 2013, NHS Scotland has used the National Reporting Framework for adverse events [29]. The category I to III classification framework was in place since 2013, although the regulatory requirement to report all Significant Adverse Event Reviews commissioned for Category I events to Healthcare Improvement Scotland (HIS) was only applied in January 2020.

The NHS GGC Incident Management Policy (2020) details the organisational system to record and address adverse events and near misses. It covers all incidents, whether they involve patients, relatives, visitors, staff, contractors, volunteers or the general public, and indicates that a robust investigation will be conducted into all Significant Clinical Incidents. The purpose of the investigation is to determine whether there are learning points, locally or for the wider organisation.

The main route for reporting adverse events within NHS GGC is through Datix (a web-based incident reporting and risk management software for healthcare and social care organisations). A trigger list categorises adverse events in line with the national guidance and a risk assessment is undertaken to inform initial notification and its escalation. A risk matrix is used to determine the incident's grade based on its impact and the likelihood of recurrence. The grades used by the matrix are designated: Insignificant, Minor, Moderate, Major and Extreme.

When an incident is scored Major or Extreme there must be an investigation, which investigates causation: one approach to this is Root Cause Analysis[30]. If the severity is

[28] The Health Foundation. Evidence scan: Levels of Harm 2011 [Available from: www.health.org.uk/publications/levels-of-harm/.

[29] Healthcare Improvement Scotland. Learning from adverse events through reporting and review. A national framework for Scotland: 2019 http://www.healthcareimprovementscotland.org/our_work/governance_and_assurance/management_of_adverse_events/national_framework.aspx.

[30] Root cause analysis offers a structured approach to the investigation of patient safety incidents and facilitate organisational learning

Moderate, there should at least be a local investigation, led by the line manager also using, if appropriate, a root cause analysis type approach.

We chose to explore the occurrence of adverse events by considering data both from the NHS GGC Datix system and from a tool specifically developed to detect adverse events in paediatric care (the Paediatric Trigger Tool).

3.4.2 The Paediatric Trigger Tool (PTT)

A trigger tool is a method for identifying adverse events (AE). In adults, the rate of detection of AE with a trigger tool is typically ten-fold greater than the rate detected through spontaneous reporting systems[31 32]. Similar results have been reported with paediatric trigger tools in general wards[33] and neonatal intensive care units[34].

In 2014, the UK Paediatric Trigger Tool (UK PTT) was developed with the support of clinicians in nine hospitals across the UK in order to detect AE in paediatric care provided in district general hospitals, acute teaching hospitals and specialist paediatric centres[35].

The intention of using the PTT as part of the methodology chosen for the Case Note Review was not to determine preventable or non-preventable harm but to create opportunities to learn from the AEs identified. The aim was to:

- identify all triggers and adverse events in all patients included in the Review
- to describe the rate and severity of harm occurring in hospitalised children in this cohort
- to compare the rate and severity of harm occurring in the cohort with evidence from published studies

3.4.3 Adaptation of the UK PTT and its use in the Case Note Review

The checklist used for the implementation of the UK PTT is shown in Appendix C

In preparation for the Review, the UK PTT was reviewed by Professor Hamish Wallace, Consultant Paediatric Oncologist at the Royal Hospital for Sick Children, Edinburgh and previously National Clinical Director of the Managed Service Network for Children and Young People with Cancer in Scotland; and by Professor George Youngson CBE, Emeritus Professor of Paediatric Surgery, Aberdeen University, a UK leader in patient safety practice.

---

[31] Classen DC, Resar R, Griffin F, et al. 'Global trigger tool' shows that adverse events in hospitals may be ten times greater than previously measured. *Health Aff (Millwood)* 2011;30(4):581-9. doi: 10.1377/hlthaff.2011.0190 [published Online First: 2011/04/08]

[32] Cullen DJ, Bates DW, Small SD, et al. The incident reporting system does not detect adverse drug events: a problem for quality improvement. *Jt Comm J Qual Improv* 1995;21(10):541-8. doi: 10.1016/s1070-3241(16)30180-8 [published Online First: 1995/10/01]

[33] Solevåg AL, Nakstad B. Utility of a Paediatric Trigger Tool in a Norwegian department of paediatric and adolescent medicine. *BMJ Open* 2014;4(5):e005011. doi: 10.1136/bmjopen-2014-005011 [published Online First: 2014/05/21

[34] Sharek PJ, Parry G, Goldmann D, et al. Performance characteristics of a methodology to quantify adverse events over time in hospitalized patients. *Health Serv Res* 2011;46(2):654-78. doi: 10.1111/j.1475-6773.2010.01156.x [published Online First: 2010/08/21]

[35] Chapman SM, Fitzsimons J, Davey N, et al. Prevalence and severity of patient harm in a sample of UK-hospitalised children detected by the Paediatric Trigger Tool. *BMJ Open* 2014;4(7):e005066. doi: 10.1136/bmjopen-2014-005066 [published Online First: 2014/07/06]

Following their review three additional triggers were recommended. These additions (PG12* Pain Score >7; PM9* Missed Doses; PM10* Antifungal treatment) were discussed and agreed by the Core Project Team.

3.4.4 Data collection

The adapted UK PTT was applied to any episode of care for which the patient was an inpatient in QEUH/RHC for at least 24 hours. A systematic structured process was used to review the entire healthcare record. The process searched for 'triggers' within each episode of care as determined by the PTT check list. Once a trigger was identified, the reviewer used clinical expertise to examine the records in more detail to understand the circumstances around the event and record additional contextual narrative details. A second reviewer (a physician) reviewed, confirmed and validated all of the AE identified, recording the details within the PTT checklist and in accompanying additional narrative notes.

NHS GGC were asked to provide copies of all Datix reports for patients included in the Review, for the duration of the Review.

The National Framework in Scotland for learning from adverse events through reporting and review recommends that the following categories (and definitions) should be used to group adverse events:

- Category I – events that may have contributed to or resulted in permanent harm, for example unexpected death, intervention required to sustain life, severe financial loss (£>1m), ongoing national adverse publicity (likely to be graded as major or extreme impact on NHS Scotland risk assessment matrix, or as Category G, H or I on National Coordinating Council for Medical Error Reporting and Prevention (NCC MERP) index[36])
- Category II – events that may have contributed to or resulted in temporary harm, for example initial or prolonged treatment, intervention or monitoring required, temporary loss of service, significant financial loss, adverse local publicity (likely to be graded as minor or moderate impact on NHS Scotland risk assessment matrix, or Category E or F on NCC MERP index)
- Category III – events that had the potential to cause harm but no harm occurred, for example near miss events (by either chance or intervention) or low impact events where an error occurred, but no harm resulted (likely to be graded as minor or negligible on NHS Scotland risk matrix or Category A, B, C or D on NCC MERP index).

The Paediatric Trigger Tool uses the NCC MERP index, whereas Datix uses the NHS Scotland risk matrix to classify adverse events. We therefore converted these classes into the three categories advised by the National Framework for Scotland. We also applied these categories to data from published papers that use the NCC MERP index. An analysis and interpretation of the findings is given in section 8.6.

3.4.5 Literature review to obtain comparative data

Evidence from the literature about detection of AEs in paediatric inpatients using trigger tools was identified through searches in PubMed and Medline. Additional records were identified from published reviews and by searching bibliographies of full text articles. (Details of the literature search strategy, screening of articles and the studies included are in

[36] https://www.nccmerp.org

a report on Adverse Event Detection with the UK PTT separately submitted to the Chief Nursing Officer for Scotland).

In comparing data with NHS GGC, hospitals identified from the literature review were classified according to the nature of the clinical services offered (secondary, tertiary).

As published studies used trigger tools in random samples from all admissions, for the comparison of event rates in NHS GGC with the published evidence, we only included adverse events that were not directly related to the infections causative of their inclusion in the Review.

3.5 Data relating to microbiology management and infection prevention and control

Telepath is the Laboratory Information Management System (LIMS) used by NHS GGC. The system is used to store laboratory sample results for patients (microbiology) and has the capacity to store patient notes (in the patient note pad - PNP) recorded by microbiologists. Communication between microbiologists and clinical teams are recorded in the PNP chronologically by date as a record of any discussions regarding advice provided by the microbiology team. This function allows any microbiologist to access the records and review previous conversations regarding patient specific issues relating to current or previous admissions, or positive samples.

ICNet is an electronic patient management system used by the Infection Prevention and Control Team (IPCT) to manage patients identified with possible or confirmed infection. The Telepath system sends microbiology results to the ICNet system every 15 minutes. This provides timely reporting to the IPCT.

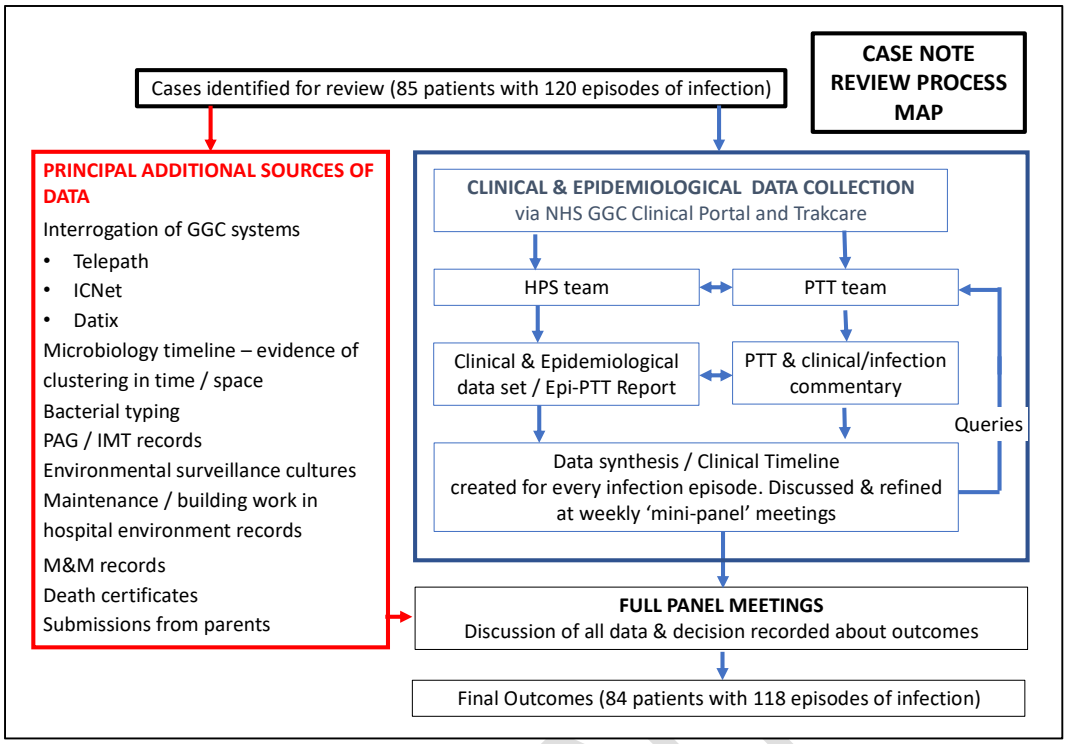
The ICNet system has a pre-defined list of alert organisms (based on the list of alert organisms in chapter 3 of the national manual[37]) which, if identified from the data transfer from Telepath, will automatically create a case in the ICNet system. This case alerts the local IPCT of a new referral to be reviewed and assessed. The IPCT also have the ability to create a case manually should the ward clinicians report patients with a possible infection where no microbiology results are available, or if separately alerted by a microbiologist. Once a case is created, the local IPCT would review the patient and assess the IPC needs in the same way as an automatically generated case. The ICNet system also receives regular information 'pushes' from the NHS GGC patient information system which allows the IPC team to identify patient location in the hospital during their stay. This is particularly helpful to assess any possible infection cross transmission risks and avoids the need to navigate multiple systems.

3.6 Expert Panel Review Process

Our overall process is summarised in Figure 3.2.

Figure 3.2: Case Note Review Process Map

[37] National Infection Prevention and Control Manual. NHSScotland



3.6.1 Anonymisation of patient data

Patients included in the Review were not identified to the Panel by name. A unique patient identifier (UPI) was created to link to the patient's Community Health Index (CHI) number and was used by the data collection teams to present information to the Panel from each of the data sources accessed.

Data that came direct from NHS GGC (for example, environmental microbiology and facilities maintenance data) were anonymised by the substitution of patient identifiers with the UPI before being presented to the Panel.

3.6.2 Data collection

Two teams (the clinical/PTT team and the epidemiology team) accessed the NHS GGC Clinical Portal to view patient case note records. Access to other GGC systems was also required to collect further data required for the epidemiology data collection (section 3.3.2) and for the PTT and augmented clinical data collection (section 3.4). These data were collated into a single document created for each patient (case) and each infection / bacteraemia (episode). This was usually supplemented by a second document that provided narrative comments about clinical care and the microbiological management of the infection.

3.6.3 Data Synthesis

The data provided by the two collection teams were reviewed and integrated into a Data Synthesis file, which was created separately for each infection episode. The Data Synthesis File had three components: Dataset; Summary; and Conclusions.

The Dataset component recorded data obtained for the data items defined in the Expert Panel Dataset and was structured to allow queries to be raised about missing data or data requiring clarification.

The Summary component included the creation of a Clinical Timeline which set out the chronology of events around the infection episode. This component also included sections for completion by the Panel in relation to data provided from additional data sources.

The Conclusions component provided a framework to structure the Panel's response to the key questions required of the Review.

The Data Synthesis files were reviewed at a weekly 'mini Panel' meeting with the data collection teams to identify and resolve queries before being passed on for full Panel review.

A copy of the Data Synthesis template is included at Appendix D.

3.6.4 Expert Panel Review

Once complete, Data Synthesis files were provided to us for review at a scheduled Panel Review meeting. All data were made available in individual files for each patient, identified by their UPI and stored in a secure MS Teams channel. In preparation for the Review meeting, in addition to the Data Synthesis file for each infection episode, we also had access to the source material utilised to create the clinical timeline; the Epidemiology timelines (via EViz - section 3.3.3); and to extracts from additional data sources (for example, extracts from the Telepath, ICNet and Datix systems).

Parents of the children involved in the Review had been invited to make submissions to the Panel if they wished, and a small number did so. When this was the case, these submissions also formed a part of the material made available to us as part of our Review.

Each case was first reviewed individually by one of us, to assess the adequacy of the data available and to make a provisional judgment on source/causality, impact and lessons learned. This initial assessment was shared and discussed amongst us at the Panel Review meeting when, after detailed review of the evidence, a consensus decision could usually be reached. In some cases, a decision could not be made pending the need for further information, in which case a further review took place at a subsequent meeting once all the information that could be obtained was available.

Some data (in particular, the results of environmental microbiology sampling, bacterial typing and facilities maintenance activity) only became available to us in a useful form in the later stage of the Review process. The reasons for this are further discussed in Chapter 8. As a consequence, we had to re-review all cases to ensure that our assessments were as informed as possible according to the information finally available. We also utilised the second review process to check for standardisation of our approach, and to review the basis of our initial decisions in the light of an evolving understanding of the issues we had been considering.

We recognised from the outset that we should need to use our judgement to assess and interpret the information available. We agreed, therefore, that our decisions should be justified by using the principle of the 'balance of probabilities,' i.e. that, on the evidence available, the conclusions we reached in the review of each case/episode were more likely to apply than not.

3.6.5 Final Outcome Reports

We recorded our final outcome within the data synthesis template for each episode of infection. In some cases, with more than one infection episode, one or more episodes were

evaluated together, usually because of close time relationship and sometimes similar causative bacteria.

Prior to commencing our review meetings, we had defined the questions we needed to answer after reviewing each episode of infection. These were as follows:

1. Are the data provided sufficient to complete the review as intended and to reach a conclusion?

   Answers: Yes; No

2. Does the infection episode fit within the criteria for the Review?

   Answers: Yes; No

3. Is it possible to link this infection episode with the environment of the RHC/QEUH?

   Answers: Unrelated; Possible; Probable; Confirmed; Unable to determine

   The criteria we considered in determining the likelihood of a link between an infection episode and the environment of the hospital are discussed in section 3.6.6

4. Was there an impact on patient care and outcome in relation to the infection?

   Answers: Yes; No; Unable to determine

5. If so, grade severity

   Answers: These were initially scored by the Panel as None, Minor; Significant; Severe; Critical but for analysis were directly converted to use Negligible, Minor, Moderate, Major, Extreme as used by the NHS Scotland Risk Assessment Matrix

   We created a framework to assure a consistent approach in the allocation of a grade of severity (section 3.6.7).

6. What lessons might be learned from this case?

   a) To strengthen IPC measures in the future?

   b) In any other respect?

7. Are there any other points arising from this review?

8. The Panel's response to any questions or comments raised by patient / family.

The data from the final outcome reports for all patients were entered into a data analysis spreadsheet to allow descriptive reporting of characteristics from the whole cohort of cases and episodes.

3.6.6 Categorising the likelihood of an environmental source for an infection

In considering the likelihood of the hospital environment being the source of each bacteraemia, we took into account all available (i.e. that was provided to us) patient, clinical, infection prevention and control, microbiology, local investigations (including Datix and IMTs where available) and hospital environmental data.

The standard epidemiological way of determining causality of, and potential links between infections is according to 'time, place and person' information[38]. The levels of certainty we agreed about a common source of infection (i.e. potentially from the hospital environment) were markedly influenced by whether clusters of episodes caused by the same bacterium occurred over successive days/weeks/months (time), affected different children (persons) in the Queen Elizabeth University Hospital and Royal Hospital for Children (place). This was most pertinent for either large clusters (in time) and/or bacteraemias due to relatively uncommon bacteria.

We decided to categorise episodes into one of four levels of likelihood that the hospital environment was the source of a bacteraemia: Unrelated, Possible, Probable or Definite. This approach is discussed further in Chapter 5, section 5.6. In some cases, we thought we might be unable to determine likelihood because of inadequate or conflicting data. The allocation of these descriptors inevitably represented a position taken along a continuum of certainty and, for the two largest groups (Possible and Probable) we attempted to refine our position by further extending our categorisation into Weak Possible, Possible, Strong Possible, Probable and Strong Probable groupings. We did not feel we were able to distinguish between Probable and Weak Probable.

For the hospital environment to be classified as a Definite source of a bacteraemia, we required not only time, place and person data to confirm the opportunity for infection to be derived from the hospital environment, but also bacterial typing data (noting the limitations set out below) that matched a patient blood culture isolate to the same microorganism recovered from water or surface samples.

For cases that we considered to be Unrelated to the hospital environment, we agreed either that key issues such as a (relative) lack of opportunity to acquire bacteria from the hospital environment over a period of time consistent with the development of bacteraemia, and/or strong alternative hypotheses about the origin of the bacteraemia, had to be present. For example, if there was strong evidence of an endogenous source, including significant mucositis or typhlitis (both descriptors of damage to/inflammation of the bowel), in the absence of clear clusters of bacteraemias caused by the same bacterial species. Mucositis and typhlitis are known to be associated with an increased risk for the passage of bacteria from the bowel, where many different Gram-negative bacteria can be found, into the bloodstream.

We found, as anticipated, that a distinction between the hospital environment being classified as a Possible or a Probable source of a bacteraemia was not straightforward. For a bacteraemia to have a Probable environmental source, we agreed that the information available supported a view that the environment was likely the source (on the grounds of probability), using a standard infection prevention and control assessment of the available data/information. In routine practice, such a conclusion would be made until/unless it was possible to confidently arrive at an alternative hypothesis for the cause/source of infection.

Clustering of cases caused by the same bacterial species was often a key factor in reaching a Probable conclusion – we discuss this further in section 4.3. Other factors included multiple/prolonged opportunities for contamination of intravascular catheters (which is a recognised cause of hospital acquired infection); bacteria that are uncommon causes of

[38] Principles of Epidemiology in Public Health Practice, Third Edition: An Introduction to Applied Epidemiology and Biostatistics. https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section6.html

bacteraemia; repeated recovery of the same bacterial species from hospital environmental samples around the time of the bacteraemia(s), especially if such samples were taken close to where the patient was managed. The latter point was complicated by the often multiple placements (wards, units and rooms) used for both inpatient and outpatient care of each patient. The more of these criteria were present, the greater was our confidence in concluding a Probable environmental source of infection.

We also recognise that the chance of finding/proving that a microbe in the environment is the source of human infection is directly related to the frequency with which it is sought. This raises two issues: how commonly/systematically is the environment sampled, and are the samples obtained examined specifically for a microbe of interest, or simply to determine the overall number of microbes and/or whether one of a few commonly sought bacteria are present? It is therefore the case that not finding a bacterium in the hospital environment does not exclude the possibility that the latter could have been the source.

Different typing methods are used by reference laboratories to characterise different microbiological isolates and can be used to compare strains of the same bacterium taken from two or more different people or sites. However, it is also necessary to take into account the bounds of possibility around the observation that one strain is the same or closely related to another, given that bacterial DNA can vary in time. Thus, it is standard practice when considering such data, to ascribe limits of differences between strains under comparison, before concluding they are identical, indistinguishable or very closely related (making it highly likely that these are 'the same' bacterium) or distinct. One caveat, however, is that where reference laboratory reports merely state that an isolate/strain is 'unique', the interpretation depends on the knowledge of what the isolate in question was compared with – is it unique amongst two or amongst a much larger number of strains of the same bacterial species to which it had been compared?

We tried to weigh up all these issues in considering the data presented for our assessment.

3.6.7 Standardising the assessment of the impact of infection on patient outcome

Assessing the consequences of the infection represented an important element of our work. In order to do so, we requested data related to the following specific areas:

1. Length of hospitalisation
2. Duration of antibiotic therapy
3. Removal of Central Venous Line (CVL)
4. Admission for intensive care (PICU)
5. Modification of the planned delivery of cancer treatment
6. Evidence of persisting toxicity
7. Death

We also considered

8. Any other impact on care highlighted by the PTT analysis or identified from the narrative of the case note records

9. Statements and insights submitted by parents about their perception of the impact of the infection episode on their child and themselves.

In order to standardise the approach taken, and to allow the generation of descriptive statistics for the final report, we developed a framework that defined a measure of the overall impact of each infection episode on an individual patient[39].

The framework was informed by the approach taken by NHS Scotland to the categorisation of adverse events and to the definition of the impact/consequences that follow[40], but it was tailored to utilise the specific outcome criteria we selected for use in the Case Note Review.

Early experience with data collected for the first 18 patients (24 episodes) in the Review was used to pilot a framework which related individual consequences to an overall category of severity. All the pilot episodes had been scored during the early phase of the review process by allocating an overall impact grade on a scale of 0 – 4 (initially defined[41] as: 0 = None, 1 = Minor, 2 = Serious, 3 = Severe, 4 = Critical impact). These overall scores were plotted into a grid against the observed occurrence of the items numbered 1-7 in the list above. A single score allocation was then adjusted to achieve a degree of consistency across the differing measures of impact experienced by the whole pilot group. In the course of this, evidence for persisting toxicity (item 6 on the list above) was excluded from the model as data to define this was only readily identifiable in one case which, for other reasons, already met the grade of Critical impact.

The final version of the impact framework subsequently used to score all cases in the final outcome reports is shown in Figure 3.3. In utilising the framework, the occurrence of the specified outcome criteria for each infection episode were plotted onto the grid but could only be allocated into an unshaded field.

Figure 3.3 Impact assessment Framework

	Admission resulting from infection			CVL removed	Treatment disrupted			PICU admission		Death
Impact grade	Not evaluable or <= 7 days	8 to <= 14 days	>=15 days	Yes	Not evaluable, none or <= 7 days	>7 days	>=14 days	<=3 days	>3 days	Infection likely to have contributed
1 Minor										
2. Significant										
3. Severe										
4. Critical										

[39] RHC Case Note Review – Defining the impact of the infection episode v1.0. 27.8.20

[40] Healthcare Improvement Scotland. Learning from adverse events through reporting and review: A national framework for Scotland. December 2019.

[41] The terminology was subsequently adjusted by the Panel to match that used by the NHS Scotland Risk Assessment Matrix (Negligible, Minor, Moderate, Major, Extreme)

The overall impact was determined by the level of the highest impact grade recorded for each episode. For example, no patient who had their CVL removed as result of the infection could be graded as experiencing a 'Minor' impact; and no patient who was admitted to PICU because of the infection for >3 days could be graded as having anything less than 'Critical' impact.

Whilst the framework offered a standardised approach to allocating an impact grade, we retained flexibility to moderate the grade (up or down) by considering any other relevant information available at the time of our review.

Although the grade allocated implies a numerical level of impact on a 5-point scale, we also attributed a short descriptive identity to each, as follows: (this shown as our original descriptor with the NHS Scotland descriptor in brackets):

Grade 1: None (Negligible) – there is no discernible impact of the infection on the patient's experience, or outcome.

Grade 2: Minor (Minor) - whilst the infection had the potential to cause harm, the impact on the patient was limited to a short additional admission and / or to a non-significant delay to planned cancer treatment.

Grade 3: Significant (Moderate) - the infection may have contributed to or caused temporary harm including any of the following: prolonged admission >7<15 days; removal of CVL; >7 day disruption to planned cancer treatment but without likelihood of long term adverse consequences.

Grade 4: Severe (Major)[42] – the infection caused significant disruption to patient experience and / or treatment with the potential for long term consequences. This includes any of the following: prolonged admission >14 days; >14 day disruption to planned cancer treatment; short (<3 day) PICU admission for higher level support.

Grade 5: Critical (Extreme) – this applied when the infection resulted in prolonged (>3 day) admission to PICU and / or if the infection is likely to have contributed to the patient's death.

Finally, and importantly, we recognise that applying a numerical grade to define our assessment of the impact attributed to an infection episode may not necessarily reflect the 'lived experience' of the patient and family who were affected. In offering feedback to individual families at the end of the Review process (see section 7.2), emphasis will be placed as much on the descriptive detail of what we have observed as on the allocated grade.

3.7 Communication with stakeholders

This section provides more detail on who the stakeholders are (acknowledging differences within each group); what information was shared about the Review; the desired methods of communicating with them; and the sensitivities we considered when doing so. It also acknowledges and includes those who have indicated their preferences to not receive communications from the Review.

[42] The description used here of Grade 4 (Major) impact is that used for the Patient Experience descriptor (rather than the Injury descriptor) in Healthcare Improvement Scotland. Learning from adverse events through reporting and review. A national framework for Scotland 2019.

A summary of the meetings and other communications activity undertaken during our Review is shown the timeline in Appendix A.

3.7.1 Children, Young People, Parents and Families

Addressing individual questions from children, young people, their parents and families was a key driver for the Review. This section focuses on how we tried to understand individual circumstances and to ensure that our response took this into consideration.

There are different levels of engagement within this group; for example, some families did not want to receive communications about the Review. We also recognised the sensitivity required to address differences in perspective. For example, some families are affected by the death of their child whether or not this was thought to be related to infection or not. Others may feel their previously expressed concerns have not been 'heard' and/or still have unresolved questions relating to their child's care. Others still may feel that their previous questions were not addressed in ways that instilled confidence or assured them that their concerns or dissatisfaction were understood. We recognise too that these positions may each overlap.

This section acknowledges the different elements to the communications work:

- introducing and setting out the background to the Review;
- contacting families and setting out the basis for case selection;
- providing families with the opportunity to highlight questions, issues or observations that they wished to make known to the Panel;
- addressing individual questions and providing appropriate updates on overall progress;
- ensuring that preferences for updates and discussion of the individual outcome for their child were elicited and delivered;
- communicating specific findings and responses to questions to those families/patients that wish to receive these;
- ensuring that the core narrative supporting this Review was consistently reflected in communications and engagement – particularly reflecting Ministerial commitments to full, open, transparent and respectful engagement with parents and families.

Considerable engagement had already taken place with this group prior to the start of the Review, in particular, by information coming from NHS GGC and the clinical team working closely with the patients/families, supported by the Paediatric Haemato Oncology Closed Facebook page. Engagement has also been supported through the Scottish Government Oversight Board Communications and Engagement subgroup led by Professor Craig White, with the support of Patient and Family Representative, Professor John Cuddihy, and with whom we agreed a process for communication with families.

We were able to harness the established communication and engagement processes, to provide patients and families with quarterly written updates on the progress of the Review, to receive questions and information from families for consideration by the Panel, and to provide responses. Further information on information sent by families to the Panel is discussed in Section 7.1.

3.7.2 Core Project Team

The Core Project Team (CPT) meetings, chaired by Professor Marion Bain, provided governance oversight for the Case Note Review. These meetings received an update on the progress of our work and provided an opportunity to discuss risks and issues arising from the Review process itself. These meetings also acted as the conduit to provide updates and escalate risks and issues to the Oversight Board.

3.7.3 NHS GGC Clinical and Medical Staff

This area of communications and engagement had been recognised as a particular risk in the Review. This group had been concerned with the appropriateness of (some of) the methods being applied for the Review, and there were particular sensitivities expressed with respect to any focus on the quality of care provided to these patients.

Steps were taken to address these concerns as far as was realistically achievable. This included quarterly virtual update meetings to which senior medical, nursing and management staff from the Paediatric Haematology Oncology service and RHC were invited. On occasions, a senior member of the CPT also attended with a view to providing opportunities to raise concerns and ask questions.

3.7.4 NHS GGC Senior Management

Senior members of the NHS GGC Senior Leadership Team were appraised through the work of the Oversight Board to which Professor Marion Bain provided updates on progress of the Review following Core Project Team meetings. In addition, we engaged frequently with Elaine Vanhegan, Head of Corporate Governance and Administration at NHS GGC regarding meetings to request and discuss data submissions for the Review.

3.7.5 Other NHS GGC staff

Through and with members of the wider Review team, we and other NHS GGC staff communicated frequently from April 2020 to December 2020 over requests for NHS GGC data, and to clarify data received. This spanned across various divisions in NHS GGC, for example, Estates and Facilities, Microbiology, Infection Prevention Control and Paediatric Haematology and Oncology.

3.7.6 Others

In line with the independent nature of the Case Note Review, we asked for meetings with, or sought written clarification from, a number of individuals who held technical, advisory or clinical positions within Scottish Government, Health Facilities Scotland and NHS GGC. The purpose was to discuss background information and to clarify our understanding of specific points identified in our review. These meetings took place between November 2020 and January 2021.

4. DESCRIPTION OF CASES AND EPISODES INCLUDED IN THE REVIEW

4.1 Overview

The criteria for the inclusion of patients in our Review were defined in our Terms of Reference (Chapter 2), and the associated methodology for identification of these cases is further described in Chapter 3, section 3.2. The work undertaken using these criteria before we began our work suggested that 85 patients, who had experienced 120 infection episodes, were eligible for review. In the course of our work, however, we identified some adjustments:

1. We identified one patient who had had two episodes of eligible infection, the earliest of which had occurred shortly before the move of the Children's Hospital from Yorkhill to the new QEUH campus. As this fell outside the timeline of the Review and did not relate to the QEUH/RHC site, we considered that this first episode was ineligible for inclusion. However, the patient remained in the review by virtue of a second qualifying episode.
2. We subsequently identified a patient who had been identified for the Review with a single episode of bacteraemia caused by *Moraxella catarrhalis*. This is a Gram-negative bacterium, but is not considered to be environmental and spreads predominantly from person-to-person by droplet contamination. We considered this ineligible for inclusion and both the patient and the episode have been excluded from our analysis. However, as the family had been notified of, and subsequently agreed for the Case Note Review, we reviewed this child's records and will provide the family with an individual report.
3. One further patient, who otherwise fulfilled the criteria for the Review, was not included as the family requested that their child should not be included in the Review. This patient had had 4 episodes of infection and although no other records were extracted or reviewed by the Panel, the timings and types of these infections were included in the microbiology data provided to the Panel because this potentially could have contributed to our understanding of any clustering with other cases with similar infections.

In summary, in this report we provide findings for 84 patients who, between them, had 118 episodes of infection and were eligible for the Review.

4.2 Demographic and Clinical Profiles of Patients included in the Review

The characteristics of the patients included in the Review are summarised in Table 4.1.

Table 4.1 Demographic and Clinical characteristics of cases included in the Review

Total no. of cases	84	100%
Gender	Male 32 Female 52	38% 62%
Diagnosis	Leukaemia 36 Lymphoma 7 CNS tumour 11 Solid tumour 23 Non malignant disease 7	43% 8% 13% 27% 8%
Age at diagnosis	Median (Range): 3y 9m (Birth – 18y 4m)	

No. of infection episodes in the Review	One episode 65 Two episodes 10 Three or more episodes 9 *(n=3 in 6; n=4 in 2; n=8 in 1)*	77% 12% 11%
Age at first episode of infection	Median (Range): 5 y 11m (3m – 18y 10m)	
Alive at the time of the publication of this report *(further discussion of patients who have died is provided in section 6.2)*	63	75%

4.2.1 Gender

The observation that 62% of the cases in this series were female is of interest. Age Standardised Rates for cancer in children to the age of 15 in northern European countries (and in most developed countries) indicate a slight excess of boys with a M:F ratio in the range of 1.1-1.2. The ratio in older teenagers and young adults is closer to 1.0. This is confirmed in the most recent publication of data for cancer in children and young people in Scotland[43], which states 'In the ten year period 2009-2018, 1,298 children (aged 0-14, 53% male) were diagnosed with cancer and 1,996 young people (aged 15-24, 51% female) were diagnosed with cancer'.

The great majority of patients in our Review were aged under 15 years at diagnosis and we are not able to offer any obvious explanation for the reversal of the expected gender balance. There is no reason to believe that gender should influence the risk of infection at this age, and the finding of a female excess is unexpected. As the number of cases in this series is relatively small, the likelihood of this being a real effect is also small. It would nevertheless be appropriate for the staff in the Paediatric Haematology Oncology service at NHS GGC to audit gender patterns of all bacteraemias in children under their care to assess this further.

4.2.2 Age

The patients included in the Case Note Review were young, both at the diagnosis of their cancer or other condition (median age 3 years 9 months) and at the time of their first Gram Negative Environmental (GNE) infection (median age 5 year 11 months). The young median age at diagnosis is not unexpected and reflects the peak of diagnosis of the commonest form of childhood leukaemia, and some solid tumours, seen in the pre-school age range.

We consider the distribution of diagnoses in patients included in the Case Note Review to be representative of the age range expected to be under treatment in the Paediatric Haematology Oncology service at NHS GGC.

[43] Children and Young People with Cancer in Scotland 2009-2018. Public Health Scotland 2020. https://beta.isdscotland.org/find-publications-and-data/conditions-and-diseases/cancer/children-and-young-people-with-cancer-in-scotland/

4.2.3 Diagnosis

The classification of cancer in children and young people uses a different system to that applied in adults. Individual diagnoses may be very rare and analyses typically group patients into four main groups – leukaemias, lymphomas, central nervous system (CNS) tumours, and solid tumours. The data shown in Table 4.1 for the distribution of diagnoses amongst patients included in the Review are broadly in line with that expected, although there is a small excess of leukaemia (43% of the cases in the Review group *vs* 31% in the Scottish data for 2009-2018[1]) and a corresponding deficit of both CNS (13% *vs* 27%) and solid tumours (27% *vs* 34%). The proportion of children with lymphoma is as expected (8% *vs* 8%). This finding is consistent with the fact that almost all children with leukaemia require periods of intensive treatment with chemotherapy, and are therefore more susceptible to infection because of the requirement for the placement of a central venous line or port, the sustained intensity of periods of their treatment and the repeated and/or prolonged risk of neutropenia. This is not necessarily the case for children with other diagnoses, although regimens for individual treatments vary and some schedules for the treatment of high risk CNS and solid tumours can also be very intensive.

The small number of children in the Review with non-malignant diagnoses included those with serious blood diseases such as aplastic anaemia and other bone marrow failure syndromes (n = 5), haemophilia (1), and two patients who had initially been diagnosed with a malignant condition but were subsequently shown to have alternative but nevertheless serious non-malignant conditions.

An additional factor to consider is that the Paediatric Haematology Oncology service at NHS GGC is the designated national bone marrow stem cell transplant service for children in Scotland. Some of the children in the series had been referred for stem cell transplantation after initial treatment elsewhere. The requirement for such treatment is typically seen amongst children with high risk, including relapsed, leukaemia and those with severe bone marrow failure syndromes. Overall, however, we consider the population of patients seen in the Case Note Review to be representative of the case mix expected to be under treatment at NHS GGC.

4.2.4 Frequency of infection episodes

It is noteworthy that although the large majority (77%) of patients included in the Review had only one episode of GNE infection, almost one quarter had more than one, and several patients had >2 episodes. We believe this indicates the persistence of risk in this population, with the continuing presence of a central venous line and, in most, ongoing exposure to chemotherapy. It may also imply the persistence of environmentally associated risk.

Further detail about the frequency and type of organisms causing the bacteraemias in the whole case series is discussed in section 4.3.

4.3 Microbiology profile of the isolates identified in the Review

We have described (section 3.2) how cases were selected for the Case Note Review and have identified the adjustments we made to arrive at the final figures of 84 cases and 118 infection episodes eligible for our Review (section 4.1).

Table 4.2 and Figure 4.1 provide a summary of all bacteraemias at genus level. Table 4.3 and Figure 4.2 provide a summary of the same data but at the species level. Note that data from

2015 represent only a partial year (from May 15th 2015) and that the isolates from the patient who was eligible but whose family did not wish them to be part of the Review (patient 3 discussed in section 4.1) are included within these data. Note also that, as some episodes were polymicrobial (i.e. more than one bacterium was identified in the same blood culture), the totals given in these tables exceed the total number of episodes considered in the Review.

Table 4.2 Frequency of infection by organism (defined at genus level) and year

Organism by genus	2015	2016	2017	2018	2019	Total
Achromobacter					1 (3.6%)	1 (0.6%)
Acinetobacter		2 (7.7%)	6 (11.8%)	2 (4.2%)	1 (3.6%)	11 (7.1%)
Aeromonas		1 (3.8%)			1 (3.6%)	2 (1.3%)
Brevundimonas			1 (2.0%)			1 (0.6%)
Burkholderia			1 (2.0%)	1 (2.1%)		2 (1.3%)
Chryseobacterium		1 (3.8%)	1 (2.0%)	2 (4.2%)	1 (3.6%)	5 (3.2%)
Citrobacter			3 (5.9%)	2 (4.2%)		5 (3.2%)
Cupriavidus			1 (2.0%)	1 (2.1%)		2 (1.3%)
Delftia			2 (3.9%)		1 (3.6%)	3 (1.9%)
Elizabethkingia		2 (7.7%)	3 (5.9%)		1 (3.6%)	6 (3.9%)
Enterobacter		1 (3.8%)	8 (15.7%)	10 (20.8%)	8 (28.6%)	27 (17.4%)
Herbaspirillum			1 (2.0%)			1 (0.6%)
Klebsiella	1 (50.0%)	10 (38.5%)	10 (19.6%)	7 (14.6%)	2 (7.1%)	30 (19.4%)
Mycobacterium		1 (3.8%)		2 (4.2%)	1 (3.6%)	4 (2.6%)
Pantoea			1 (2.0%)	1 (2.1%)	1 (3.6%)	3 (1.9%)
Pseudomonas	1 (50.0%)	3 (11.5%)	3 (5.9%)	6 (12.5%)	4 (14.3%)	17 (11.0%)
Raoultella		1 (3.8%)	1 (2.0%)			2 (1.3%)
Rhizobium		1 (3.8%)				1 (0.6%)
Roseomonas			1 (2.0%)			1 (0.6%)
Serratia		2 (7.7%)	1 (2.0%)	2 (4.2%)	2 (7.1%)	7 (4.5%)
Sphingomonas			1 (2.0%)			1 (0.6%)
Stenotrophomonas		1 (3.8%)	6 (11.8%)	12 (25.0%)	4 (14.3%)	23 (14.8%)
Totals	**2**	**26**	**51**	**48**	**28**	**155 (100.0%)**

Figure 4.1 illustrates the same data as a coloured bar chart to visually illustrate the diversity of infections year by year.

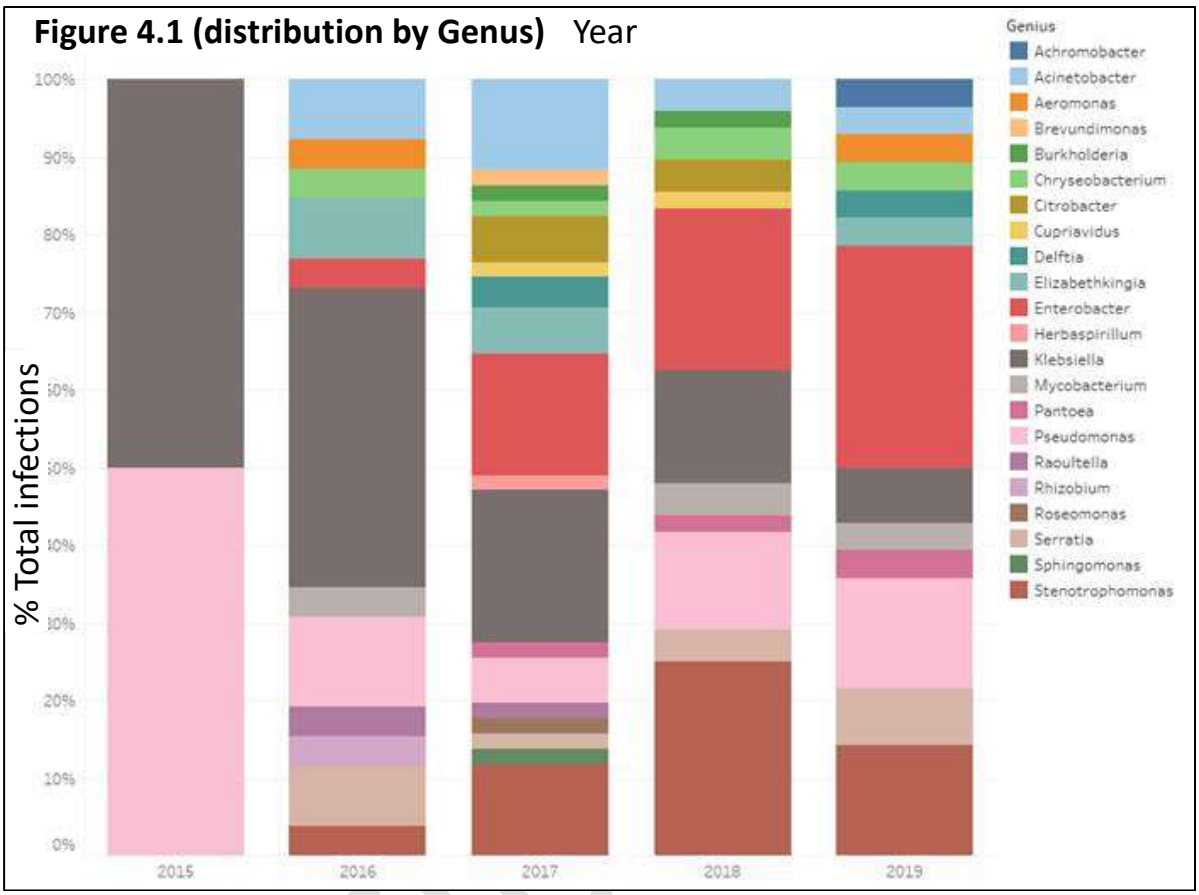
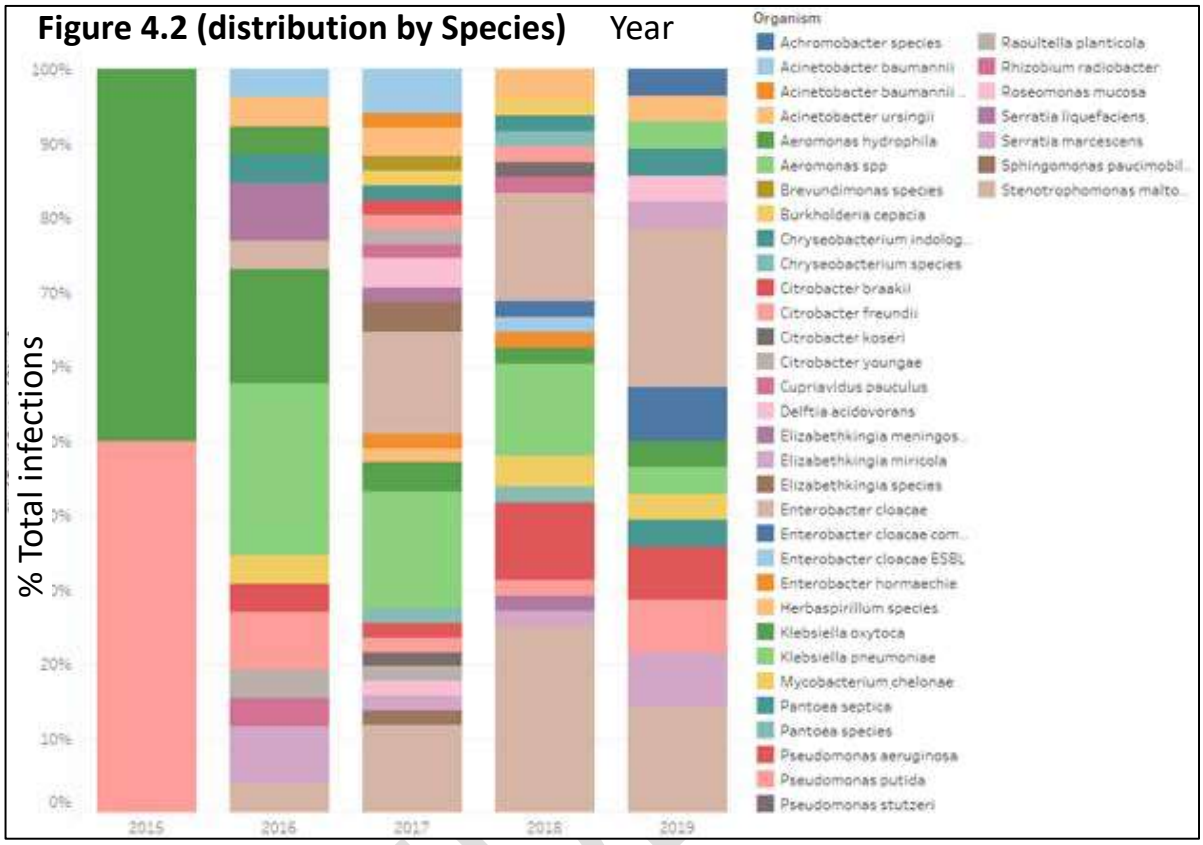


Table 4.3 Frequency of infection by organism (defined at species level) and year

Organism by species	2015	2016	2017	2018	2019	Total
Achromobacter spp.					1 (3.6%)	1 (0.6%)
Acinetobacter baumannii		1 (3.8%)	3 (5.9%)			4 (2.6%)
Acinetobacter baumannii complex			1 (2.0%)			1 (0.6%)
Acinetobacter ursingii		1 (3.8%)	2 (3.9%)	2 (4.2%)	1 (3.6%)	6 (3.9%)
Aeromonas hydrophila		1 (3.8%)				1 (0.6%)
Aeromonas spp.					1 (3.6%)	1 (0.6%)
Brevundimonas spp.			1 (2.0%)			1 (0.6%)
Burkholderia cepacia			1 (2.0%)	1 (2.1%)		2 (1.3%)
Chryseobacterium indologenes		1 (3.8%)	1 (2.0%)	1 (2.1%)	1 (3.6%)	4 (2.6%)
Chryseobacterium spp.				1 (2.1%)		1 (0.6%)
Citrobacter braakii			1 (2.0%)			1 (0.6%)
Citrobacter freundii			1 (2.0%)	1 (2.1%)		2 (1.3%)

Citrobacter koseri				1 (2.1%)		1 (0.6%)
Citrobacter youngae			1 (2.0%)			1 (0.6%)
Cupriavidus pauculus			1 (2.0%)	1 (2.1%)		2 (1.3%)
Delftia acidovorans			2 (3.9%)		1 (3.6%)	3 (1.9%)
Elizabethkingia meningoseptica		2 (7.7%)	1 (2.0%)			3 (1.9%)
Elizabethkingia miricola					1 (3.6%)	1 (0.6%)
Elizabethkingia spp.			2 (3.9%)			2 (1.3%)
Enterobacter cloacae		1 (3.8%)	7 (13.7%)	7 (14.6%)	6 (21.4%)	21 (13.5%)
Enterobacter cloacae complex				1 (2.1%)	2 (7.1%)	3 (1.9%)
Enterobacter cloacae ESBL				1 (2.1%)		1 (0.6%)
Enterobacter hormaechie			1 (2.0%)	1 (2.1%)		2 (1.3%)
Herbaspirillum spp.			1 (2.0%)			1 (0.6%)
Klebsiella oxytoca	1 (50.0%)	4 (15.4%)	2 (3.9%)	1 (2.1%)	1 (3.6%)	9 (5.8%)
Klebsiella pneumoniae		6 (23.1%)	8 (15.7%)	6 (12.5%)	1 (3.6%)	21 (13.5%)
Mycobacterium chelonae		1 (3.8%)		2 (4.2%)	1 (3.6%)	4 (2.6%)
Pantoea septica					1 (3.6%)	1 (0.6%)
Pantoea species			1 (2.0%)	1 (2.1%)		2 (1.3%)
Pseudomonas aeruginosa		1 (3.8%)	1 (2.0%)	5 (10.4%)	2 (7.1%)	9 (5.8%)
Pseudomonas putida	1 (50.0%)	2 (7.7%)	1 (2.0%)	1 (2.1%)	2 (7.1%)	7 (4.5%)
Pseudomonas stutzeri			1 (2.0%)			1 (0.6%)
Raoultella planticola		1 (3.8%)	1 (2.0%)			2 (1.3%)
Rhizobium radiobacter		1 (3.8%)				1 (0.6%)
Roseomonas mucosa			1 (2.0%)			1 (0.6%)
Serratia liquefaciens				1 (2.1%)		1 (0.6%)
Serratia marcescens		2 (7.7%)	1 (2.0%)	1 (2.1%)	2 (7.1%)	6 (3.9%)
Sphingomonas paucimobilis			1 (2.0%)			1 (0.6%)
Stenotrophomonas maltophilia		1 (3.8%)	6 (11.8%)	12 (25.0%)	4 (14.3%)	23 (14.8%)
Totals	**2**	**26**	**51**	**48**	**28**	**155 (100.0%)**

Figure 4.2 illustrates the same data as a coloured bar chart to visually illustrate the diversity of infections year by year.



In the following sections, we briefly consider the frequencies and distributions of bacteraemias caused by 4 particularly common Gram-negative environmental species groups.

4.3.1 *Enterobacter* spp.

In total, there were 38 bacteraemias in 31 children. In 2017, between mid-July and mid-December, there were 7 episodes in 6 children. In 2018, of the 10 affected children, all occurred in a 6-month period (February – August 2018). Similarly, in 2019, 11 children had bacteraemias, but none after May 2019.

4.3.2 *Stenotrophomonas* spp.

21 bacteraemias occurred in 19 children. There were 12 episodes of S. maltophilia bacteraemia in 11 children during 2018, but none after September 2018, until the first of 5 episodes in 5 children between April - September 2019.

4.3.3 *Klebsiella* spp.

22 children had a Klebsiella spp. bacteraemia. In 2016, there were 9 episodes affecting 8 children; all except one of these bacteraemias occurred in between June - November 2016. In 2017, 9 bacteraemias occurred in 7 children, with all except one occurring in a 5-month period (July - December). In 2018, 6 children had a Klebsiella spp. bacteraemia, 5 of which occurred between late January and mid-May.

4.3.4 *Pseudomonas* spp.

16 bacteraemias occurred in 14 children; in 2018, all 5 episodes (in 4 children) occurred between 21 February - June. Similarly, in 2019, there were 4 bacteraemias in 4 children; with respect to time, there were two pairs, one five days apart in March and the others 16 days apart in June.

4.3.5 Conclusions

The above observations demonstrate two notable points. Firstly, while it is not possible to state this with certainty, the frequency of these bacteraemias caused by GNE appears to be higher than would be expected, particularly for the infections caused by *Enterobacter* spp. and *Stenotrophomonas* spp.. As *Klebsiella* spp., and *Pseudomonas* spp. are the second and third most common Gram-negative bacteria (after *Escherichia coli*) causing blood stream infections, it is less clear that the frequencies of these two bacteria are higher than would normally be expected.

The second notable point is the clustering of bacteraemias in time; by virtue of this Review they are all broadly clustered in place. We consider the chances of the cluster patterns identified above occurring by chance is small.

Thus, we conclude from this simple analysis of the epidemiology of a large proportion of the bacteraemias in this Review that there is evidence for both increased frequency of specific Gram-negative environmental bacteraemia and episode clustering in time (and place). Neither phenomena prove that some of the bacteraemias had hospital environment sources, but the observations are consistent with this hypothesis.

5. THE ROLE OF THE HOSPITAL ENVIRONMENT AS A SOURCE OF INFECTION

5.1 Context

Concerns about the QEUH/RHC hospital environment have been widely discussed. They were discussed in detail the Independent Review undertaken by Dr Andrew Fraser and Dr Brian Montgomery, published in June 2020[44], and will be further addressed by the Oversight Board whose final report is to be published to align with the publication of our own report.

Reported deficits in the hospital environment include (but not are not limited to) issues such as: the design and maintenance of the water system[45]; lower than required air exchange in patient rooms and inadequate positive pressure protection of patient rooms; the lack of provision of particulate (HEPA) filtration in some higher risk patient areas; and uncertainties around the appropriate utilisation of chilled beams for temperature control in rooms used for immunocompromised patients[46].

The focus of the Independent Review was explicitly on the built environment of the QEUH and problems related to infection prevention and control. Its Terms of Reference state that it was charged 'to establish whether the design, build, commissioning and maintenance of the Queen Elizabeth University Hospital and Royal Hospital for Children has had an adverse impact on the risk of Healthcare Associated Infection and whether there is wider learning for NHS Scotland'.

It is not the remit of the Case Note Review to revisit that objective but, in addressing our task to consider how many children in the specified patient population had been affected by the defined types of infection over the period from May 2015 to December 2019, and to answer the question whether it is possible to associate those infections with the environment of the RHC and the QEUH, it is inevitable that we have had to place our considerations in that context.

The remit of the Hospitals Public Inquiry now being undertaken by the Right Hon. Lord Brodie is much broader. Its overarching aim is 'to consider the planning, design, construction, commissioning and, where appropriate, maintenance of both the Queen Elizabeth University Hospital Campus (QEUH), Glasgow and the Royal Hospital for Children and Young People and Department of Clinical Neurosciences (RHCYP/DCN), Edinburgh. The Inquiry will determine how issues relating to adequacy of ventilation, water contamination and other matters adversely impacting on patient safety and care occurred; if these issues could have been prevented; the impacts of these issues on patients and their families; and whether the buildings provide a suitable environment for the delivery of safe, effective person-centred care'[47].

[44] Queen Elizabeth University Hospital Review Report. Scottish Government. June 2020
[45] Water Management Issues Technical Review. NHS Greater Glasgow and Clyde – Queen Elizabeth University Hospital and Royal Hospital for Children. Health Facilities Scotland. March 2019
[46] Issues summarised in: Potential infection control risks associated with chilled beam technology: experience from a UK hospital. T Inkster, C Peters, H Soulsby. J Hosp Inf, 2020;106:613-616
[47] Scottish Hospitals Inquiry. https://www.hospitalsinquiry.scot

We recognise, therefore, that our work and conclusions are not only informed by the findings of the Independent Review but also will be of relevance to the work of the Independent Inquiry.

The conclusions of the Independent Review record that there were, amongst many other findings, examples of non-compliance in the design of the water and ventilation systems at QEUH. The report also concluded that, at commissioning, there was a lack of documentation to prove the water and air ventilation systems in Royal Hospital for Children (RHC) wards 2A & 2B and QEUH 4B (ultimately to become the location of the adult bone marrow transplant (BMT) service, and currently offering accommodation for the paediatric BMT service whilst the deficits identified in wards 2A and 2B are being rectified) were compliant with specification.

In a succinct summary of the challenges identified with the water system, Drs Fraser and Montgomery wrote that 'the water system of the hospital became, from within one year of admitting patients, the emerging source of infections that entered the bloodstreams of a substantial number of child patients with haematological cancers. The Health Protection Scotland report (2018)[48] states that they were investigating a 'contaminated water system'; the entire new hospital was affected and, after immediate local action in the vicinity of the affected patients, the remedy became a new system of additional chemical disinfection for the hospital water supply'.

A key statement made in the Executive Summary of the Independent Review, and relevant to the work of our Review, reads as follows:

'Patients, staff and visitors who are vulnerable due to immuno-suppression, or who are in proximity to patients with certain highly infectious communicable diseases, have been exposed to risk that could have been lower if the correct design, build and commissioning had taken place'.

Nevertheless, the two high level findings reported by the Independent Review read as follows (with our italics):

1. In the course of the Review, through examination of documentation, listening to witnesses, discussion with experts and input from the Review's expert advisers, and site visits*, we have not established a sound evidential basis for asserting that avoidable deaths have resulted from failures in the design, build, commissioning or maintenance of the QEUH and RHC*.

2. The QEUH and RHC combined now have in place the modern safety features and systems that we would expect of a hospital of this type. *The general population of patients, staff and visitors can have confidence that the QEUH and RHC offers a setting for high quality healthcare.*

We suggest that these two, more positive conclusions stand in some contrast with the immediately previous statement we have quoted, and with the considerable detail of adverse findings in the hospital environment highlighted elsewhere in the Independent Review. This places the relevance of our work into sharper focus and, whilst we

[48] Summary of the Incident and Findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/ Royal Hospital for Children water contamination incident and recommendations for NHSScotland. Health protection Scotland. December 2018

acknowledge that considerable work has been undertaken within NHS GGC to address or mitigate the risk associated with the environmental concerns described by the Independent Review, we are aware that some feel these concerns have remained unresolved. For example, microbiology staff addressed concerns about the situation on Ward 6A (currently the home of the Paediatric Haematology Oncology service) even as late as the second part of 2019[49].

This chapter provides our observations on the maintenance of the hospital environment and its microbiological surveillance, and on the inferences we derive for the risk of environmentally acquired infection.

5.2 The built environment and its maintenance

Regular maintenance and repair of the building, its equipment and fixtures and fittings is a normal, and essential, part of the life of any hospital. Nevertheless, the nature and frequency of interventions by Facilities department maintenance staff or other contractors provides the potential for environmentally acquired infection, despite the fact that any work of this nature must be risk assessed and mitigated in compliance with HAI-SCRIBE requirements[50] [51]. Furthermore, the nature of any incident they are called to resolve may itself be evidence that a potential source of infection exists in the environment (for example, the risk posed by a blocked sink or shower drain).

We have therefore undertaken a retrospective review of a large database of logs and documents provided by NHS GGC that offered data related to the maintenance of the clinical environment with a particular focus on Wards 2A and 2B and 6A and 4B.

This has not been straightforward. Initially we found it difficult to interrogate the large amount of data related to facilities management because of the way this information was structured and presented. Nor did the initial data submissions from NHS GGC allow us to readily link a maintenance action to a specific clinical location; frequently these initial records identified only the ward and not the individual room. They also did not provide the precise date work was undertaken, more often indicating a range of days between the requisition and the completion of the work. This experience suggested to us that the data systems used within NHS GGC to record facilities maintenance activity are better designed to manage workload than to provide information of potential relevance in the management of clinical situations, particularly Infection Prevention and Control events.

Latterly, further work by NHS GGC to clarify the data and reformat its presentation provided a more workable solution to better allow us to investigate links between patients and maintenance activity in their care environment. However, even the later database did not always reflect the location of work undertaken with sufficient detail for the information to be useful. Subject to these constraints, however, we found very few examples where work undertaken in close temporal and physical relationship to the care environment of a patient could be linked to the occurrence of a specific infection, or to potential outbreaks of infection.

[49] SBAR – Ward 6A environment. Microbiology dept QEUH. 26/8/19.

[50] Healthcare Associated Infection – System for Controlling Risk in the Built Environment: a system used to identify, manage and record built environment infection control

[51] SHFN 30 Part B: HAI-SCRIBE Implementation strategy and assessment process. Health Facilities Scotland 2014.

Overall, however, it was apparent to us that there were large numbers of requisitions for Estates and Facilities department interventions in the Haematology Oncology wards and that those relating to plumbing and drainage seemed particularly evident (although we have no suitable comparative data with which to compare these observations). These problems include blocked toilets or drains; leaking showers and taps; and the management and maintenance of chilled beams following reports about leaks or condensation, or both, and where additional cleaning was required for control of dust.

We have not been able to ascertain with clarity what planned programme of inspection and preventative maintenance existed or was actually undertaken on a routine basis, particularly with regard to the chilled beam system.

5.3 Cleaning and Standard Infection Prevention and Control Measures

Effective cleaning and IPC practice make a significant contribution to ensuring patient safety within the hospital environment. A cycle of audit and subsequent improvement in practice contributes to the ethos of a learning organisation.

To investigate the potential link between cleaning standards, infection prevention practice and the incidence of bacteraemia, we reviewed the available Infection Prevention and Control (IPC) data and the relevant national and local policies commensurate with the time period of our Review.

5.3.1 IPC audits

Infection prevention safe practice in acute care audits looks at a wide range of factors including environment, isolation, equipment, hand hygiene, personal protective equipment, linen, waste and indwelling devices, including intravenous lines. Where suboptimal practice is identified, remedial action should be instigated through a systematic action/implementation plan, work execution and recording of completion.

The National Infection Prevention and Control Manual (NIPCM)[52] specifies standards for infection prevention and control and includes an audit tool for each of the Standard Infection Control Precautions (SICP), which should be performed monthly by the Senior Charge Nurse (SCN)[53]. Non-compliance with SICP audits should be resolved locally by the SCN working with their team. On occasion SICP audits may be performed by the Infection Prevention and Control team (IPCT) during incidents or outbreaks to ascertain practice against national guidance. Any non-compliance should be recorded and an action plan implemented for improvement. NHS GGC used an audit tool based on the national guidance in place when QEUH/RHC opened.

We reviewed reports of IPC audits and SICP audits undertaken at NHS GGC between 2016 and 2019. These were based on the NHS GGC IPC audit tool as part of a planned audit cycle. SICP audits formed part of an audit cycle that appeared to have commenced in 2017. The overall score from an IPC audit then defines when a re-audit is due and the report generates an action plan for any noncompliance or if standards are not met.

[52] National Infection Prevention and Control Manual. NHSScotland http://www.nipcm.scot.nhs.uk

[53] A National Monitoring Framework to Support Safe and Clean Care Audit Programmes . An Organisational Approach to Prevention of Infection Auditing. NHS National Services Scotland 2018. https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2678/documents/1_national-monitoring-framework.pdf

The only data we saw that related to cleaning compliance was included in IPC audit reports, and within reports of the various supportive practice interventions that were implemented at various times during the period of our Review. We did not receive separate cleaning audit reports although these had been requested. There are also nationally collected data in the public domain providing scores for cleaning compliance at the level of each Health Board but this is not informative at the level of an individual ward[54].

Compliance against an audit resulted in a RAG + Gold rating according to criteria shown in Table 5.1

Table 5.1 RAG + Gold rating criteria for IPC audit

RAG + Gold score	% compliance obtained	Re audit interval
Red	0-65%	3 months
Amber	66-79%	6 months
Green	80-90%	12 months
Gold	91-100%	12 months

During 2017 IPC audits in ward 2A were undertaken monthly from May to September and then twice monthly in October and December of the same year. We noted that whilst a score may be classified as Gold, the highest rating, some elements may have less satisfactory compliance. For example, an audit might score 91% overall and yet the environment score could be 67% and equipment 75%. The Gold outcome would indicate that a re-audit was not required for 12 months despite there being obvious areas for improvement: in such situations we would expect to see a focused plan for improvement in areas that were not compliant. Significantly the guidance within the NIPCM about audit includes a statement about the use of RAG scores: '…although RAG status can be useful; where it is used there should also be structures in place which weights the risk associated and not necessarily concentrates on the percentage score'.

In 2018, there were monthly audits for Ward 2A (until it closed in September and patients were transferred to Ward 6A). We noted again that an overall Gold rating could be achieved but with some sections (usually environment and equipment) achieving non-compliant scores, demonstrating no sustained improvement. No action plan was identified and, as an overall Gold standard was reached, the next scheduled audit would not have been required for 12 months. This is not indicative of a culture that was thinking carefully enough about quality improvement and we are not convinced that the data shown in Table 5.2 are sufficient to tell the whole story.

Table 5.2. Summary of overall scores for NHS GGC IPC & Safe Practice in Acute Care audits

Ward	2016	2017	2018	2019
2A	91%	94%	96%	
2B	95%	92%	98%	

[54] NHSScotland National Cleaning Compliance Report Domestic and Estates Cleaning Services Performance 2015/2016. Health Facilities Scotland 2016. https://nhsnss.org/media/4966/1479909664-2015-16-cleaning-monitoring-report-quarter-4-v10-published.pdf

6A			95%	96%
4B				94%

Given the concurrent concerns relating to the possibility of environmentally acquired infection, we are not persuaded from the documentation we have received that effective governance and assurance was in place to verify that improvement actions were robustly and continuously undertaken.

5.3.2 Enhanced Supervision

A process of Enhanced Supervision was used by NHS GGC to support ward 2A to monitor and drive improvement with infection prevention practice. The aim of the supervision was to support staff and provide real time education to the clinical teams. The process involves review of areas such as equipment, cleaning, clinical wash hand basins, PPE and hand hygiene. If standards were not adequate, the issue was referred to the nursing manager for action. It is not clear to us, from the documents we have received, how actions were pursued or how improvement and learning was shared and sustained.

During 2017, there were six such interventions in Ward 2A but the Enhanced Supervision appears to have ended prior to assurance that all the standards had been achieved.

During 2018, Enhanced Supervision was undertaken from March to December (the period from late September relating to Ward 6A) and we observed that standards were often under achieved.

Enhanced Supervision was undertaken again in Ward 6A during 2019, and yet our observations were that the standards were again often not compliant. This leaves us to question whether this approach offered a reliable improvement intervention and we are uncertain where the accountability lay for the assurance it provided in relation to IPC.

5.3.3 Hand Hygiene

Hand hygiene is considered an important practice in reducing the transmission of infectious agents that cause healthcare associated infections. It is one of the core Standard Infection Control Precautions (SICPs). Hand hygiene refers not only to hand washing using the established technique but also to the appropriate use of alcohol based hand rubs at point of use. The NIPCM for Scotland has a framework for hand hygiene to support a safe and clean care audit programme. We reviewed hand hygiene audit results undertaken by the NHS GGC hand hygiene coordinators. The information we received for audits between 2015 and 2019 did not appear have a consistent frequency, and it was unclear to us how a lower compliance score triggered an improvement response and reaudit.

The audit is measured as a percentage of opportunities taken for hand hygiene and compliance with correct procedure. It then provides a combined score to give an overall indication of hand hygiene practice. From the data we have seen, it is not clear how many hand hygiene opportunities were observed for each audit or which staff groups were represented in the audit, although circumstances relating to non-compliance were occasionally described in IMT minutes.

Regarding the use of improvement plans for improving hand hygiene, we saw, for example, that in 2017 there was a programme of ward based hand hygiene education, but we were

unable to link the impact with subsequent improvement in compliance or any effect on the incidence of infection episodes. We also saw data pertaining to Enhanced Supervision of ward 2A during 2017 but only one question related to hand hygiene. Where inconsistencies or non-compliance were observed, the ward manager was informed but we have not been able to identify records of improvement actions.

In addition, data provided by hand hygiene audits were also included as a part of the SICP audit programme. This audit records only a yes/ no response and from the data we received we were unable to identify how regular hand hygiene audit was used as a tool to contribute to sustainable improvement in the provision of care.

We would have expected to see more frequent hand hygiene audits in the ward environments, particularly during the periods where continuing concerns regarding the increased occurrence of bacteraemia were under investigation by an IMT. Example 5.1 provides one situation to illustrate our concern:

EXAMPLE 5.1

The minutes of a PAG meeting in early June 2019, called because of 2 recent Stenotrophomonas infections, and 2 further GNE isolates in May that year, document that the last hand hygiene audit on Ward 6A had been held in October 2018 and the last Infection Control audit in November 2018.

The infrequency of these audits seems surprising, as was a statement that enhanced supervision of environmental cleaning was discontinued in April 2019 on the basis that practice observed was of a consistently high standard.

5.3.4 Conclusion

Given the continuing focus on a possible link between bacteraemia (particularly due to Gram-negative Environmental Bacteria) and the hospital environment and its water supply, we cannot find consistent reference to IPC audits in the IMT process.

The documentation we have reviewed does not assure us there was a robust enough culture of continuous improvement for IPC within the organisation during the period of our Review or that the Enhanced Supervision process for IPC had sustained impact.

We were unable to determine a strong governance and assurance process for IPC and formed a view that the focus of the organisation appeared to be directed more towards the task of audit than to the achievement of quality improvement outcomes.

5.4 Environmental microbiological surveillance

In contrast to water sampling (section 5.5), we recognise that routine microbiological sampling of so called 'hard surfaces' offers little to routine IPC practice but we consider it relevant in the investigation of outbreaks of specific or unusual infection providing it is undertaken systematically.

We have had access to a database, provided by GGC, of 'hard surface' samples taken during the period of our Review. This also included samples taken from drains. Initially these data were subject to the same limitations as those for facilities maintenance in that the information supplied frequently failed to link samples to a recognisable clinical location. Later in the Review, reprovision of the data allowed us to investigate links more readily between the location of patient care and environmental microbiology samples. In reality, however, it proved difficult to link environmental samples taken from patient rooms to

dates of specific bacteraemia, not least because samples (we had the results for both positive and negative samples) were infrequent and, when taken, seemed not to be taken in a systematic way. It was also often not clear to us which microorganisms had been sought/identified during laboratory processing of samples.

There were, however, occasions when samples requested by the IMT were reported positive for an organism under investigation. A good example of this would be the identification of Enterobacter in drains on Ward 6A during a cluster of *Enterobacter* spp. bacteraemias in 2019. Even here, however, positive samples came from different areas of the ward and were not specifically found in the rooms previously occupied by the patients who developed bacteraemia. This does not, in our view, diminish the argument that the environment was the potential likely source but limits our ability to strengthen the observation that it was.

The further specific significance of microbiological typing to consolidate a relationship between isolates from different sources is discussed in Chapter 8, section 8.3.1.

In other IMT records, where actions recorded that environmental samples should be taken, evidence was not always available to confirm that this had been done (and whether this was a single sampling exercise or was repeated) or, if it had been done, the outcome had not been recorded.

Overall, we were unable to conclude that the organisation had a systematic approach to environmental sampling in the context of either a specific, unusual infection or an outbreak of a more commonly seen infection.

5.5 Water safety

5.5.1 Water testing policies and practice

Following increasing evidence relating to outbreaks and incidents of *Pseudomonas aeruginosa* in augmented care units, and notably a cluster of infections in a neonatal unit in Belfast, the Department of Health (England) published 'Water sources and potential *Pseudomonas aeruginosa* contamination of taps and water systems: advice for augmented care units' in 2012. An addendum to Health Technical Memorandum 04-01 was also published in 2013 and superseded the 2012 document[55].

This guidance is concerned with controlling/minimising the risk of morbidity and mortality due to *P. aeruginosa* associated with water outlets. It provides guidance on: assessing the risk to patients when water systems become contaminated with *P. aeruginosa* or other opportunistic pathogens; remedial actions to be taken when water systems are contaminated; protocols for systematic sampling, testing and monitoring of water for *P. aeruginosa*; and forming a Water Safety Group and developing water safety plans. The guidance is aimed at Estates and Facilities departments and Infection Prevention and Control (IPC) teams and is directed towards healthcare organisations providing patient care in augmented care settings. These include patients:

- who are severely immunosuppressed because of disease or treatment: this will include transplant patients and similar heavily immunosuppressed patients during high-risk periods in their therapy;

[55] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/140105/Health_Technical_Memorandum_04-01_Addendum.pdf

- cared for in units where organ support is necessary, for example critical care (adult paediatric and neonatal), renal, respiratory (may include cystic fibrosis units) or other intensive care situations;
- those patients who have extensive breaches in their dermal integrity and require contact with water as part of their continuing care, such as in those units caring for burns.

NHS Scotland did not adopt a similar approach to water testing in augmented care units until 2018[56] and was provided in an addendum from HPS to advice directed at neonatal units and adult and paediatric intensive care units[57].

5.5.2 Water testing at NHS GGC

We set out the summary of the policy above because, whilst the timing of the guidance issued in Scotland means that water systems in Haematology Oncology wards at NHS GGC were not required to be tested for *P. aeruginosa* contamination, there must have been professional and managerial awareness that such guidance was in place elsewhere in the United Kingdom. This ought to have further strengthened the need for regular, systematic sampling/testing of water given the emerging concerns over this timeframe about possible environmental sources for paediatric bacteraemias.

In general, water testing at NHS GGC appears to have lacked a co-ordinated systematic approach.

The investigation undertaken by HFS[58] and the findings of the Independent Review[59] have each confirmed that there were serious issues about the design and commissioning of the water system. The response of the organisation to the point at which additional whole system chlorination was introduced, suggests that these issues were accepted. Yet we have been told that there was a lack of a robust water testing strategy from the point at which the new hospital building was commissioned, including assurance that the system was fit for purpose.

From the information with which we have been provided, it has proved difficult to understand the rationale for how water sampling/testing took place, in particular to assure the organisation that water systems/sources were not related to the observed Gram-negative bacteraemias in children. There did not appear to be a systematic water sampling process in place, or a consistent water system related response to clusters of infections caused by (often unusual/uncommon) Gram-negative environmental bacteria. We are not assured that there was adequate communication about what sampling and testing occurred and the results obtained. We have been told that some staff involved in IPC at NHS GGC were denied access to water sampling/testing information despite multiple requests. As the concerns increased about whether the bacteraemias occurring in children on the Haematology Oncology wards at NHS GGC might be related to environmental/water

[56] https://hpspubsrepo.blob.core.windows.net/hps-website/nss/1989/documents/3_psuedomonas-water-testing-v1.0.pdf

[57] https://www.hps.scot.nhs.uk/web-resources-container/guidance-for-neonatal-units-nnus-levels-1-2-3-adult-and-paediatric-intensive-care-units-icus-in-scotland-to-minimise-the-risk-of-pseudomonas-aeruginosa-infection-from-water/

[58] Water Management Issues Technical Review. NHS Greater Glasgow and Clyde – Queen Elizabeth University Hospital and Royal Hospital for Children. Health Facilities Scotland. March 2019

[59] Queen Elizabeth University Hospital Review Report. Scottish Government. June 2020

contamination, the lack of a clear step change in the organisation's approach to water sampling, testing, reporting and strategy is of concern.

After repeated requests for information on what water system sampling testing took place, we were provided with data that frequently did not specify the precise location from where a sample was obtained, and/or precisely which bacteria were sought and identified in the laboratory. It is possible that water samples were examined to determine only the burdens (total numbers) of bacteria present, without formal identification of the bacteria present; conversely, samples may have been taken to look for specific bacteria (e.g. in relation to bacteraemias caused by uncommon microorganisms). Specific bacteria may have been sought in some samples, but this does not mean that all bacteria present were identified. Also, searching once or only occasionally for specific bacteria, and from only a limited number of sites, limits the confidence that a bacterium of concern was not contaminating a water point/system and thus could have been the source of one or more bacteraemias. Example 5.2 illustrates some of our concerns.

EXAMPLE 5.2

We summarise here the results provided in a file provided to us labelled '2018 Potable Water Master File Complete 13.11.20'.

Despite the electronic title referring to 'potable', the samples were actually taken from a mixture of sources including water tanks, taps and showers. The Excel spreadsheet contains detailed information about the samples (n = 2864), dates, investigations and results. At first glance it appears to represent a comprehensive set of sampling/testing information. However, for over 70% of the listed water samples, Cupriavidus is stated as the target microorganism. As such, there appears to have been limited testing for other bacteria performed on these samples.

The file contains results from multiple locations/buildings but 336 are stated as coming from water sources on Ward 2A. Of note, however, with the exception of 22 (dated during September 2018), almost all the samples were taken during one of two adjacent months (i.e. March or April 2018). For Ward 2B we see a similar time constrained sampling pattern, but for only 27 samples; 16 were in March, 2 in May and 9 in September 2018.

We emphasise that 2018 was a year of heightened concern about the possibility of contamination of water sources.

We conclude that these data do not support a systematic approach to water sampling (i.e. frequent, repeated sample collection) certainly for wards 2A and 2B and in the context of concern regarding possible environmental sources of bacteraemias.

In summary, and crucially, without any other clear account of which water points/systems were/were not sampled, when and how often sampling occurred, and which bacteria were specifically sought, we frequently could not confidently exclude these as potential point sources for bacteraemias caused by Gram-negative bacteria that are known to be associated with such environments.

5.6 The likelihood that infections were linked to the hospital environment

Chapter 3 addresses the methodology utilised for the work of the Panel and section 3.6.6 describes the principles we used in reaching our conclusions about the likelihood of an environmental source for an infection in each episode of infection. That section also describes the cautions and limitations we had to consider in making our decisions. Table 5.3 summarises our overall findings.

Table 5.3: Panel assessment of the likelihood that infection episodes were linked to the hospital environment

Likelihood of a link to the hospital environment	No. of Episodes	Proportion
Unrelated	8	7%
Weak Possible	17	14%
Possible	55	47%
Strong Possible	4	3%
Probable	30	25%
Strong Probable	3	3%
Definite	0	0%
Unable to Determine	1	1%
Total	**118**	**100%**

Whilst we classified 8 episodes as being unrelated to the hospital environment, and one we were unable to determine, the rest of the episodes fell into either the Possible (overall 76 episodes, 70%) or Probable group (overall 33 episodes, 30%).

Our decisions reflected our judgements based on the balance of probability when considering all the data we had available. They also reflect the complexity of drawing such distinctions in a population of patients who, by the nature of their diagnoses and treatments, are susceptible to serious infection. Many of these infections can arise both from endogenous (within the patient him/herself) and exogenous (from the external environment) sources. Exogenous sources include not only the environment of the hospital but also all environments encountered by the patient outside the hospital.

The lack of any episodes being classified as Definite reflects the tight criteria, agreed before we started our Review, that are required to achieve this descriptor. Decisions at this level were also influenced by the inconsistency with which our investigation and evaluation could be informed by data systematically investigating the microbiological environment (section 5.4), the water system (section 5.5.2), and the likelihood that, by using typing methodologies, different bacterial isolates were linked (Chapter 8, section 8.3).

Microbiological information alone was insufficient for us to reach our conclusions and we also looked carefully at clinically relevant information. Above all, the complexity of the challenge we faced was in the retrospective acquisition of adequately informative data.

The distinction between classification as ‘Strong Possible’ and ‘Probable’ was often relatively subtle, as was that between ‘Probable’ and ‘Strong Probable’, and by linking these three categories we believe we can reasonably create a group of infections with the closest likelihood of a link to the hospital environment (‘Most likely’ to be associated with the hospital environment). In total, these three groups constituted 37 (32%) of the whole series. Table 5.4 describes the profile of bacteria encountered in this ‘Most likely’ group of episodes, compared to that of all other episodes.

Table 5.4 Microbiological profile of infections in the group ‘Most likely’ to have been associated with the environment vs the rest

Organism	Seen in 'Strong Possible', 'Probable' & 'Strong Probable' groups ('Most Likely' n = 37 episodes)	Seen in all other episodes (n = 81)
Stenotrophomonas spp.	14	7
Klebsiella spp.	10	18
Enterobacter spp.	7	18
Pseudomonas spp.	4	13
Acinetobacter spp.	3	7
Cupriavidus spp.	2	0
Serratia spp.	1	6
Elizabethkingia spp.	1	5
Chryseobacterium spp.	1	4
Mycobacterium chelonae	1	3
Other	0	21
TOTAL	44[1]	**103[2]**

[1] 6 and [2]14 episodes were polymicrobial (i.e. they involved more than one bacteria)

There is a striking excess of Stenotrophomonas spp. in the 'Most likely' group which is significant (Chi square 14.80; $p<0.05$) but differences in the frequency of all other bacteria are less obvious. Other characteristics of the 'Most likely group' are discussed in Chapter 6.

We also looked at the frequency with which we identified episodes as 'Most likely' in relation to the year of infection. We did this in case there might have been a shift in the amount of data available to us over the era of the Review. We found that there was a substantially greater proportion of 'Most likely' episodes in 2018 but concluded that this probably reflected the fact that most isolates of Stenotrophomonas (11/21) occurred in that year.

In closing this chapter, we offer one further observation. Whilst we are not reassured about the adequacy of the systems in place to monitor the environment during the period of our Review, and believe that almost one third of the episodes we reviewed were 'Most likely' linked to the hospital environment, we suggest NHS GGC also recognised that some links with the environment were likely on the basis of the interventions and control measures that were introduced. For example, the closing of Wards 2A and 2B, with relocation of services to Ward 6A and 4B; the addition of point of use filters for water outlets; augmented chlorination of the water supply; and additional decontamination of the healthcare environment.

6. THE IMPACT OF INFECTION ON PATIENT OUTCOMES

6.1 Background

Our Terms of Reference charged us with defining: a) How many children were affected by Gram-negative environmental bacterial infection (addressed in Chapter 4); b) Whether it is possible to associate these infections with the environment of the QEUH/RHC (Chapter 5); and c) Was there an impact on care and outcomes in relation to infection? This chapter addresses this third question.

The findings described in this chapter will also inform the final question asked of us: d) What recommendations should be considered by NHS GGC and, where appropriate, by NHS Scotland more generally to address the issues arising from these incidents to strengthen infection prevention and control in future? Our overall recommendations are given in Chapter 10.

The approach we took towards defining and assessing the impact of infection is described in Chapter 3, section 3.6.7. We address issues relating to aspects of clinical care in section 6.2: these are the principal items that contributed to the scoring framework we used to assess the impact of the infection. In section 6.3 we will discuss information about the 21 children known to have died by the time of the publication of this report. Our approach to the collection and grading of adverse events is described in section 6.4 and in section 6.5, we try to bring these various themes together in a narrative summary of impact.

The themes raised by families in their submission to the Panel are dealt with in Chapter 7.

6.2 Items relating to aspects of clinical care

Details of the specific items identified in this section were sought in the data collection process and included the Data Synthesis files created to inform Panel review (as described in section 3.6). The data in this section are presented in two ways; first for all episodes in the Review (correcting the numbers for those which were not evaluable); and second, comparing the episodes we considered 'Most likely' to have been linked to the hospital environment with the remaining episodes (as described in section 5.6).

6.2.1 Overall impact

We have described the approach taken to agree an overall impact score for each infection episode (section 3.6.7). The distribution of these scores for evaluable episodes of infection is summarised in Table 6.1 which presents the data both as the impact grade used for the panel review and as the equivalent NHS Scotland Risk Assessment Matrix score.

Table 6.1. Overall impact grade allocated in each episode of infection

Panel Impact Grade	NHSS Risk Assessment Matrix score	Whole Group (No. evaluable = 115)	Most Likely linked (No. evaluable = 36)	Least Likely linked (No. evaluable = 79)
None	1. Negligible	1 (1%)	0 (0%)	1 (1%)
Minor	2. Minor	5 (4%)	1 (3%)	4 (5%)
Significant	3. Moderate	65 (56%)	21 (58%)	44 (56%)
Severe	4. Major	40 (35%)	12 (33%)	28 (35%)

Critical	5. Extreme	4 (3%)	2 (6%)	2 (2%)
*Non evaluable		3	1	2

Three patients were not evaluable for an overall impact grade because of the circumstances of their admission and complications of their disease.

6.2.2 Length of hospitalisation

We requested data for the duration of the whole admission during which each infection episode took place and/or was treated. We also collected details of all antibiotics used and the duration of antibiotic treatment. It became clear to us, however, that whilst the duration of the entire admission and/or the duration of antibiotic treatment was easiest to define, the best measure of the overall impact (burden) of the infection was the length of an inpatient admission that could, as far as it was possible to assess, be attributed to the treatment of the infection. Making this distinction was not always easy: in many patients, the duration of admission was extended either because of other toxicities, including other infections, or because the patient stayed in hospital to continue or restart treatment. In others, antibiotics were continued for several days (and occasionally significantly longer) after the patient had been discharged from inpatient care. However, by considering the details collected from the case notes to inform the patient's clinical timeline, we found it was generally possible to make a reasonable assessment of the length of an admission that could be accounted for principally because of the occurrence of the Gram-negative environmental infection (Table 6.2).

Table 6.2 Length of hospital stay attributed to the infection

Duration	Whole Group (No. evaluable = 115)	Most Likely linked (No. evaluable = 36)	Least Likely linked (No. evaluable = 79)
1-7 days	15 (13%)	9 (25%)	6 (8%)
8-14 days	43 (37%)	11 (30%)	32 (40%)
15+ days	57 (50%)	16 (44%)	41 (52%)
Not evaluable	3	1	2

6.2.3 Removal of the central venous line

Patients with indwelling venous access devices (lines and ports) are especially susceptible to blood stream infections. It is frequently necessary to remove the device in order to eradicate a blood stream infection although there are often good clinical justifications to try to 'salvage' the line (or port) with antibiotic treatment in order to facilitate continuing care in a challenging clinical situation. This may be possible by extending antibiotic treatment and by using antibiotic 'locks' (instillation of a high concentration of an antibiotic into the catheter lumen, and allowing it to remain for a period of time), but may also be associated with risk if the strategy fails.

The removal of a central line in a child almost always requires a short anaesthetic and, under most circumstances, a replacement line will be required once the infection has been treated. This contributes a degree of further risk and an added logistical challenge to the delivery of care.

The data we collected are summarised in Table 6.3.

Table 6.3 Infection episodes requiring removal of the central line

CVL removed?	Whole Group (No. evaluable = 115)	Most Likely linked (No. evaluable = 36)	Least Likely linked (No. evaluable = 79)
Yes	78 (68%)	26 (72%)	52 (66%)
No	37 (32%)	10 (27%)	27 (34%)
No CVL in situ	2	1	1
Not evaluable	1	0	1

6.2.4 Admission for Intensive Care

Bacteraemia of any kind can result in severe illness, but many Gram-negative environmental bacteria can be virulent pathogens (with the potential for endotoxic shock) which may cause rapid clinical deterioration and risk of death. Admission to the paediatric intensive care unit (PICU) is therefore an important measure of the severity of infection and its impact on the patient.

All infections which merit admission to PICU are serious but there are occasions when patients who might sometimes be managed satisfactorily in the normal ward environment are admitted to PICU because of the opportunity for closer and more intensive monitoring and, perhaps, short term life support. There are others whose deterioration is more profound and who may require prolonged support. Empirically, we therefore divided admissions to PICU into two groups - those of up to 3 days and those with longer stays - as a way of trying to reflect this distinction (Table 6.4). We also recognised that some patients required PICU support for other problems at the time of the bacteraemia but not, in our judgement, specifically because of the bacteraemia.

Table 6.4 Admission to PICU

PICU admission at the time of the bacteraemia	Whole Group (No. evaluable = 114)	Most Likely linked (No. evaluable = 37)	Least Likely linked (No. evaluable = 77)
Yes, for 1- 3 days	9 (8%)	6 (16%)	3 (4%)
Yes, for >3 days	3 (3%)	2 (5%)	1 (1%)
No	102 (89%)	29 (78%)	73 (95%)
Yes, but not related to infection	3	0	3
Not evaluable	1	0	1

6.2.5 Cancer treatment disruption

Children and young people with cancer are most often treated with a predefined plan (protocol) for treatment which is shaped by the details of their diagnosis and is based on the outcome of prior experience of the same condition or by a clinical trial. These protocols represent an 'intent to treat' strategy which incorporate combinations of different elements of therapy (chiefly chemotherapy and/or radiation therapy and/or surgery according to diagnosis). This is delivered according to a schedule that has either been achieved in the past with defined results, or represents an ambition based on preliminary or pilot data but may still be under evaluation in a current trial. The reality, however, is that many patients are not able to adhere to the intended plan at some or other stage in their treatment, with the result that therapy has to be paused or modified, or both.

The circumstances leading to a decision to pause or modify treatment will vary but generally these relate to the extent to which the patient already manifests side effects from the therapy delivered to date. This includes, for example, the severity of bone marrow suppression with consequent low blood counts; infection; nutritional deterioration; other organ toxicity (e.g. liver or kidney function problems); and the psychological state of the patient and/or family. The oncologist treating the patient continually monitors these factors and must judge whether, and when, a pause in treatment is required, and if treatment needs to be modified in the future (for example, reduction or omission of a planned chemotherapy dose or the deferral of the start of a course of radiation therapy). This constitutes the 'art' as well as the 'science' of oncology care. Clinical trial protocols, however, usually include rules that set out whether, when and how treatment should to be modified in relation to specific toxicities.

It is to be expected that most parents and clinicians would agree that adherence to the intended treatment protocol leads to a better chance for long term disease control and cure. However, there are remarkably few peer reviewed publications that explore the impact of treatment adjustment and treatment delay on outcome. From an entirely pragmatic perspective, minor (up to one week) delays in treatment are common in practice and there is no evidence that this makes a material difference to outcome. Longer delays are, however, sometimes necessary and whilst the impact is also uncertain, this is more undesirable and would generally be avoided if circumstances permit. It is also generally the case that avoiding delay in the early phase of treatment after a new or recurrent diagnosis is more important than at later stages in treatment.

In order to explore the impact of infection on the continuity of cancer treatment, we tried to define, from the clinical records, the extent to which treatment was disrupted specifically in relation to the Gram-negative environmental infection. We looked principally for evidence that chemotherapy had been delayed on the basis of the infection although this was not always clear and often compounded by the fact that, for example, blood count recovery was insufficient to allow chemotherapy to proceed with safety. Complexity in attributing a causal effect is compounded when one considers that whilst infection may itself contribute to delayed bone marrow recovery, this can also happen without infection.

It was more difficult to identify where drug doses had been subsequently modified but dose reduction as a result of an infection is less likely to be required in the short term than a delay in re-starting treatment. We also recognised that not all patients were receiving chemotherapy at the time of their infection and we therefore also looked for evidence that other elements of treatment had been deferred. The data in Table 6.5 represent our best estimates of all types of treatment delay.

Table 6.5. Delay to treatment attributed to the infection

Duration of delay	Whole Group (No. evaluable = 101)	'Most Likely linked' (No. evaluable = 32)	Least Likely linked (No. evaluable = 69)
None	53 (53%)	18 (56%)	35 (50%)
1 - 7 days	19 (19%)	6 (19%)	13 (19%)
8 – 14 days	17 (17%)	5 (16%)	12 (17%)
15+ days	12 (12%)	3 (9%)	9 (13%)
Not evaluable*	17	5	12

** 9 episodes of infection were experienced by patients with non malignant diagnoses for whom we did not attempt to determine the impact of the infection on treatment; 3 patients were not evaluable*

because the data were insufficient; 3 were excluded because treatment was delayed by other toxicities and we were unable to separate the specific impact of the infection; treatment was discontinued after infection in 1 patient because of concurrent evidence of progressive disease; and in 1 patient treatment had already been completed after stem cell transplantation.

6.3 Details of the children and young people who have died

At the time of the publication of this report, we were aware of the deaths of 21 patients (6 male and 15 female) who had been included in our Review.

Dates of their death ranged from November 2016 to January 2021. The primary diagnoses were: Solid Tumour (n=7); CNS Tumour (6); Leukaemia (5); Lymphoma (2); and non-malignant condition (1).

Median age at death was 6 years 2 months with a range from 1 year 8 months to 16 years 3 months. The median interval from the last Gram-negative environmental infection episode to the date of death was 10 months (range 1 day to 3 years 8 months).

Three patients died within 28 days of a Gram-negative infection episode. Two of these died from tumour related causes and their deaths were not linked to the prior infection; in one of these cases we decided that the preceding infection was Unrelated to the hospital environment and in the other that it was Probably related to the hospital environment.

The third child died in the early phase of a stem cell transplant. We judged that the Gram-negative environmental bacteraemia was implicated in the cause of death; this was also identified as the principal cause of death on the death certificate. We also determined that this infection was Probably related to the hospital environment.

One further child, whose infection we had similarly determined was Probably linked to the hospital environment, also died relatively early (within 6 weeks) of the infection episode. We judged that the Gram-negative bacteraemia was implicated in the cause of death; this was also identified as a contributory factor on the death certificate.

Overall, death certificate information was obtained for 19/21 patients – it was unavailable in one because the patient had died abroad, and in the other because the death had occurred too recently for us to be able to access the record.

Overall, based on death certificates and clinical information, we decided that infection was implicated as a cause of death only in the two patients discussed above; 18 had died of their underlying disease (all cancer) and 1 died from other causes unrelated to infection.

6.4 Adverse Events

The approach we took to the detection of Adverse Events (AE) by the use of the Paediatric Trigger Tool (PTT) and interrogation of the Datix system at NHS GGC is described in chapter 3, section 3.4.

6.4.1 PTT data

In addition to the 115[60] GNE bacteraemias occurring in the 83 patients eligible for the PTT analysis (all of which were defined as an AE), the PTT review separately identified 386 other

[60] Of the total of 118 episodes evaluated in the Review, one involved sepsis from Pseudomonas aeruginosa which was isolated from other sites but not from blood cultures; a second involved culture proven

AE. Of these 24 (5%) were classified as Category I[61], according to the National Framework[62] (discussed in section 3.4.4) and occurred in 17 (14%) of the 117 episodes.

All unplanned admissions to PICU were classified as Category I AE and occurred in 16 episodes[63], accounting for 67% of all Category I AE. Moreover, 7 of the remaining Category I events occurred in 2 of the same 16 episodes. The only Category I event to be recorded in an infection episode with no PICU admission occurred in a patient who was resuscitated for sepsis on the ward but whose condition stabilised sufficiently to avoid PICU admission. These data suggest that admission to PICU is an obvious way of identifying patients with the greatest risk of the most serious category of AE for audit and review.

There were 362 Category II[64] AE of which 78 (22%) related to removal of the central line.

Overall, of the 501 AEs detected by the PTT, only one fifth (91 (18%)) were unrelated to management of the infections. Six of these were Category I – four of the admissions to PICU, one pulmonary embolus and one case of pressure ulcers.

We recognise that some of the triggers identified by the PTT relate to expected complications of chemotherapy or represent support measures commonly required by this group of patients. Nevertheless, the use of the PTT could provide a useful audit tool to monitor trends in the occurrence of AE that occur during care.

6.4.2 Datix system data

In total, 174 incidents were recorded in Datix in 65 (76%) of the 84 patients included in the Review (collected during the period of review) with a median of 2 (range, 1 - 6) incidents per patient. In 23 of these patients a total of 31 Datix reports were made during an admission that incorporated one or more episodes of Gram-negative environmental infection. The other 143 Datix reports were made during admissions that occurred either before (n=84) or after (n=59) the admissions with infection episodes.

Of the total 501 AEs detected with the PTT, only 6 (1%) were reported in Datix, which included 2 (8%) of the 24 Category I AEs. One of these patients had severe sepsis and died in PICU; this was correctly classified in Datix as Category I (Extreme). The second patient had a PICU admission for toxic megacolon due to *C difficile*, but this was incorrectly scored as Moderate (Category II) on Datix.

---

disseminated infection with Mycobacterium chelonae but without positive blood cultures; and a third patient was excluded as the detection and management of the bacteraemia was at another hospital.

[61] Category I events are those that may have contributed to or resulted in permanent harm, for example unexpected death, intervention required to sustain life, severe financial loss (£>1m), ongoing national adverse publicity. These are likely to be graded as major or extreme impact on NHSScotland risk assessment matrix, or Category G, H or I on National Coordinating Council for Medical Error Reporting and Prevention (NCC MERP) index.

[62] Healthcare Improvement Scotland. Learning from adverse events through reporting and review. A national framework for Scotland: December 2019 2019: http://www.healthcareimprovementscotland.org/our_work/governance_and_assurance/management_of_adverse_events/national_framework.aspx

[63] 12 PICU admissions for infection related AE; 4 for AE unrelated to infection; and 3 with PICU admissions that were not classified as AE.

[64] Category II events are those that may have contributed to or resulted in temporary harm, for example initial or prolonged treatment, intervention or monitoring required, temporary loss of service, significant financial loss, adverse local publicity. These are likely to be graded as minor or moderate impact on NHSScotland risk assessment matrix, or Category E or F on NCC MERP index

The 6 AE common to both systems included 2 incidents that were categorised as infection control in Datix: septic shock associated with Gram-negative bacteraemia and the *C difficile* infection (mentioned above). The other 4 incidents common to both systems were pressure ulcers, infusion of infected bone marrow cells and 2 pain control incidents.

The 23 patients with Datix reports made during an admission that incorporated one or more episodes of Gram-negative environmental infection had a total of 36 incidents. However, 9 (29%) of these were recorded as Negligible risk, i.e. Category III[65] incidents that were not associated with harm, whereas the PTT review only included Category I and II incidents. However, one of the Datix incidents that was graded as Negligible risk was one of the two deaths we identified as being associated with infection. The reason given in Datix for reporting this death was (correctly) that it had occurred within seven days of stem cell transplant. Whether or not the stem cell transplant *per se* contributed to death is not the issue but, as the incident was an unexpected death, this should have been reported as Category I.

In addition to the Extreme incident (Category I - death in PICU), there was only one other incident reported in Datix as Major in any of these patients throughout the period of the Review, and this was unrelated to an infection episode.

Of the total of 174 Datix incidents, 124 (71%) were classified as Minor or Negligible. Only 5 of the total 174 incidents were coded as relating to infection control for the entire period of the Review, and only 2 of these were documented as such during an infection episode. However, some Datix reports that were classified as 'Other' clearly described an infection control incident (e.g. bacterial contamination of donor stem cells) and should have been coded as such.

We concluded that Datix reporting significantly underestimated the number of AE experienced by this group of patients and that, even when reported, some incidents were incorrectly classified and under scored in terms of their severity.

6.5 Summary

In this chapter we have tried to set out measures of the burden of the Gram-negative environmental infections experienced by the patients we have reviewed. Our data provides an insight into the overall experience of children and young people with cancer (these were, in the great majority, children and young people with leukaemia and other forms of cancer) who experience such infections.

In the course of our review, we used selected clinical indices to express our overall assessment of the impact of an infection episode on the patient (section 3.6.7). In so doing, we identified that over one third (38%) had experienced an overall severe or critical impact and only 5% of the whole group experienced no or minor impact.

Whilst accepting the limitations on our ability to define the length of hospital admission directly attributable to infection, our estimate suggests that additional hospitalisation of 15 days or more was required in approximately half of the episodes reviewed.

[65] Category III events are those that had the potential to cause harm but no harm occurred, for example near miss events (by either chance or intervention) or low impact events where an error occurred, but no harm resulted. These are likely to be graded as minor or negligible on NHSScotland risk matrix or Category A, B, C or D on NCC MERP index

Removal of a central line was required in two thirds of these episodes for the management of the infection, which implies that, in almost all those patients, a further anaesthetic and surgical procedure would have been required to insert a replacement.

Twelve patients (11%) required admission to PICU specifically for the consequences of their infection although admissions were short (1-3 days) in the majority of cases.

Finally, infection is an important reason for treatment to be disrupted in this clinical context and we estimated that approximately 30% of episodes were associated with a delay in planned treatment of over 1 week, and in 12% for over 2 weeks.

Tables 6.1 to 6.5 also analyse the data according to two groups: those with the Gram-negative environmental infections we determined were 'More likely' to have been acquired from the hospital environment (defined in section 5.6) and those for whom we did not find strong evidence for an association (labelled as 'Less likely').

There is, in fact, little difference between the two groups except for the frequency with which patients were admitted to PICU: 8/37 in the 'More likely' group *vs* 4/77 in the 'Less likely' group. This difference is significant (Relative Risk 4.16 (95% CI 1.34 – 12.94)) and whilst it may be unwise to speculate too much on a single variable in an analysis of this kind, variation in the type and pathogenicity of organisms contributing to these two groups may be the relevant factor. Table 5.4 shows that there was a significant excess of *Stenotrophomonas* spp. in the 'More likely' group of infection episodes. This may be relevant and, perhaps, a predictive factor for greater risk of severe illness.

Gram-negative bacteraemia was implicated in the deaths of 2 of the 21 patients known to have died; this was the primary cause of death in one and an important contributory factor in the second. Both were infected with *Stenotrophomonas maltophilia*.

The use of the Paediatric Trigger Tool identified that 5% of 501 AE identified in the whole population included in the Review were Category 1 events (classified as Major or Extreme in the NHS Scotland risk assessment matrix). Comparison of PTT data with Datix incident reporting suggests that the NHS GGC reporting system had significantly underestimated the true extent of such events and, where reported, may underestimate their severity.

Finally, we recognise that nothing analysed in this chapter measures the broader implications of infection on the lives of the children and young people affected, and their families. Unplanned or prolonged admission, or both, will contribute to the already significant impact they experience in their lives. It further disrupts schooling, social life, parental work, and the care of siblings or dependent relatives. It contributes to additional anxiety both because families are well aware that infection is a risk, can be serious and may be life threatening; and because families are anxious about the consequences of delays to treatment.

We have been able to characterise part of the physical impact of infection but wish to emphasise that the emotional, social, financial and psychological costs can also be significant.

7. COMMUNICATION WITH THE FAMILIES

7.1 Overview

At the heart of this report lies our responsibility to the children and young people who experienced the Gram-negative environmental infections included in our review, and to their families. Throughout the Review we have tried to address the Terms of Reference with which we were charged as fully and accurately as we have been able, with the information provided to us. We have also recognised our responsibility to keep families informed about the Review and its progress. In order to do so, the following principles were adopted:

1. Clarity about the purpose of, and eligibility for the Review – this was addressed by an initial communication sent on 4th March 2020 to all families from Professor Fiona McQueen, Chief Nursing Officer, and Professor Marion Bain, Director of Infection Prevention and Control NHS GGC and Senior Medical Consultant, NHS National Services Scotland (now Deputy Chief Medical Officer), setting out the criteria for inclusion in the review and its terms of reference.

2. A commitment to regular progress reporting – this has been undertaken in collaboration with Professor Craig White (Communications and Engagement Lead, Scottish Government) and Professor John Cuddihy (Patient and Family Representative for the Case Note Review and the QEUH/NHS GGC Oversight Board) with whom meetings have been held regularly (as shown in Appendix A) during the review process, and through whom we provided written updates to the families in July, October and December 2020.

3. The opportunity for families to submit written comments to us in relation to their own child was made clear at the outset and was reiterated in subsequent progress updates; a summary of the responses we received is shared in section 7.2.

In line with our Terms of Reference, we have given an undertaking that, in addition to this overview report, we will provide an individualised report for each patient/family describing our assessment of the infection episode(s) experienced. Our plans for doing this are set out in section 7.3.

In our previous communications with families, we have made two important points. First, given that we have had to make judgements on retrospectively acquired data, we have used the principle of the 'balance of probability' in reaching our conclusions. This means that, based on the evidence available to us, our conclusion about an event is more likely to apply than not. Second, that our report will not include the case details of individual patients in a way that would readily allow them to be identified by others.

7.2 Information received from families about the Case Note review

All information and updates to and from families has so far been coordinated through NHS GGC. Communications from families were received by NHS GGC in the first instance, and then passed on to us via Professor Craig White for consideration in the Review.

Of the 86 patients initially identified as eligible for inclusion in our review, NHS GGC received communication from one family requesting that their child be excluded: we undertook no consideration of the clinical circumstances of this case.

A further 9 written communications were passed on to us for consideration. One raised specific concerns relating to nursing care which was considered out of scope but we will

acknowledge and explain this in the individual report to that family; 1 requested a copy of their child's medical notes from NHS GGC and a copy of any reports about their child; (this is outwith our remit); and 7 included specific concerns relating to their child's infection.

The main themes addressed by these 7 communications can be summarised as follows (note that some families raised several points and the number of families addressing each theme is given in brackets):

- Lack of clear communication about the nature of the infection(s) (6)
- Questions raised about medication prescribed for and/or to prevent infection(s) (3)
- Describing the impact the infection had had on their child/themselves, including delay in treatment (3)
- Concern about the length of time before the central venous line was removed (1)
- Concern about the timing and interpretation of microbiological typing results from the reference laboratory (1)

We intend to respond to these points as fully as we can in our individual written reports to the families concerned.

7.3 Individual Reporting to Families

After the publication of this report, we will prepare individual written reports for each of the infection episodes included in our review for every patient. These will summarise our findings in line with the framework to which we worked during the review process (section 3.6).

We view these as private reports from the Panel to the patient and family concerned. The Review Team will therefore take responsibility for distributing the reports having first worked with NHS GGC to ascertain up to date contact details and communication preferences for the patients and families concerned, and to confirm the updated status of all patients.

The process by which this will be effected has been the subject of discussions between ourselves, representatives of NHS GGC, Professor White and Professor Cuddihy. It is agreed that families will receive written information about the process approximately 4 weeks before the reports are distributed. This will explain the timescale and offer the opportunity for patients and families to meet with members of the Panel after receiving their report, if they wish to do so. They will also receive information about the support available to them should they find the details of the report distressing or if it raises other concerns about their treatment experience and its consequences. We will ensure that those families who have been bereaved by the death of their child will be able to access appropriate support.

Whilst we believe that the individual report should be 'owned' by the patient/family, we also believe it is appropriate, subject to the consent of the patient/family, that a copy of the report is made available to the clinical team who was, or may still be responsible for the care of each patient. The opportunity to share the report with the relevant clinical team will be set out in the advance letter to the families.

When we send families their reports, we will also send an information sheet and consent form requesting consent to share the report with the relevant clinical team. Families will

then be able to contact the Review Team to make an appointment for a meeting with the Panel should they wish to do so.

To further facilitate direct contact with the Review Team, a specific electronic mailbox has been set up and will be in operation prior to the distribution of individual patient reports. It will be manned until the process is complete. A contact telephone number will also be provided for families to use if preferred.

A written summary of the meeting held with a family will not be prepared but families will be able to bring an additional person with them to the meeting to act as a supporter who may, if wished, also keep notes for the family during the discussion. Any agreed action points that emerge from the discussion will however be documented and shared in writing with the family after the meeting. This will include an indication of how and by when it is hoped these can be addressed.

We will treat the proceedings of the meetings as confidential and we will not share the content of the discussion with any other person or organisation unless specifically requested and agreed by the family.

At the completion of the process, the dates of all meetings held with families will be notified to the Oversight Board, NHS GGC and Scottish Government. This will indicate that the Case Note Review is complete.

8. AREAS OF CONCERN

In this chapter we bring together issues encountered in the course of our Review that have caused us concern or otherwise wish to comment. We have separately identified examples of the good practice we observed which we discuss in chapter 9.

We address concerns about data availability and its quality in section 8.1 and offer a detailed analysis of our observations about the management, investigation and reporting of infection outbreaks in section 8.2: this is the longest section in this chapter and, we believe, provides a context against which the previous recognition and investigation of Gram-negative environmental bacteraemia within NHS GGC can be viewed. Section 8.3 looks at microbiology and Infection Prevention and Control information systems and includes some important observations about how data relating bacterial typing were collated and stored. Section 8.4 addresses issues about clinical records and section 8.5 looks in more detail at Adverse Event reporting. Sections 8.6– 8.8 address selected aspects of clinical practice.

Some of these observations create opportunities for changes to policy and practice, and all, we believe, offer learning for the future.

8.1 Data Availability and Data Quality

The concurrence of the COVID-19 pandemic with the period of the Review created additional challenges both for NHS GGC and for the Review Team, with pressures on staff resource and the necessity to work remotely. There were, nevertheless, areas in which NHS GGC's response to the Panel's need for access to data was unsatisfactory and where we encountered difficulties in its presentation.

8.1.1 Access to NHS GGC information systems

In March 2020, an Information Sharing Agreement (ISA) was approved between Scottish Government and NHS GGC as the designated data controllers for the project. This provided permissions for individuals named on the agreement to access specified NHS GGC IT systems, and set out the principles governing the use of the information obtained from those systems. A process was established whereby any amendments required to the ISA would be raised with Scottish Government and with NHS GGC Information Governance by email and subsequently submitted to the NHS GGC Caldicott Guardian for approval.

As resource assigned to the Review, particularly in relation to Infection Prevention and Control (IPC) expertise, had been re-directed to COVID-19 related work, changes to those contributing to the Review Team became inevitable, requiring amendment of the ISA. The response time from making such requests to NHS GGC Information Governance to receipt of approval was often slow. It became common that repeated emails were required to generate a response. One example was a request to add an individual to the ISA on 23rd October 2020 which, despite twice chasing for a response and escalating the matter to a member of the NHS GGC Senior Executive Team, was not approved until 9th November 2020. Given the time constraint under which the Review Team was working, this caused delay to planned work.

Finally, there were several instances when the access of all members of the Review Team who had access to NHS GGC IT systems was unexpectedly suspended. For example, on 4th September 2020 the Review Team requested account extensions beyond the existing agreement to the end of that month. Despite this, all accounts were still suspended on 30th

September 2020. This caused delays in retrieving the information required for us to carry out the review.

8.1.2 Environmental Microbiology and Facilities Maintenance Work data

By April 2020, the Review Team had identified the need for additional data which were not available from the access already granted to the clinical records. We needed to be able to consider environmental data for the QEUH/RHC buildings; NHS GGC was asked to supply results relating to environmental microbiology sampling and the records of facilities department maintenance work for the duration of our review. We have discussed the significance of such records in Chapter 5, specifically, sections 5.2, 5.4 and 5.5; notably, we needed data that could be related in time and place to the locations of care of the patients within the review. We initially requested 'all environmental microbiology sampling results that are available' in an email on 8th April 2020. Thereafter difficulties were encountered over the supply and quality of these data.

The first data were received on 11 May 2020 were for water samples only; we later discovered drain samples were not included. We found that the data appeared to be incomplete and inconsistent. For example, a large number of samples listed in the database provided were recorded to have 'No DMA[66] Record' and, for samples that had such a record, either no sample location was provided or it was identified only at the level of the ward and not by the patient room or other designated location.

In line with our initial request, the facilities maintenance data provided to us first came as HAI-SCRIBE[67] records. We subsequently recognised that our requirements would be better addressed by focusing on the work actually carried out in the Paediatric Haematology Oncology wards, and not on the HAI-SCRIBE risk assessments. Further communication with staff in NHS GGC Estates and Facilities provided these data on 1st June 2020 but with similarly limited location information which did not permit us to relate, for example, the visit of a plumber to Ward 2A to deal with a blocked drain, to any specific room or drain.

During June-September 2020, further attempts were made to communicate with NHS GGC to discuss the data received, its incompleteness and the lack of location identification, as well as to clarify additional data the Panel would require for review.

At a meeting on 1st October 2020 we began to understand for the first time that NHS GGC did not have data available in the form we needed or, it seemed in one place. Consequently, NHS GGC had to undertake significant work to generate an appropriate data set from source records. At the beginning of December 2020, as we were coming to the end of our initial review process, we received what we now believe to be the complete records available for water samples, environmental 'hard surface' samples (which included the drain samples) and maintenance data.

[66] DMA was the private contractor employed by NHS GGC to undertake water sampling

[67] Healthcare Associated Infection – System for Controlling Risk in the Built Environment: a system used to identify, manage and record built environment infection control.

This delay, and others regarding our access to the laboratory information systems (section 8.1.3), necessitated us to undertake a second complete review of the entire series of infection episodes so as to incorporate this additional information.

8.1.3 Laboratory information systems

In Chapter 3, section 3.5, we have discussed the relevance of our access to both the Telepath and ICNet systems. Although access to ICNet was agreed in the ISA in March 2020, by August 2020 it had become evident that we had no access to the system. When exploring this with the NHS GGC IPC Team, we were initially advised that we would not require direct access and that any information could be requested from them as required. We rejected this suggestion and escalated the matter to senior members of the NHS GGC Executive Team who rapidly resolved the issue. In the meantime, however, the IPC Team provided us with extracts from ICNet for 5 patients scheduled for imminent Panel review. Our review of these extracts suggested that, in 4 of the 5 cases, potentially relevant information was lacking but we were unable to ascertain if this was because it was not available or had not been included – emphasising our need for direct access to the system itself.

It was only at this time that we became aware of the Telepath system. Initially, we received copies of entries in its Patient Note Pad function from NHS GGC. This part of the system records information relevant to our review as it documents the dialogue between microbiology and clinical staff and provides information about, for example, the identification and antibiotic sensitivity profile of the organism concerned; the advice given about the type and duration of treatment; and the necessity (or otherwise) to remove a central line. Our initial request to be provided with material recorded in Telepath within a period of 1 month either side of the date of an infection episode proved unsatisfactory as a wider perspective seemed likely to be helpful. We also recognised that we would benefit from independent IPC expertise to interrogate both this and ICNet.

By late September 2020, we had identified the IPC resources required to support our work and made arrangements via NHS GGC Information Governance for access to both systems. However, the access level set in Telepath provided limited functionality; this meant that it was not possible to copy or download information from the system, requiring data to be transcribed into a separate Word document for us to use in our review.

These issues contributed to impede and delay our ability to assess and integrate relevant information into our case note reviews.

8.1.4 IMT and PAG meeting records

In assessing causation in relation to specific infection episodes, we began to look for data utilised in NHS GGC's internal processes for investigating and responding to infections in real time. We requested, and from September 2020 began to receive, minutes from Problem Assessment Group (PAG) and Incident Management Team (IMT) meetings. The relevance and agreed process for implementing such meetings is defined in NHS GGC's SOP for Outbreaks/Incidents in hospitals.

We initially noted that, for some of the 2018 IMT minutes, environmental microbiology sample results were given with details of sample location. This prompted us to undertake an exercise to cross check some of the sample results found in IMT minutes against the data we had received. An example of the inconsistency we encountered is shown as Example 8.1:

EXAMPLE 8.1

"Subsequently, the colonised patient and one of the cases were nursed sequentially in Room 12, which is the only room with water results positive for Stenotrophomonas." **(IMT Minute, 23rd March 2018)**

Our investigation of the environmental water sample results received from NHS GGC in May 2020, showed that a water sample positive for Stenotrophomonas could be identified, but no sample location was recorded.

This experience challenged our confidence about how records of data utilised in IMT meetings were located and stored. We began to reflect whether, on the basis of what we had seen, NHS GGC had systems in place to ensure comprehensive reporting and recording of data relevant to the IMT process.

We reassured ourselves that the quality of the environmental microbiology sampling data received in December 2020 had improved by undertaking a further cross checking exercise from which, for example, the sample results highlighted in Example 8.1, shown above, could now be identified. Unfortunately, inconsistent coding characterised this final data set and made it difficult for Data Managers to present the data in a usable and searchable format for the Panel to review. Substantial further manual checking and data cleaning were required before this could be achieved, resulting in an additional delay at a point when we were under considerable pressure to complete our second round of reviews.

8.2 Managing, investigating and reporting infection outbreaks

We examined the notes of investigations into outbreaks of infection undertaken by NHS GGC, to help our consideration of the likelihood of a hospital environmental source for the Gram-negative environmental infections under our review.

The process used for investigating a possible outbreak of infection is outlined in NHS GGC's Standard Operating Procedure (SOP) for Outbreaks of Communicable or Alert Organisms in Healthcare Premises. This advises on the safe systems and processes required to identify and manage a potential outbreak/cluster of infections, and for convening a formal investigation into an increase in infections that can be linked by time, place and person: we make some observations about the SOP in section 8.2.1. In section 8.2.2. we look at evidence for compliance with the process.

8.2.1 Recognising and Investigating an Outbreak: the NHS GGC Standard Operating Procedure

Our understanding of the process is that, once the possibility of an infection incident has been raised, a member of the Infection Prevention and Control Team (IPCT) should make an initial assessment; criteria are given in the SOP to guide the calling of a Problem Assessment Group (PAG)[68] to further assess the situation. The framework mandated for use in the initial risk assessment is the Healthcare Infection Incident Assessment Tool (HIIAT). Whether or not the HIIAT is formally recorded at the earlier stage, the practice we have seen at NHS GGC has been for it to be completed (or confirmed) and documented once a PAG meeting has been convened.

[68] The PAG was added to the process as part of the update to the NHS GGC Outbreak SOP in 2019

The SOP also provides guidance for the institution of an IMT (Incident Management Team) which serves to further assess and manage the situation. Once the process is complete a final report (in the form of a 'Hot Debrief' or a full IMT report) should be prepared by the IMT chair, agreed by the members and escalated up the organisation by a defined reporting pathway. Once the IMT process is complete and the report approved by its members, the SOP states that the incident should be reported on Datix.

We have reviewed the sequential SOPs during the era of our review (versions 2015, 2017, 2019) as well as that released in 2020. The SOP appears to be commensurate with the guidance published in the NIPCM[69].

The main changes to the 2017 version of the SOP included an update to organisational roles and responsibilities, as described in recommendation 16 of the Vale of Leven Hospital Enquiry[70],and the addition of a recommended agenda template from Chapter 3 of the NIPCM.

The SOP was further updated in October 2019. This update occurred at the end of the period of our review but incorporated reference to an Acting Chief Nursing Officer publication earlier in 2019[71] which reiterated guidance on ensuring robust communication with patients and their families during infection incidents and outbreaks. This revision also expanded the documentation required, stating that each meeting 'will have an action log and a data collection tool presented at each meeting. Each agenda item will be listed in the action log and must document the discussion and rationale for each decision made. It is not enough to record actions; the relative risks and options and why the final decision was made must also be part of the documentation of the event (Civil Contingencies Act 2004)'. Whilst we saw this as welcome step to strengthen future responses to outbreaks of infection, the previous versions of the SOP had nevertheless indicated a requirement for minutes to be kept and actions to be recorded and justified.

8.2.2 Compliance with the process

We reviewed PAG and IMT documentation between 2016 and 2019 to assess the recognition, analysis, and action taken in relation to the Gram-negative environmental infection episodes included in our Review; and for evidence of compliance with the SOP.

8.2.2.1 Triggering an investigation**.** PAG and IMT reports covering incidents between 2016 and 2019 (no such documentation was available for 2015) identified the investigation of infections (relevant to our Review) caused by Stenotrophomonas, Cupriavidus and Enterobacter, whilst some IMTs were convened to address a more general increase in Gram-negative bacteraemia. Not all outbreaks which may appear relevant retrospectively were investigated at the time, and not all incidents/outbreaks progressed to IMT status.

The NHS GGC SOP defines outbreaks/incidents in line with the NIPCM. This defines a healthcare associated infection outbreak as:

- Two or more linked cases with the same infectious agent associated with the same healthcare setting over a specified time period

[69] National Infection Prevention and Control Manual. NHSScotland http://www.nipcm.scot.nhs.uk

[70] The Vale of Leven Hospital Inquiry Report. November 2014.

[71] HAI-related incidents, outbreak/incidents and data exceedance: Assessment, and reporting requirements and communication expectations. ACNO February 2019.

or

- A higher than expected number of cases of HAI in a given healthcare area over a specified time period.

We note that the NHS GGC SOP does not define the term HAI which we have seen used both to mean Hospital Acquired Infection and Healthcare Associated Infection. This may be important as distinctions between the two[72] sometimes appear in the PAG/IMT records in the discussion of the significance of a reported bacteraemia. It is clear to us that the utility of the distinction offered by these two definitions is less informative in a clinical setting where, in addition to inpatient episodes, patients are attending for day care or outpatient appointments at the very high frequency seen in this patient group.

We also read accounts of discussions at IMTs where analyses from different individuals were used to confirm or refute the reality of an increase in GNE infection over the period of our review. We have reservations about the reliability of SPC[73] charts used in this setting. First because it is necessary to establish a prior baseline and it can be argued that the use of data for the incidence of Gram-negative environmental infections when the hospital was located at Yorkhill merely swaps one set of environmental risks for another. Neither are we sure this is the most reliable approach when dealing with small numbers of incidents and we have found it more helpful to look at simple timelines and clusters of individual Gram-negative environmental bacteraemias, particularly those reported to be the same genus/species (section 4.3). Example 8.2 provides a context for this point.

EXAMPLE 8.2

There was no investigation into an increasing number of Klebsiella bacteraemias encountered between 2016 and 2018. Whilst Klebsiella bacteraemia is not infrequently seen in this patient population, and may be endogenously as well as environmentally acquired, we would have expected the evidence apparent to us for an increasing number of infections, to have triggered a formal investigative process.

Section 4.3.3 of our Report points out that, of 22[74] Klebsiella infections identified in the Review, 9 episodes (affecting 8 patients) were noted from June to November 2016; 9 (7 patients) between July and December 2017; and 5 episodes (5 patients) between January and May 2018.

We would have expected these apparent clusters to have attracted greater attention particularly as our own assessment is that Klebsiella occurred in 10 of the 37 episodes 'Most likely' linked to the hospital environment (section 8.6 and Table 8.4).

We perceive that part of the problem confronting NHS GGC was a relatively small number (small in relation to the overall IPC workload) of patients presented with unusual infections and our concern is that opportunities to instigate early investigation may have been missed because of too great an emphasis on 'standard' definitions for an outbreak. Rather, when it was clear that there were concerns about the possibility of environmental sources for some

[72] The definitions used in the Protocol agreed for the Case Note Review were: Hospital associated infection (HAI) – positive blood culture in a patient who has been hospitalised for at least 48 hours and Healthcare associated infection (HCAI) – positive blood culture in patient within 48 hours of admission but who has had specified healthcare contact or intervention in the prior 30 days. In the event, we did not find this distinction useful in our review.

[73] Statistical Process Control

[74] Note that the numbers of Klebsiella isolates exceed the number of patients because some episodes were polymicrobial

Gram-negative bacteraemias occurring in this patient population, a more conservative/detailed approach to investigating the epidemiological patterns (to identify case clusters) should have been practised.

8.2.2.2 Appropriate investigation and recording of action taken. Retrospective review of the records we received for the period within our Review did not always provide clarity that the governance and assurance required to establish an outbreak had been appropriately investigated and subsequently managed appropriately.

Root Cause Analysis (RCA) methodology was not utilised for any case in the series and was only agreed as the basis for future IMT investigation in late 2019. We have seen the template subsequently created to support RCA for bacteraemias in Haematology Oncology patients. This includes many of the data items we had identified as necessary for our own investigation. The template (appropriately, we believe) goes beyond the HPS Outbreak/Incident Data Collection Tool provided as an appendix to the NHS GGC outbreak SOP.

We found it surprising that a requirement (or even a recommendation) for the use of a structured process in line with the RCA approach does not feature in the 2019 SOP. It is difficult to understand why, given the experience of repeated GNE infection over a period of 5 years, this would not have been introduced earlier or more generally. We are, however, also aware that recommendations for use of a more detailed approach to the investigation of infection using RCA methodology do not feature in the NICPM[75].

We identified a consistent concern that action logs from individual IMT meetings were either not systematically created, or if they had been, were only rarely apparent to us. These were not routinely referenced within the minutes of the IMT meetings or provided to us separately. We could not identify a clear and contemporaneous record of all outbreak management actions to span the entire timeline of an IMT investigation.

We found several examples, particularly in earlier IMT meetings, where actions were not assigned, reviewed or recorded as completed or, if completed, there was any form of assurance that the actions had been sustained. Where logs were provided, we saw that some had outstanding actions for which we could find no closure. Overall, however, this improved in the incidents we reviewed from later in 2018 and 2019.

Example 8.3 illustrates a range of our concerns about: delay in escalating concerns identified at a PAG meeting to a full IMT; underestimation of HIIAT score; lack of documentation about follow through of actions agreed; failure to link to the wider context i.e. that two PAG meetings on the same day were addressing fundamentally the same problem of increased GNE infection; and the premature discontinuation of planned IMT meetings.

EXAMPLE 8.3

Between 28.4.18 and 20.8.18, 8 isolates of *Enterobacter cloacae* were identified in 7 patients (one was infected twice) and including 2 isolates in separate patients on the same day.

A PAG was convened on 18.5.18 (at this stage there had been 4 cases in 16 days). Only one patient had symptoms consistent with gut translocation and the minutes of the PAG meeting record concerns about cleanliness, 'clutter' in patient rooms and too many people on the ward. The latest

[75] http://www.nipcm.scot.nhs.uk

hand hygiene combined compliance score was 85%. Surprisingly, the HIIAT only scored minor/moderate (Amber).

A separate PAG was held on the same day to discuss simultaneous concern about an increased incidence of *Stenotrophomonas* spp. isolates but no cross reference was made in the records of the two meetings and a separate HIIAT also scored Amber.

An IMT was not held until 29.5.18 after a 5th isolate of *Enterobacter* spp. bacteraemia. The minutes record that various actions in relation to cleaning were to be implemented and a plan was made to sample drains. The HIATT score remained Amber and no further meetings were planned 'unless further isolates'.

There are further examples in 2018 where the IMT was closed or stood down despite continuing outstanding actions and with no clear process in place to continue to monitor the situation or measure the impact of interventions made.

We could find no evaluation in the IMT minutes of recommendations implemented that impacted the risk of infection to patients; for example, the installation of point of use water filters to taps and linking these to the results of water testing. This is illustrated in Example 8.4 which follows the continuing evolution of the *Enterobacter cloacae* outbreak already identified in Example 8.3 above.

EXAMPLE 8.4

Despite the suspension of the IMT on 29.5.18, it was appropriately reinstated on 4.6.18 after swabs from drains on Ward 2A were shown to have grown a range of Gram-negative bacteria including *Enterobacter cloacae, Pseudomonas aeruginosa, Sphingomonas* spp. , *Cupriavidus pauculus, Acinetobacter ursingii* and *Klebsiella oxytoca*. It was concluded that the recent *Enterobacter* spp. bacteraemias were associated with the contaminated drains.

The actions taken at this time included drain cleaning and Actichlor (chlorine containing disinfectant) treatment; filters on taps; and antibiotic prophylaxis for all children/young people with a central venous line.

Surprisingly, however, the IMT was discontinued again after meeting on 21.6.18 despite ongoing actions and did not meet again until 5.9.18 notwithstanding two further isolates of *Enterobacter cloacae* in July and August.

Although the parallel water review group continued to meet during this time, these meetings did not summarise the clinical situation, directly address patient management or record evaluation of the impact of interventions.

8.2.2.3 Adequacy of IMT meeting records. In reviewing IMT meeting minutes, we did not receive any supplementary appendices or microbiology reports that would have been necessary to have influenced critical recommendations. For example, we would have expected water and other environmental microbiology results to have been shared at IMT meetings in a format that allowed link to patient location, and for IPC audit reports to have been referenced and utilised in the decision-making process and risk assessments.

We pursued the issue of documentation for the IMT process in discussions with NHS GGC. Ultimately, we concluded that the records relating to each IMT meeting do not consist of a comprehensive written collation of all the information that may have been considered and/or shared at the meeting. It seems that certain pieces of information (for example, data relating to environmental microbiology results or bacterial typing) may be brought to the

IMT by different individuals and are not stored centrally in the Infection Control Shared Drive as we had envisaged. We acknowledge that whilst such data may have been both shared and discussed, there is a limited audit trail of the evidence used to support conclusions made or action taken.

IMT minutes were not always easy to understand in retrospect: patients may not have been identified in a way that allowed them to be tracked across a series of meetings; staff were not always identified by their role, making it difficult to see if the attendance was appropriate in terms of relevant expertise; the structure of the documents varied and the style was sometimes informal. A short, written assessment of an IMT record dating from July 2019 and taken from our own records of a Panel meeting, is shown in Example 8.5.

EXAMPLE 8.5

(This case was) Not specifically identified at IMT meetings, and minutes are not precise; for example (IMT) on 3.7.19 identifies 6 Gram-negative bacteraemias in Ward 6A but these isolates are not dated or named and minutes go on to state *"All Gram-negative bacteraemia have unique strains. This rules out cross transmission between staff/patients but not from water/drains which has tested positive for the organisms".* No detail of samples/results from water or drains is given.

These IMT minutes include a statement about the implications of typing results which does not seem correct and our comments illustrate the difficulty we had in linking IMT records to individual patients and to investigations undertaken.

In respect of investigations, we found it difficult to understand how requests for environmental samples were consistently agreed, implemented and reported to inform IMT discussions.

Example 8.4 (above) suggests that the IMT did not record results of environmental samples taken yet we know that this meeting referred to at least one of a series of 8 isolates of *Enterobacter cloacae* that occurred in 7 patients from 15.1.19 to 31.12.19. We have also ascertained from the data we received that there are no records to show any 'hard surface' (including drain) samples were taken for *Enterobacter* spp. from 1.11.18 to 27.9.19 and that the only water sample taken/examined for *Enterobacter* spp. in the same period was from a basement water tank on 27.3.19. These insights limit our confidence that the IMT process was either able to direct or assess environmental microbiological investigation adequately.

8.2.2.4 Upward reporting from IMT meetings. We have seen no 'hot debrief' or full reports at the close of a series of IMT meetings relating to cases included in the review despite this being mandated in the GGC outbreak SOP. Examples of such documents have however been provided to us from IMTs in other clinical areas within NHS GGC, raising questions about consistency in practice across the organisation.

The SOP also indicates that these reports should be signed off by members of the IMT and sent to the Acute Infection Control Committee from which upward reporting to the NHS GGC Board is expected. There is little or no documented evidence that IMT members were asked to approve such reports.

Whilst it is evident from NHS GGC Board papers that reports about the problems encountered within Wards 2A/B, and subsequently 6A, were provided at Executive level, we are concerned that the significance and scale of what was happening may not have been

adequately expressed. Example 8.6, describes a HAIRT (Healthcare Associated Infection Reporting Template) report made to the NHS GGC Board at the first meeting held following the death of a child after GNE bacteraemia[76].

EXAMPLE 8.6

"Two cases of …..bacteraemia were identified over an 8- day period….. A Problem Assessment Group (PAG) was held ….. HPS were notified and a Healthcare Incident Infection and Outbreak Reporting Template (HIIORT) was completed. No further cases were identified and the two cases were later confirmed to be different types".

We suggest this represents either an underplay or a lack of understanding (or both) about the serious nature of what was happening and its consequence. We conclude this may represent an organisational culture that promotes more of a focus on process (i.e. that a report was received) than on being clear what were the cause or consequences of an incident.

8.2.2.5 Clinician concern. We noted that the there are occasions when the minutes record that clinicians present at an IMT meeting directly questioned if the environmental risks had been reported to senior management within NHS GGC (this was mainly in 2018 and 2019 and while there is an unsubstantiated suggestion that this could also have been in 2017, the Panel have not seen written evidence for this). It was interesting for us to hear, at a meeting with RHC clinicians in February 2020, the IMT process described as 'lacking integration and fails to recognise patterns'. This simple statement reflects the overall impression of the Panel.

8.3 Microbiology and IPC information systems

We have already discussed issues over our access to the Telepath and ICNet systems (section 8.1.3). In this section we discuss the constraints encountered in using the systems and focus on two particular issues: the challenges we experienced in accessing and interpreting data on bacterial typing; and the concerns we identified about the alert system used for ICNet.

8.3.1 Telepath and Bacterial Typing

The Telepath laboratory information management system (LIMS) is used across all laboratories within NHS GGC. The system provides listings of all microbiological samples, detailing the laboratory processing and results for these, in addition to a Patient Note Pad (PNP) option for a given patient, which allows microbiologists to record free text information related to any positive isolates/infection episodes of key interest (which typically includes isolates from sterile sites, including blood cultures). The PNP is also used to record information obtained from communications with ward based clinical teams, and any advice provided to these.

We found that the PNP generally provided very good evidence of frequent engagement and information sharing between the microbiology and ward based clinical teams, including recommendations for choice and duration of antibiotic treatment, based on laboratory derived susceptibility testing, and associated infection management (e.g. removal of sites of infection such as intravascular catheters), and follow on diagnostic sampling/testing. This

[76] Dates and some detail of the infections have been omitted from this quote to protect patient identity

information was helpful to us in understanding more about the nature of the infections we reviewed and their management.

Notably, however, the Telepath system did not systematically offer the basis for recording the results of typing bacterial isolates (mainly derived from reports provided by the Public Health England reference laboratory at Colindale, London but some data also from the Scottish Microbiology Reference Laboratories), either by annotating the original specimen results page or within a patient's results at a later date (when the typing information was received).

We found that typing results were also not routinely entered into the PNP, although some results were referenced and, where so, the results were most frequently reported as 'unique'. Some were also referenced with the statement that a full report could be found on the Clinical Portal (the electronic clinical patient notes system). We were able to access the typing results on the Clinical Portal, but these reports were similarly vague, reporting isolates as 'unique' but without any crucial context of which bacterial strains it had been compared with (what strains, their origin and how many other strains?).

Discussion with NHS GGC about bacterial typing revealed that, hitherto, there had been no electronic database of typing results. Generally, results from PHE Colindale had been received as pdf documents which were filed as such, either in paper form or, more recently, electronically. Consequently, the organisation had no ability to search a database in order to relate potentially linked bacteria whether these came from a patient or the environment. Useful linkage searches would involve several items of data about the bacterial isolate: the date it was obtained, the patient sample or environmental site from which it derived, and the physical location within the hospital environment from which it was obtained.

This is precisely what we had hoped we might have been able to achieve to support our Review and we were surprised that, despite over 5 years of experience with outbreaks of Gram-negative environmental bacteraemia and concerns about the hospital environment, a database with this functionality had not been created by the time the Case Note Review had been commissioned. It appeared from our discussions with NHS GGC that work had commenced but a considerable amount of work was needed for staff to collate information held in different systems in order to provide us with the data we requested.

Most of these data were not received by us until December 2020. Databases identifying bacterial typing by year from 2015 -2019 were supplemented by additional data relating to more sophisticated analyses using Whole Genome Sequencing (WGS) methodology in specific types of bacteria. The year-related databases were very large and appeared to include all typing done within NHS GGC for that year, i.e. for patients of all ages, at all clinical sites and involving many different clinical samples other than blood cultures. It was not clear, even in 2019, that all isolates from patients within our Review had been typed but, in general terms, we were not able to ascertain evidence of a direct links between bacterial isolates obtained from children in our review and other specimens.

However, the number of environmental samples in these databases were limited. For example, the 2019 database (being the database we assumed would be most likely to be complete) listed almost 550 samples but included only 6 water samples, of which 3 could not be typed. There were approximately 140 other samples from environmental sites but none had complete location information rendering it impossible to relate to sites of patient care.

Whilst the interpretation of WGS derived data may offer a considerable advance in linking bacterial isolates in the future, at present, it seems that there are significant challenges to the interpretation of these data. This applies even to the fundamental point of determining how close a relationship between two isolates needs to be for it to be considered significant. This measured as SNPs (Single Nucleotide Polymorphisms) each representing an individual DNA building block. There is a risk that defining difference by an absolute number of SNPs (for example, by saying anything more than a 25 SNPs difference is not significant when comparing two samples of the same bacteria isolated from different patients/places) may result in an oversimplification. It is likely that bacteria found in environmental locations may exist as multiple types and it may best to say that whilst the demonstration of a close relationship between a patient specimen and an environmental isolate of the same bacteria is strongly indicative of a relationship, the reverse does not necessarily apply.

The WGS was carried on three groups of isolates: *Enterobacter* spp., *Stenotrophomonas* spp. and *Cupriavidus* spp..

The *Enterobacter* spp. (n=42) comprised 36 clinical/patient isolates and 6 environmental isolates. However, isolates from 5 of the children with *Enterobacter* spp. bacteraemia were not included. Similarly, the records of water and surface sampling show a total of 25 *Enterobacter* spp. isolates during the review period, and thus approximately three-quarters of these were not included in the WGS exercise.

The *Stenotrophomonas* spp. (n=84) included n=15 isolates from haematology-oncology children (10 others from patients) and 59 environmental strains, 11 of which were from 2020. Five children in our series with *Stenotrophomonas* spp. bacteraemia were not included.

There were 18 *Cupriavidus* spp. included in this exercise, and yet 263 such isolates were recovered from water or surface sampling in the review period.

We conclude from the above that there are too many gaps in terms of which isolates were included (alongside the inconsistent environmental sampling – Chapter 5) to be able to interpret from these WGS results the true extent of relatedness between patient and environmental isolates.

8.3.2 ICNet and IPC Alerts

The ICNet system relies on data being exported from Telepath to ICNet every fifteen minutes. If a microorganism is identified as one of a pre-defined list of 'alert' microorganisms within the ICNet system, it will automatically create a 'case'. This case will alert the Infection Prevention and Control Nurse (IPCN) / Team (IPCT) responsible for that hospital site, who will then review the situation, ascertain if there is an infection risk to the clinical area or patient population and advise on the appropriate care for that patient.

The IPCN is then required to complete a question set, which will determine if the infection is hospital acquired for the purposes of local surveillance. The questions also confirm what written information should be provided for the alert microorganism such as care plans, care bundles or patient information leaflets. Following the initial assessment, the IPCN has the opportunity to close the case if no infection risk is identified, or to keep the case open to monitor the patient's condition until they are discharged or no longer an infection transmission risk. There is a patient notes function within the ICNet system, which allows

IPCNs to record any communication with the clinical team or microbiologists. NHS GGC/IPCT policy is that patients with open ICNet cases should be reviewed weekly as a minimum.

The NIPCM provides a nationally agreed minimum list of alert organisms/conditions; this informs NHS Boards of those alert organisms/conditions that may require further investigation. The guidance states 'The list is not exhaustive and specialist units, for example those managing patients with cystic fibrosis, will also be guided by local policy regarding other alert microorganisms not included within these lists.'

As part of our review, we assessed information provided to us from ICNet and identified whether cases were created or not. We found little evidence, even as late as summer 2019, that the GGC alert list had been modified in light of the evolving experience with bacteraemias caused by Gram-negative environmental infections. This resulted in frequent absence of alerts being triggered within ICNet and the subsequent absence of IPCN input into cases under our review. Example 8.7 provides brief details of two different situations.

EXAMPLE 8.7

a) In late July 2019, a patient presented with an *Enterobacter cloacae* bacteraemia.

This was the seventh isolate of this organism in the Paediatric Haematology Oncology population in 6 months. An IMT had been initiated in May because of concerns about the frequency of this type of bacteraemia (see also Example 8.2) but no alert was raised in ICNet for this next case despite the previous experience. Why?

b) In late September 2019, a patient presented with bacteraemia associated with *Achromobacter* spp. which is a particularly unusual bacterium.

In this case, however, an alert was triggered on ICNet, not because of the specific nature of the bacterium, but because the system had by then been adjusted to trigger an alert should two or more positive blood cultures be reported on Ward 6A within 14 days.

This coincided with a period of great concern about the safety of Ward 6A and limitations being placed on admissions. Why was this change not implemented previously?

We have heard that requests from some microbiologists for the list of microorganisms on the ICNet alert list to be augmented were not heeded.

We understand that when cases are not identified by alerts in ICNet, there is still capacity within the system for IPCNs to manually create a case for any patient if they are alerted to the identification of a microorganism of concern. We have been told that some microbiologists did make direct contact with IPCNs to alert them under such circumstances but we have also seen evidence that Infection Control management within NHS GGC actively sought to discourage this – a position that seems entirely inappropriate. Whilst it might be argued that this could be a workload issue, and that direct patient care was not adversely affected, this stance would have excluded the IPC Team from the management of some Gram-negative environmental infections at NHS GGC, which, at the very least, limited awareness of the problem. More importantly, perhaps, it may also reflect a culture of denial about the nature, scale and importance of these infections within the organisation.

Overall, however, our observations suggest to us that the communication between microbiologists, the infection control doctor and the infection prevention and control nursing team is not as robust or systematic as it should be. The teams often appear to work

independently and communication between these staff groups and appears to occur on an adhoc basis: referral of patients with alert organisms on the basis of an automated electronic process (where it happens) is not direct communication.

8.4 Clinical records

This commentary is based on the experience of reviewing the health care records for 83 patients with 117 episodes of infection[77]. It highlights the challenges we experienced in extracting relevant information from the case records, focusing particularly on inpatient medical records.

8.4.1 The Clinical Portal

The Clinical Portal is the web-based application that presents patient clinical data from various NHS clinical systems. It is widely accessed by a range of medical, nursing, AHP and administration staff, as well as by GPs and other Health Professionals, and has largely replaced paper-based case records at most NHS Scotland locations.

In general, the review team found that the medical and nursing care for each patient was identifiable in the Clinical Portal, and was recorded routinely and reliably on a day to day basis. The challenge, however, was locating the specific information required as there are wide variations in the way that parts of the clinical record are scanned into and filed within the Clinical Portal.

Daily recordings of In-patient medical care were found in 3 different areas in the Portal:

- Written and scanned in a sub section tab of Clinical Notes detailed as “In-patient Medical Notes”
- Embedded in the “Nursing Assessment” tabs on a generic continuation sheets continuous with the nursing records and not necessarily recorded as a medical record of care
- Digitally recorded in the “Clinical Notes”

Nursing care is reliably recorded and stored in the nursing assessment tabs. These records are exemplary with dated, signed entries of the elements of care recorded. In particular, standardised elements of care (for example CEWS[78] and CVC/PVC bundle[79] care) are reliably recorded in the dedicated record segments.

Medications are recorded in a wide range of documents/places within the medical and nursing records in narrative form when administered or considered for change as instructed by medical staff.

All laboratory results are reliably entered into the associated test carried out under the separate laboratory headings.

When a procedure was undertaken, such as the insertion or removal of a central line, the information was usually recorded in dedicated records for “Interventions” under the sub

[77] Records were not reviewed for one patient as the bacteraemia was identified and managed at another hospital after day case attendance at NHS GGC.

[78] Children’s Early Warning Score. This identifies paediatric patients at risk for clinical deterioration.

[79] A ‘Bundle’ is a structured way of improving processes of care and patient outcomes; in this context in relation to central and peripheral venous catheters

tabs of “Anaesthetics” and “Operation Notes”. In some cases, the records for the same procedure were not dated correctly or signed. Mentions of the procedures/interventions are also recorded in the medical and nursing records.

Admission and Transfer information was embedded in the nursing and medical records and in the “Patient Notes” sections. Transfers of care within the hospital system are difficult to identify, as Medical PICU admission and discharge summaries were often scanned and embedded within nursing notes within the Nursing Assessment section; and not all patients had an immediate discharge or final discharge letter prepared and stored.

It was challenging to find all components of the records, although knowledge and frequent use of the system enabled easier navigation of the anomalies. Some records were scanned in long sections, representing one document with a variety of records within. Some records were scanned in with dates many months or years after discharge. Scanned records for each episode did not necessarily have the correct care episode date. Scanned pages within the records, particularly for patients with extended in-patient stays and/or multiple episodes of care were often the most problematic. We found that many cases had pages of the records scanned in reverse order and had multiple admission episodes within the same scanned document, and not necessarily in date/time order.

8.4.2 Inpatient Medical Records

We focused on an analysis of in-patient medical records - both the scanned hand written records and the digital notes - as these related directly to the management of the bacteraemia.

8.4.2.1 Scanned Hand Written Notes. For the 117 infection episodes, we found completed written notes for 76 (65%), incomplete notes for 22 (19%) and no written notes for 19 (16%). Only 60% of the written notes were filed under the date of discharge; others were filed up to 14 months after the date of discharge.
Standards varied to a considerable extent. One patient, who experienced multiple episodes of Gram-negative environmental infection, had 906 pages of hand written notes covering 418 days of admission, which were complete, in order and with no irrelevant information. In contrast, another patient had 139 pages of hand written notes covering care after a Gram-negative environmental bacteraemia, but many of the pages were undated or were not filed in chronological order; the notes commenced one week after the bacteraemia and contained very few details regarding the clinical management of the bacteraemia itself. However, further hand written medical notes with critical information about bacteraemia management, including discussions with parents, were found filed in the nursing records.

8.4.2.2 Digital Notes. Digitally typed inpatient medical records may be filed in three separate areas within Clinical Notes - Generic Continuation, Patient Notes and Pharma Care Plan. When filed under Generic Continuation, notes were not linked to specific admissions and contained diverse inpatient and outpatient records from a range of clinical disciplines and specialties. When Generic Continuation records were labelled Paediatrics, we found those to contain digital inpatient medical notes. These were detailed and fully electronic, which enabled word searching but might cover several admissions.

Patient Notes were labelled by medical (e.g. Haematology) or AHP (e.g. Dietetics) specialty. Most Patient Notes were outpatient contacts covering a clinic appointment, home visit or telephone call. However, there were some notes about inpatient contacts.

Pharma Care Plan notes are stored within a standardised care plan exclusively recording information about medicines.

We found digital notes (to any degree) for a minority (37%) of episodes. There was no trend to show the increasing use of digital records over time suggesting that there was no planned evolution to full digital record keeping over the period of the review.

8.4.3 Completeness of Inpatient Medical Records

Overall, we were able to locate complete inpatient medical records for 111 (95%) of all episodes. However, only 46 (39%) of all episodes had complete medical records filed by the date of discharge for the episode concerned. Finding medical records for 61% episodes required searching through written records for up to 14 months and digital records for up to 35 months after the date of discharge for the episode.

Both written and digital notes were found for 28 (24%) of 117 episodes, but these were not duplicate records and sometimes included separate, important information about the same day of the episode. For example, inpatient medical notes for one patient were correctly filed under the date of discharge but in fact only contained records for 2 of the 18 days of the admission: records were ultimately identified for every day of this admission but were filed within different areas of the Clinical Oncology, Haematology and Paediatrics Patient Notes sections of the record. For another patient, we found inpatient records relating to a single 24 hour period in three different locations in the clinical portal system.

We found no written or digital medical notes for three episodes

8.5 Patient location records

The locations of patients during hospital attendance and inpatient stays were obtained from TrakCare, the Patient Management System used by NHS GGC. All patient episodes (Outpatient, Inpatient and Emergency) are recorded and managed on TrakCare. In the course of our Review, we found that a specific bed was identified for almost all inpatient stays, but the system did not provide location (to the level of a specific bed space) when patients were receiving day care in Ward 2B or, subsequently, in Ward 6A. This limited the sensitivity by which we could assess location of care as a risk factor for infection.

One singularly unexpected issue was the coding of Haematology Oncology Day Care patients as attending Ward 2B after the date on which both Wards 2A & 2B had been closed in September 2018.

This occurred inconsistently within individual records; although we were made aware that Ward 2B was used for the RHC pre-assessment service from 29.4.19 to 15.11.19, we have been assured that no Haematology Oncology patients attended that area during this period. It seems self-evident for the benefit of tracking purposes that patients should never be coded to an area other than that to which they physically attended.

It was also often difficult to identify from the clinical records in which operating theatre surgical procedures took place. It also seems likely that procedures (e.g. bone marrow sampling and lumbar puncture procedures) were undertaken in anaesthetic rooms, also without a record of the location.

Attention needs to be paid to the accuracy with which patient location is defined, should a review of this kind be required again, or if support to an internal investigation of linked episodes of infection is required.

8.6 Adverse Event Reporting

We have already discussed data derived from adverse event (AE) reporting, whether from the PTT or Datix notifications, in Chapter 6, section 6.4. In this section, we compare AE rates in the Haematology Oncology patients we have reviewed at NHS GGC with data available from the literature from other paediatric hospitals, and offer some further reflections about issues we have identified.

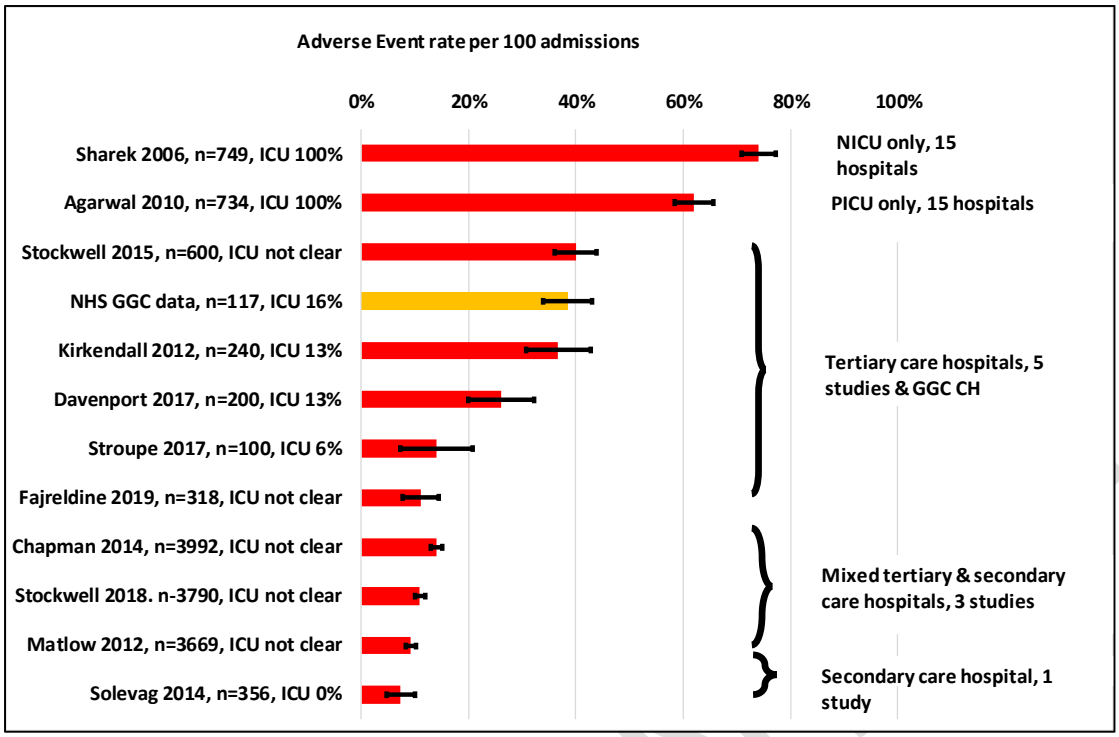
8.6.1 Comparison of AE rates at NHS GGC with other paediatric hospitals

A literature search identified 11 studies involving 15,153 paediatric inpatients from 104 hospitals in five countries (Argentina, Canada, Norway, the UK[80] and the USA). This is summarised in Figure 8.1. These studies only included data from randomly selected patients but, for comparison, the event rate at NHS GGC was calculated using the PTT data from the 45 inpatient episodes with one or more AE that were not related to the management of infection in these 117 admissions. The proportion of patients receiving intensive care was calculated using all PICU admissions.

The reported AE rate ranged from 7% to 74%, but much of this variation can be explained by the different settings in which data were collected (shown in Figure 8.1) which confirms that: the highest AE rates were in the two studies that only included patients from ICUs; studies that only included tertiary care hospitals had higher AE rates; and in tertiary care hospitals, a higher proportion of ICU patients was associated with higher AE rates.

Figure 8.1: Adverse events per 100 admissions in 11 studies of paediatric inpatients and at NHS GGC.

[80] Chapman SM, Fitzsimons J, Davey N, et al. Prevalence and severity of patient harm in a sample of UK-hospitalised children detected by the Paediatric Trigger Tool. *BMJ Open* 2014;4(7):e005066. doi: 10.1136/bmjopen-2014-005066 [published Online First: 2014/07/06]



Bars show 95% CI of event rates. The numbers for each study are the total number of admissions and the % of admissions that included admission to the ICU.

Eight of these studies used the NCC-MERP classification of harm[81] to assign severity to AEs; this is also the classification used in the UK Paediatric Trigger Tool. The median proportion of Category I events from those studies was 11%, range 2-22%; in comparison, 5% of AEs at NHS GGC were category I.

Appendix C shows the PTT score sheet used in our Review. For ease of analysis, the adverse events that derive from searching for these triggers can be grouped as shown in Figure 8.2.

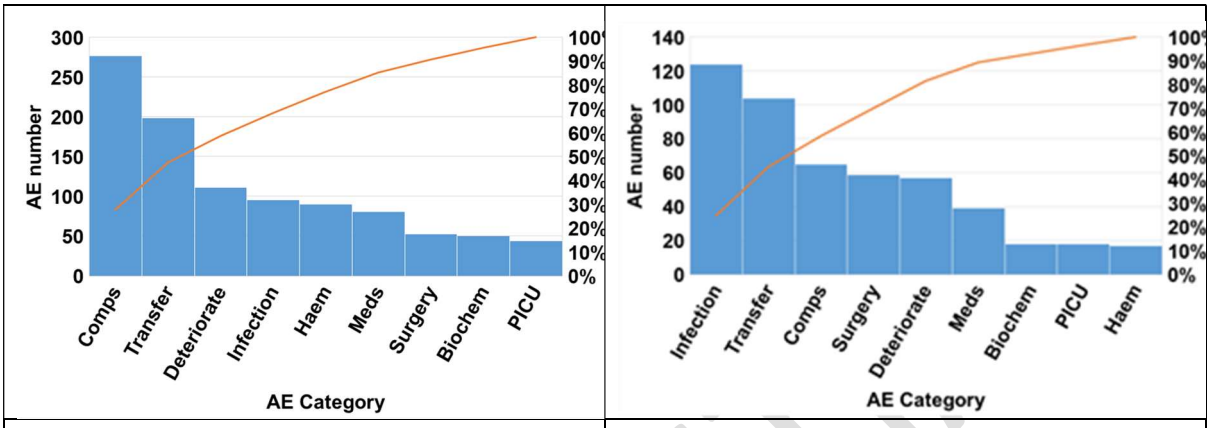
Table 8.1 Adverse Event Categories (adapted from Matlow 2012 and Stroupe 2017).

Biochem	Biochemistry	Intervention for increased creatinine; high/low potassium, sodium, sugar
Comps	Care complications	Intervention for tissue damage, thrombosis, other complication (e.g. adverse drug reaction, central line infection) or pain
Deter	Deteriorating patient	Delayed response to Early Warning Score; intervention for cardiac/respiratory arrest, hypoxia or hypovolaemia
Haem	Haematology	Intervention for anticoagulation, anaemia, thrombocytopenia or neutropenia
Infection	Infection	Intervention for infection causing admission or occurring >48h after admission, bacterial or fungal
PICU	PICU	Unplanned transfer to PICU
Meds	Medication	Intervention with naloxone, chlorpheniramine, glucagon; unplanned anti-emetic; interruption of planned treatment
Surgery	Surgery	Returned to theatre for unplanned procedure

[81] https://www.nccmerp.org

Transfer	Transfer to/from hospital	Readmission, unplanned admission, delayed discharge

Figure 8.2 Pareto charts plotting the pattern of AE at NHS GGC compared with those of large study at other UK hospitals.



Chapman 2014. Data from 1001 AE from 25 UK hospitals (9(36%) were tertiary care)	NHS GGC. Data from all 501 AE identified from the PTT

The NHS GGC data are dominated by AE classified as Infection and Transfer, which is much as would be expected from the nature of the group selected. It is reassuring, however, that although nearly 1/3 of 'Deteriorating patient' AE in the Chapman study were caused by failure to do or to respond to Early Warning Scores, this was not identified as causing AE in any of the NHS GGC episodes. In contrast, 74% of these AEs in the NHS GGC data were in patients who were given fluid resuscitation on the ward in response to symptoms of their bacteraemia – in itself, this is indicative of the serious nature of such infections.

8.6.2 Learning for the future

Using the data derived from the PTT to identify AE, we saw that most were related to the appropriate management of the serious infections under our Review. The analysis illustrated in Figure 8.1 suggests that overall AE rate in this population of patients at NHS GGC is comparable with reports from other tertiary care hospitals. It was clear to us, however, that Datix reporting significantly underestimated AE rates and that individual AE were sometimes incorrectly classified and under scored for their significance (section 6.4.2). We also have concerns about their identification and suggestions for learning from incidents.

Only one of the Category I events identified via the PTT was reported as risk level 4/5 on Datix; and there was only one other risk level 4/5 incident reported on the entire patient cohort from 2015-2019. The NHS GGC Incident Management Policy is clear that these events should be reported on Datix and "will be considered potential Significant Clinical Incidents and subject to screening using the appropriate tool to support decision making as to whether the incident should be confirmed as an SCI." Our data suggest that this was not done.

Of the 17 episodes with one or more Category I events, 14 included a PICU admission. The only exception was a patient who was resuscitated for sepsis on the ward but did not

require PICU admission. Therefore, 94% of the patients with Category I events could have been identified from routine data (PICU admission within 28 days of their bacteraemia). This illustrates a way to use routine data to identify patients for review. Other opportunities to use routine data to identify Category I events might include, for example, deaths within 7 days of stem cell transplant or within 30 days of chemotherapy.

Our analysis suggests that Category II events will occur in 20-40% of children in tertiary care, but we are not clear how incidents are selected for reporting, review and audit within NHS GGC. An advantage of looking for adverse events in random samples of patients is that it provides a systematic approach to the identification and classification of events in an unselected setting. In addition, reviewing a random sample of patients rather than starting with an incident provides a better opportunity to identify and feedback on good practice. We recognise, however, that many of the episodes we have reviewed are of very long duration, and so consideration could be given to focusing such reviews on a limited period within an admission (for example, within 28 days of admission or 28 days of a bacteraemia).

8.7 Morbidity and Mortality Reports

In Chapter 6, we have looked at the characteristics of the 21 children and young people included in our review who had died by the time of the publication of this Report (section 6.3). Cause of death was assessed from the clinical records in all cases, and validated from death certificates in the 19 cases for whom these were available.

We accessed 15 reports of Morbidity and Mortality (M&M) reviews from patients in the cohort, all from amongst the patients who had died. Two of these reviews were about patients who died and where the infection was attributed, at least in part, as the cause of death and two others were deaths within 28 days after discharge following an infection episode.

In one of these four patients, the initial M&M report referred to the role of the infection in death. An additional review was undertaken of this patient, at the request of NHS GGC management over two years after the child died. This was in response to questions raised by Scottish Government. The death had been reported on Datix as an Extreme incident, although there was no recognition of this in the subsequent review.

The other three M&M reviews of deaths that related in time to infection episodes were all initiated by clinical staff. None of these reviews included a discussion of the Gram-negative environmental infection but they did identify other significant discussion points, including death within 30 days of chemotherapy and the very large resource implications of transferring a ventilated patient from PICU to another hospital for other treatment. None of these issues were reported on Datix and the M&M reports do not include action plans.

Much of the content of the other M&M reports related to the chronology of the patient's underlying disease, its treatment, and to aspects of end of life care. There was no reference to Gram-negative environmental infection. The M&M reports we have seen were limited to patients who died, but the Scottish Mortality and Morbidity Programme[82] clearly states that such reports should include review of care complications in addition to patient deaths.

[82] Healthcare Improvement Scotland. Scottish Mortality and Morbidity Programme [Available from: http://www.healthcareimprovementscotland.org/our_work/patient_safety/scottish_mortality__morbidity.aspx.

Some of the M&M reviews were presented by Specialist Trainees. Audit and quality improvement are Outcome 8 in the RCPCH Paediatric Training Curriculum, and this is one of nine areas for assessment of applicants for Specialist Training, with clearly described indicators of involvement in audit/quality improvement and learning from this[83] [84]. We could not identify a systematic approach to how the use of incident reporting or M&M review was used either to improve patient care or to provide professional learning. Some of the M&M reviews clearly identified important issues. If these were cross referenced to, or entered as reports on Datix, this would create an opportunity to engage more widely with the organisational response and in creating action plans and auditing improvement.

8.8 Central Venous Line Care

We have looked at aspects of central venous line (CVL) care in the patients in our review. CVLs, like other indwelling medical devices, present a clear risk for infection but are intrinsic to the delivery of many aspects of the complex care required by children and young people undergoing chemotherapy or treatment for other serious blood diseases.

We assessed central line care in 81[85] patients who had 115 episodes of central line associated infection that were treated as an inpatient in the GGC Paediatric Oncology Unit. We collected information from written and digital inpatient medical and nursing records, and from the Patient Note Pad section in Telepath.

8.8.1 NHS GGC policies

The antibiotic policy for Paediatric Haematology Oncology patients with febrile neutropenia incorporates detailed recommendations about antibiotic treatment and addresses aspects of CVL usage in the context of presumed line related infection. This has been regularly updated from v1.0 dated 2010, to v4.0 dated March 2020. The policy includes a recommendation to document the central line insertion site in febrile patients and cautions that if a child deteriorates with flush or continuing use of the line, consideration should be given to siting a peripheral cannula and discontinuing use of the line, with further consideration given to adjusting the antibiotic regimen. There are otherwise no specific recommendations for resting, removing or challenging lines.

The Patient Note Pad notes in Telepath frequently state that microbiology advice is based on evidence from the IDSA (Infectious Diseases Society of America) guidelines on management of intravascular catheter related infection[86]. Overall recommendations for Gram-negative bacteraemia in patients with long term catheters are:

---

[83] Royal College of Paediatrics and Child Health. Paediatric ST4 Recruitment 2020 – R2R Self-assessment Framework & Guidance [Available from: https://www.rcpch.ac.uk/sites/default/files/2020-07/st4_recruitment_2020_round_2_readvert_self-assessment_framework_0.pdf

[84] Royal College of Paediatrics and Child Health. Paediatric ST1 Recruitment 2020-2021 Application Scoring Framework & Guidance [Available from: https://www.rcpch.ac.uk/sites/default/files/2020-11/ST1%20Application%20Form%20Scoring%20Framework%20v.3b%20JAC%20291020_0.pdf

[85] three patients were excluded because they did not have central line associated bacteraemia treated in GGC (two had no central line in place during the episode of infection, and one was not an inpatient in GGC during the infection episode).

[86] Mermel LA, Allon M, Bouza E, et al. Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2009;49(1):1-45. doi: 10.1086/599376

- If the line is removed, treat with 7-14 days antibiotics
- For line salvage, use systemic and antibiotic lock therapy for 10-14 days.

Specific recommendations from the IDSA guidelines provide more detailed advice about criteria for line removal, treatment without line removal and about management of infection in paediatric patients. The IDSA guidelines do not mention line challenge.

8.8.2 Observed CVL management

The appearance of the line site was recorded when the patient became symptomatic in 94 (82%) episodes and was documented as clean in 84 (89%) of these records.

The line was rested in 51 (45%) episodes and subsequently challenged in 21 (18%) episodes. Signs and symptoms of sepsis occurred after 9 (43%) of those line challenges and, in one case, resulted in a patient who experienced rigors, became cyanosed, tachycardic and had limited response to bolus fluid infusion, being admitted to PICU.

The Chief Nurse for Paediatric and Neonatal Services at NHS GGC provided us with this information about central line challenges: “Challenging the lines was a rather historic practice where if a child had a pyrexia they would stop using the line, insert a cannula and use that, then a few days later ‘challenge’ the line by taking more blood cultures and flushing, gradually using for fluids and medications. This practice was discussed at the QI group (set up in May 2017) and we worked from there towards a change. Microbiology and other representatives within the group agreed to continue to use a line or remove a line depending on the clinical and microbiological status of the child”.

However, the frequency of line challenges did not appear to reduce with time and was identified in 5 (14%) of 36 episodes occurring up to May 2017 versus 16 (20%) of 79 episodes from June 2017 onwards. The latest line challenge we noted in our Review was for a bacteraemia diagnosed in March 2019.

Patient Note Pad notes do not document any microbiology concerns about plans to challenge the line where this is explicitly mentioned.

Data in section 6.2.3 looks at the removal of a CVL in response to GNE infection. This occurred in 78 (68%) of episodes. We found that the Patient Note Pad notes recorded consistent advice when line removal was the optimal management decision and that, when line salvage was attempted, there was regular advice from microbiology about systemic and antibiotic lock therapy, with frequent reference to IDSA guidelines. We were, however, concerned to see that when a decision was reached to remove a line, there were delays in its implementation. We were not able to investigate this in detail but recognise that this may be a consequence of competing priorities for operating theatre and anaesthetic time. Nevertheless, we believe that delay in removal of an infected line carries risk and so that removal should be prioritised accordingly.

8.8.3 Conclusions

We have seen that CVL care was well documented by the nursing staff and that good advice was provided by the microbiologists in the context of bacteraemia. We acknowledge that considerable work was being undertaken within NHS GGC during the period of our Review to reduce the incidence of central line associated blood stream infections (CLABSI) through a Quality Improvement framework. We are, however, concerned both about the practice of

'line challenge' and the lack of documentation in the medical records when attempts to continue to salvage a line were preferred over advice from microbiology to remove it.

Episodes of central line associated bacteraemia present an opportunity as much to learn from its management as from the analysis of its causation.

8.9 Other aspects of clinical care

Two other issues have arisen in our review that we discuss briefly here.

8.9.1. Antimicrobial prophylaxis

The prophylactic (preventative) use of antibiotics, antifungal and antiviral drugs to reduce the risk of infection in patients who are at high risk by virtue of their disease and/or treatment is well established in Paediatric Haematology Oncology care. The evidence base varies according in relation to diagnosis, treatment and age. In practice, consistency is often addressed by guidance incorporated within established treatment schedules and clinical trial protocols.

Concern about the incidence of Gram-negative environmental bacteraemia at NHS GGC raised an understandable question for the clinical and microbiological teams about the use of antibiotic prophylaxis (i.e. whether its use should be extended beyond the settings in which it would normally have been considered). The use of fluoroquinolone antibiotics is a particular focus because of concern that this can contribute to selection of antibiotic resistance and to the risk of *Clostridium difficile* infection. Its use in the context of preventing neutropenic sepsis has recently been reviewed by the National Institute for Health and Care Excellence[87], but whether use of fluoroquinolone prophylaxis is useful in a setting where there is concern about a possible environmental focus for infection is unclear. Furthermore, once a policy of this kind has been initiated, it is understandably difficult to know when to de-escalate.

We note that this issue was reviewed within NHS GGC in an SBAR written by Dr Andrew Murray, Medical Director, NHS Forth Valley and Co-chair, Scottish Managed Service Network for Children and Young People with Cancer in December 2019. This concluded that the continuing use of fluoroquinolone prophylaxis should be on the basis of individual patient assessment; no indication was given for criteria against which such individual assessment should be effected but consensus guidelines for the use of antibiotic prophylaxis in Paediatric Oncology practice have recently been published and should be reviewed for their use in NHS GGC[88]. We have not sought information about audit of ongoing use of antibiotic prophylaxis but best practice would anticipate this is being undertaken.

[87] 2020 exceptional surveillance of neutropenic sepsis: prevention and management in people with cancer (NICE guideline CG151)

[88] Lehrnbecher T, Fisher BT, Phillips B, Alexander S, Ammann RA, Beauchemin M, Carlesse F, Castagnola E, Davis BL, Dupuis LL, Egan G, Groll AH, Haeusler GM, Santolaya M, Steinbach WJ, van de Wetering M, Wolf J, Cabral S, Robinson PD, Sung L. Guideline for Antibacterial Prophylaxis Administration in Pediatric Cancer and Hematopoietic Stem Cell Transplantation. Clin Infect Dis. 2020;71(1):226–36. https://doi.org/10.1093/cid/ciz1082.

8.9.2 The impact of the organisational response on the delivery of clinical care

In Chapter 6 we have tried to share data we obtained or derived from our Review in order to demonstrate the impact of Gram-negative environmental bacteraemia on individual patients. We were less able to form a view of the overall effect on the clinical service although it was obvious that disruption was substantial, particularly in relation to the decisions to close Ward 2A and 2B in September 2018 and to limit admissions to Ward 6A in the summer of 2019.

Throughout our Review we had not seen any document prepared by the clinical team, by NHS GGC management or by the Managed Service Network that set out an analysis of how these decisions affected the overall delivery of Paediatric Haematology Oncology care. Measures that would have been of interest are, for example, timeliness in delivering planned chemotherapy; deferral of planned treatment (e.g. surgery, radiotherapy, stem cell transplantation); use of shared care; and transfers to other units.

We questioned the availability of evidence of this kind at a meeting with the Haematology Oncology clinicians in December 2020 and have since seen two documents. One is an audit of admissions with bacteraemia from 1.7.17 to 31.8.18. This looked at characteristics of patients affected by age, gender, diagnosis and the profile of the microorganisms causing infection and their antibiotic sensitivities (this was not restricted to Gram-negative environmentals). The main focus of the audit seemed to be on defining the optimal choice of empirical antibiotics. It did not attempt to look at the observed frequency of bactaeraemia against that which might have been expected, but it is possible to see that 7 out the 8 most frequent bacteria identified in the series fell into the Gram-negative environmental group. We do not know where these data were presented within the organisation or what response was made.

The second document presents an analysis of episodes of care transferred to other Wards/Hospitals/Health Boards for delivery of chemotherapy and relates to data collected from 29.7.19 to 4.11.19, during the period when there were restrictions on admission to Ward 6A. In summary, this showed that 8 children (9 episodes of treatment) were transferred to Edinburgh during this period; 4 children (5 episodes) to Aberdeen; 1 child (1 episode) to Newcastle; and 1 young person (2 episodes) to the Young Person's Unit at the Beatson West of Scotland Cancer Centre. Internally, accommodation was found within Ward 4B for 11 children (17 episodes) in addition to the ongoing Paediatric Stem Cell Transplant activity planned to be delivered in that ward. We have also been informed that shared care activity increased during this time and has since been maintained although we have seen no data.

Short term adjustment to patient flow is expedient under such circumstances and it was good that these transfers were able to take place to limit delay to treatment. It seems, however, that there may also have been some more permanent change to shared care activity as a result of the impact of these infections. The wider development of the Shared Care Network may have been helpful to individual families in offering more care, closer to home but appropriate structures and processes are needed to ensure that a Shared Care Network is both supported and safe.

We have not seen evidence that the issues that arose at NHS GGC were supported by any action from the Managed Service Network. This seems to us to be precisely what the MSN is intended to do.[89]

[89] https://www.youngcancer.scot.nhs.uk/managed-service-network/about-us/about-the-network

9. EVIDENCE OF GOOD PRACTICE

In the course of our Review we identified areas of Good Practice which we briefly summarise here.

9.1 Nursing Care Records

Nursing records were especially comprehensive and clearly written. There was almost universal completion of vital signs and central venous line and peripheral venous catheter documentation.

9.2 Medical Care Records

Notwithstanding our criticism of the organisation of the medical records, the medical care notes were generally comprehensive and frequently very detailed in their account of specific clinical issues. Reading these notes gave a picture of good communication between junior and senior medical staff and clear evidence of consultant led care.

9.3 Communication with families

Although we are aware of complaints from some families about standards of communication, we saw examples where communication with individual families about clinical care was particularly carefully recorded and, in respect of the Duty of Candour, this included cases where an adverse event had occurred.

We also saw evidence of joint consultations with parents by Consultant Haematologists/Oncologists and Consultant Microbiologists to discuss specific aspects of the causes and treatment of difficult to treat infection.

9.4 CLABSI surveillance and incidence

Despite the fact this Review has been initiated because of concern about bacteraemia, we are also aware of the work done by the Quality Improvement group established to reduce central line associated blood stream infection. We have seen data which illustrates the impact of their interventions and we recognise the openness with which the group acted to ensure comparison was made between NHS GGC and other institutions nationally and internationally to establish a benchmark for future care.

9.5 Infection Prevention Control Nursing practice

Where ICnet generated a case in response to a positive laboratory test result, there was evidence of good record keeping and a detailed information of the IPC nurse response and intervention.

During IMT investigations the IPC nursing response was seen to generate appropriate infection prevention and control support measures, often undertaking an enhanced review of basic IPC practice and actions.

9.6 Microbiology advice.

The advice provided to the Haematology Oncology Team by the microbiologists was well documented in Telepath and shows that frequent and clear advice was provided about the identification of the infecting organism; antibiotic sensitivities; choice and duration of antibiotic treatment; and removal of the central venous line.

10. SUMMARY OF FINDINGS AND RECOMMENDATIONS FOR ACTION

This chapter is structured to answer the questions we were asked to address at the outset of our Review and offers recommendations for consideration and action by NHS GCC, and other organisations.

10.1 How many children in the specified patient population have been affected, details of when, which organism etc?

The work undertaken to define the number of patients and infection episodes that would be the subject of our Review appears comprehensive. We are not able to ascertain with complete certainty that any patients/episodes that should have been included were omitted in error, but we have no reason to believe this to be the case. We identified only two episodes and one patient we deemed ineligible, resulting in a final population of 84 patients and 118 episodes of infection in our Review.

We found that the patients broadly represented the population of patients we would expect to be under the care of the Paediatric Haematology Oncology service at NHS GGC, given that it also houses a unit for Teenagers and Young Adults. Their ages ranged from 3 months to 18 years 10 months at the time of their first infection episode, with a median age of 5 years 11 months. There was an unexpected excess of female patients which we suggest is investigated further, but this may still be a chance finding. The great majority of the patients had a diagnosis of leukaemia (as expected, the largest sub-group) or other cancer but a minority had other forms of serious blood disease or a non-malignant condition.

Although, over three quarters of patients experienced 1 episode of infection, 10 had 2 episodes and several had more than 3 or more episodes, up to a maximum of 8 episodes in one patient.

By the time of the publication of this report, we were aware that 21 children and young people had died. We decided that infection was implicated as a cause of death in 2 patients; 18 had died of their underlying disease (all cancer); and 1 from other causes unrelated to infection.

10.2 Is it possible to associate these infections with the environment of the RHC and the QEUH?

We were able to conclude that bacteraemia was Unrelated to the hospital environment in only 8 (7%) episodes and, for reasons we have discussed in detail, we were not able to identify any episodes that were Definitely linked to the environment. The remainder of the episodes were graded, in varying degrees, as Possible or Probable in their relationship to the hospital environment.

This is not as satisfactory a conclusion as many will have hoped we would be able to reach but we have described the standards of proof we required and discussed the complexity of attributing cause/origin in this population of patients.

It is without question, however, that our decision making was affected by the inconsistencies we encountered in the data we received from NHS GGC: data that, we had hoped, would clarify concerns about the maintenance and surveillance of the environment, the water system, and the use of typing methodologies to link different bacterial isolates.

We conclude that the difficulty the organisation had in locating, collating and presenting these data to us supports our belief that this information may not have been readily and/or consistently available in real time for their own investigations over the period of our Review. The very fact that, in late 2020, such data remained difficult to provide to us suggests that the previous years of concern and investigation of Gram-negative environmental bacteraemia had not translated into clear evidence that good quality data about the control of the environment were being sought, interrogated and stored in a retrievable format for future use.

We have, nevertheless, identified 37 (32%) of the bacteraemias in the Review as being 'More likely' to be linked to an environmental origin. These infection episodes are characterised by a particular excess of *Stenotrophomonas* spp. but do not otherwise appear to be related to any distinctive microbiological profile or to have occurred more than expected in any particular period in the years covered by our Review.

We are surprised that the evidence for an excess of Gram-negative environmental bacteraemia in the Paediatric Haematology Oncology patients was challenged by some within the organisation. By 2018, we suggest that simple observation should have identified a disturbing pattern characterised by the occurrence of bacteraemias caused by some very unusual microorganisms and apparent clusters of some of those more commonly encountered. The widespread contamination of the water system seems to have been accepted and NHS GGC's response, notably its decision to close and relocate an entire clinical unit in September 2018, must be interpreted as evidence of the organisation's acceptance that the environment presented a risk of serious infection to a vulnerable group of patients. Although the investigations undertaken to that date had failed to identify a single cohesive hypothesis for the origin of many of the infections, the approach taken to surveillance thereafter did not appear to match the severity of what had already occurred.

10.3 Was there an impact on care and outcomes in relation to infection?

First, it should be recognised that infection occurs in Paediatric Haematology Oncology patients and carries risk, regardless of its likely origin. We have characterised the impact of all the Gram-negative environmental infection episodes experienced by the whole group within our Review and then looked separately to determine if these were different in those episodes we judged to be 'More likely' to be associated with the hospital environment.

We created a 5-point scale by which we defined the overall impact of each infection on the patient. This was based on a number of specific criteria which we shall highlight separately. In summary, we identified only 5% of episodes with a Negligible or Minor overall impact whilst 38% of episodes were associated with a Major or Critical overall impact.

In looking at the individual components of the impact assessment, we identified that 87% patients experienced a hospital admission of more than 7 days directly as a result of their

infection, and this was greater than 14 days in 50%. Seventy-five (68%) of infection episodes required removal of the central line to control the infection; this is a striking finding because it also conveys an additional risk of general anaesthesia, first to remove the line and then (in almost all cases), to insert another one. This also carries a significant logistic and resource cost in the additional operating theatre utilisation required.

Twelve patients (11% of those evaluable) required admission to the intensive care unit solely or principally because of their infection, of whom the majority (75%) could be discharged to the ward within 3 days. This statistic tells its own story in relation to how sick these patients may become and illustrates again the resource burden that Gram-negative environmental bacteraemia imposed.

Treatment disruption was, as we have discussed, more difficult to characterise but we estimated that treatment delays of more than one week were seen in 29% patients (and for more than 2 weeks in 12%). It is not possible to ascribe clear significance to such observations because many other factors are involved and delays in treatment are common during cancer care. We believe most clinicians would accept that, under most circumstances, a delay of 1 week is very unlikely to be significant in terms of patient outcome. However, it also seems logical to accept that the longer the delay beyond that point, the more likely there could be an impact on disease control.

These are not trivial findings and indicate the scale of the impact of Gram-negative environmental infections within the whole group. When we looked separately at the 37 episodes we deemed 'More likely' to be associated with the hospital environment, the pattern of impact was generally similar except for an increase in risk of admission to intensive care. This may link to the excess of *Stenotrophomonas* spp. infections seen in this group.

We measured Adverse Events using two different approaches – first by exploring incident reporting through NHS GGC's Datix system, and second by using the Paediatric Trigger Tool (PTT). Although many of the triggers identified by the PTT relate to expected complications of chemotherapy or represent other support measures commonly required by this group of patients, the incidence of adverse events identified in this way far exceeds the evidence available from Datix reports. Furthermore, it was apparent that when incidents recognised as adverse events were entered into Datix, there was a clear possibility that the situation might be misclassified and/or its risk underestimated. The principal lesson here is that, used appropriately, the reporting of events into Datix could provide a valuable tool for auditing patient safety in this group of high risk patients, as it is intended to do.

The work using the PTT also provided an opportunity to compare the overall incidence of adverse events in these patients at NHS GGC with paediatric populations in other hospitals: our conclusions are that, when comprehensive data were used, NHS GGC performed in line with that of other comparable institutions.

Death from bacteraemia is a risk that is well characterised in the literature. We found that 2 of the 21 patients who had died by the time of the publication of this Report died as a result of their infection. In one child, who died very soon after the onset of the bacteraemia, this

had been implicated at the time as the principal cause of death and was recognised as such on the death certificate. The second child died at a longer interval after the bacteraemia and a number of other contributory factors were present. We decided that the bacteraemia was implicated in the cause of death and this was reflected on the death certificate. In both cases we had determined that the infections were both Probably related to the hospital environment and fell within our 'Most likely' to be related to the environment group.

10.4 What recommendations should be considered by NHS GGC – and, where appropriate, by NHS Scotland, more generally – to address the issues arising from these incidents to strengthen infection prevention and control in future?

In our work in undertaking this Review, we have explored data pertinent to an understanding of the nature of each infection and to the factors at play in determining its likely origin, subsequent management and influence on patient outcome. We also reviewed the Infection Prevention and Control processes in place, and the approach taken to the investigation of these infections when identified internally as an infection incident or outbreak. We identified specific concerns that we have discussed in Chapter 8.

NHS GGC should take immediate steps to ensure greater consistency in the way the organisation monitors and investigates Gram-negative environmental infections in Paediatric Haematology Oncology patients. The approach hitherto has been fragmented and incomplete. In responding to this report and our recommendations, NHS GGC must assure patients, families and staff of a new approach. It is particularly important that it does so before the Paediatric Haematology Oncology service returns to Wards 2A and 2B. In this way, it will be seen that change has been implemented and that risk will be monitored in the return to the upgraded environment.

These are our Recommendations.

1. Overall Management of Gram-negative environmental infection in Paediatric Haematology Oncology

1.1 Every Gram-negative environmental bacteraemia occurring in a Paediatric Haematology Oncology patient at NHS GGC should be comprehensively investigated using RCA methodology, whether or not it is considered at the outset to be related to the hospital environment or thought to be part of a potential outbreak. This will ensure that future consideration of the underlying issues can be informed by consistent, comprehensive and prospectively collected data.

1.2 A new multi-professional group, with a defined and consistent membership representing all appropriate skills and backgrounds, should be established with responsibility for continuing oversight of these data: for assessment of its quality, and completeness, and for its analysis and reporting. The intent is that this group, which should have external representation, will grow in collective expertise and knowledge; have a shared understanding of the history and challenges encountered since the opening of the new QEUH/RHC site; and will be able to define and guide the organisation's response to future concerns about environmentally acquired infection in this group of patients.

2. Demographic profile of patients

Given the unexplained but significant excess of female patients in the Case Note Review, the Paediatric Haematology Oncology service should audit all bacteraemias for a sufficient period either to reassure that there is no real gender effect, or to investigate further if this proves to be the case.

3. Environmental surveillance

3.1 The data systems used to document facilities maintenance activity in clinical areas need to consistently capture the exact location of the work done; the date(s) on which the work was actually done; and be accessible to inform the IPC process, including the investigation of clusters and outbreaks.

3.2 The frequency with which facilities maintenance activities occur in specific ward areas should be reported on a regular basis in a way that informs wider awareness of the vulnerability of the environment and tracks changes in the pattern of such activity.

3.3. The precise location of any swab or water sample taken for microbiological surveillance, and the date on which it was obtained, must be recorded and the results made accessible to inform the IPC process, including the investigation of clusters and outbreaks.

3.4 When a suspected infection outbreak is being investigated, the plans agreed for environmental sampling of the relevant area must demonstrate a systematic approach appropriate to the circumstances of the investigation.

3.5 When the Chair of an IMT (or similar future structure) identifies that environmental samples are required to inform an investigation, these should be taken, reported back promptly and evidenced in the IMT minutes.

4. Water testing

4.1 A systematic, fit for purpose, routine, microbiological water sampling and testing system is required to provide assurance going forwards. How the results from such sampling/testing are recorded, accessible and used to highlight concerns should be reviewed, including to ensure that investigations of possible links between clinical isolates and water/environment sources can be informed in a timely way. In addition, investigations of possible links between clinical isolates and water/environment sources should consider whether (short or medium/long term) changes to the routine microbiological water sampling and testing system are required.

5. Infection Prevention Control Practice and Audits

5.1 NHS GGC should review the current approach to IPC audit: a) to ensure that the component elements are addressed individually and that the RAG rating is not determined only by an overall score; and b) to show that the governance and assurance process relating to improvement action plans can demonstrate if interventions have been effective. Use Quality improvement methodology to drive and sustain improvement.

5.2 The current status of IPC audit should form a routine and documented component of IMT assessment.

5.3 Greater effort should be made to ensure that deficits identified by IPC audits are remedied, re-audited, linked to measures of ongoing quality improvement/compliance, and clearly documented.

5.4 Greater attention should be paid to the evidence for benefit from Enhanced Supervision by demonstrating sustained improvement in standards where this approach is introduced to a clinical area.

5.5 The validity of Hand Hygiene audits should be strengthened by ensuring the staff sample audited is sufficiently representative in terms of numbers and types of staff; and that effectiveness of the interventions are monitored to demonstrate sustained improvement.

5.6 The frequency of Hand Hygiene audits should be increased when there are concerns about infection rates potentially related to the environment

6. Infection Prevention Control Communication

NHS GGC should ensure better communication between the Microbiology and IPC teams. We recommend a forum by which sharing of information and actions occurs in real time to support and improve quality of care to patients, maintain progress and discuss action for any potential change in a patient's condition or linked infections.

7. ICNet Alerts

NHS GGC should review the ICNet alert organism list to ensure that, at a minimum, it reflects the advice in the Scottish NIPCM and to ensure that it is further updated to reflect experience with Gram-negative environmental bacteraemias.

8. Infection Incident and Outbreak Policy

8.1 NHS GGC should review its Standing Operating Procedure regarding the use of the term HAI to make it clear whether this includes all Healthcare Associated Infections. This is a specific issue in the context of patients who, like those in Paediatric Haematology Oncology, frequently and repeatedly attend the hospital as outpatients, day patients and inpatients and for whom the distinction between Hospital Acquired Infection (HAI) and Healthcare Associated Infection (HCAI) is unlikely to be applicable.

8.2 NHS GGC should revisit how they will monitor and, if necessary, trigger concerns about future outbreaks of Gram-negative environmental infections. The value of SPC charts to determine if episodes of infection caused by unusual/uncommon microorganisms are significant should be re-evaluated. The process in place for much of the Review period appears to have been insensitive to identifying clusters that should have raised earlier concerns about potential for a common/environmental source of infection.

8.3 Root Cause Analysis methodology should become the standard approach to the investigation of serious infections in Paediatric Haematology Oncology patients.

8.4 NHS GGC should consider the further and consistent use of the RCA process across the organisation a) to identify evidence of common themes as a cause of infection over time; and b) what can be extracted from the RCA process for organisational learning and improvement.

8.5 NHS Scotland should consider if this approach should become a recommendation in the National Manual.

9. IMT Process

9.1 The IPC Team should ensure IMT minutes are filed with all supporting papers so that a complete record of the discussions held, evidence presented, actions agreed and the overall report concluding the process, is available and accessible in a single place.

9.2 The IMT action log should be a continuous and evolving document throughout all meetings in an IMT series. The log should be reviewed and updated at each meeting so that there is a clear record of actions agreed, responsibility held and tasks completed. The IMT should not be closed if there are actions which have not been completed.

9.3 The absence of IMT reporting at the closure of an IMT sequence is a breach of NHS GGC's own policy. This should be remedied so that practice complies with policy.

9.4 In addition to confirming that due process has been followed in line with organisational policy, IMT and other IPC reports intended for upward reporting within the organisation should more fully describe the scale and significance of the incident that has been investigated from the patient perspective.

9.5 NHS GGC should assure that the governance of the IMT process, its reporting and escalation to Board level, is clearly defined and followed; and that an audit trail of all evidence related to any suspected or actual outbreak is clearly documented and fully reported.

10. Bacterial typing data / Reference laboratory reports

10.1 NHS GGC must (continue to) develop a comprehensive and searchable database that allows details of microbiology reference laboratory reports to be compared between samples of the same bacteria obtained from different patients or environmental sites.

10.2 The system for integrating microbiology reference laboratory reports into the patient microbiology record needs to be reviewed and strengthened. Similarly, the system for ensuring that microbiology reference laboratory information is available to and used by the IMT process, including the investigation of clusters and outbreaks, needs to be reviewed and strengthened.

11. Patient Records

11.1 NHS GGC should undertake a review of the current effectiveness of the system for collating, storing and integrating both scanned handwritten records and digitally recorded records and how this achieves an accurate, accessible and chronologically accurate health record for each patient.

11.2 NHS GGC should clarify their strategy for further evolution towards fully digital records

11.3 Consideration should be given to the integration of the microbiology recommendations regarding the diagnosis and management of infections, as currently documented in the Telepath patient notepad, into the patient clinical record.

12. Patient location coding

It should not be possible to code patient activity to a clinical area in which the patient was not present: this should be addressed.

13. Adverse Events

13.1 The Paediatric Haematology Oncology service should engage with regular reporting and analysis of adverse events. Admission to PICU is an obvious way of identifying, for audit purposes, the patients most likely to have the most serious (Category I) adverse events.

13.2 The Paediatric Trigger Tool offers a useful tool to identify and monitor trends in the occurrence of adverse events that occur during care.

13.3 NHS GGC should assure and report consistent utilisation of the Datix system, and audit the validity of the classification and risk categorisation given to incidents by its staff.

14. Central Venous Line Care

14.1 The Paediatric Haematology Oncology service should review the practice of 'challenging' central venous lines in line with evidence for its risks and benefits.

14.2 When it is agreed that a central line should be removed for optimal management of a patient's infection, operating theatre and anaesthetic resources must be made available to ensure its prompt removal (within 24 hours).

14.3 The Paediatric Haematology Oncology service should ensure that a decision not to remove a central venous line contrary to the advice of the microbiologists is always documented in the medical record.

15. Other aspects of Clinical Care

14.1 The Paediatric Haematology Oncology service should ensure that Morbidity and Mortality reports are not restricted to a review of patients who die. Future Gram-negative environmental infections should be used as a trigger for an M&M review; to assess management and outcome; and with the inclusion of an action plan to identify approaches to reduce risk and improve care.

14.2 International consensus guidelines have recently been published for use of antibiotic prophylaxis in Paediatric Oncology. These should be reviewed by both the Paediatric Haematology Oncology service and by the Managed Service Network, and local and network policy and practice should be amended accordingly.

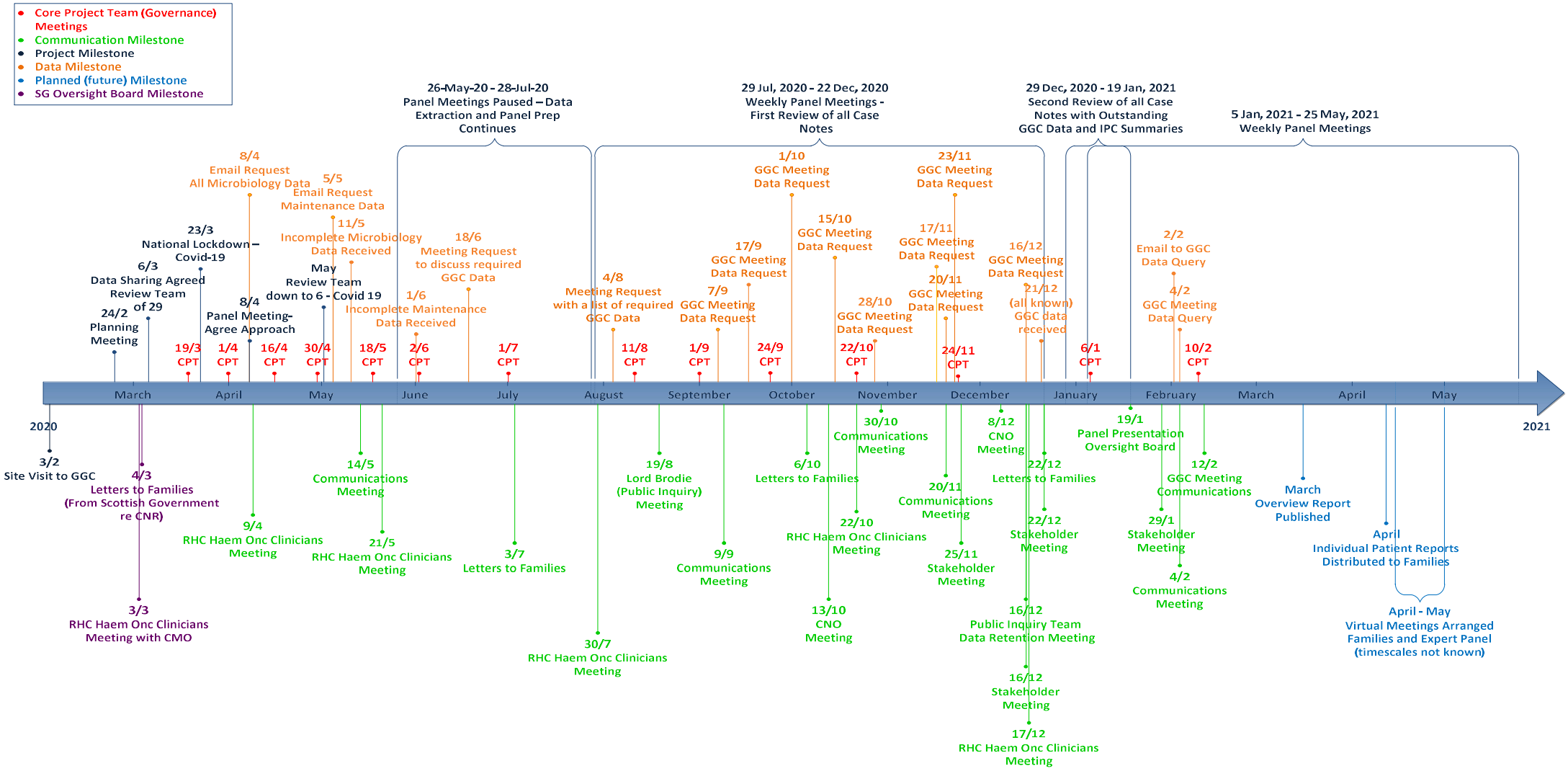
14.3 The Paediatric Haematology Oncology service should audit the use of antibiotic prophylaxis against the new policy once implemented.

14.4 The Managed Service Network and NHS GGC should review any changes to the use of shared care that have evolved as a result of the service disruption experienced in recent years, and ensure the structures and processes in place adequately address patient safety and staff support across the shared care network.

9. REFERENCES

To follow

Appendix A: Timeline of the Work of the Review



Appendix B: Organisms Selected for Inclusion

Gram-negative Environmental/Enteric grouping	
Genus	**Species**
Achromobacter	*Achromobacter species*
Acinetobacter	*Acinetobacter baumannii* Acinetobacter baumannii complex *Acinetobacter ursingii*
Aeromonas	*Aeromonas hydrophila* *Aeromonas species*
Brevundimonas	*Brevundimonas species*
Burkholderia	*Burkholderia cepacia*
Chryseobacterium	*Chryseobacterium indologenes* *Chryseobacterium species*
Citrobacter	Citrobacter braakii Citrobacter freundii Citrobacter koseri Citrobacter youngae
Cupriavidus	*Cupriavidus pauculus*
Delftia	*Delftia acidovorans*
Elizabethkingia	*Elizabethkingia meningoseptica* *Elizabethkingia miricola* *Elizabethkingia species*
Enterobacter	*Enterobacter cloacae* Enterobacter cloacae complex Enterobacter cloacae ESBL Enterobacter hormaechie
Herbaspirillum	*Herbaspirillum species*
Klebsiella	Klebsiella oxytoca Klebsiella pneumoniae
Pantoea	*Pantoea septica* *Pantoea species*

Pseudomonas	*Pseudomonas aeruginosa* *Pseudomonas putida* *Pseudomonas stutzeri*
Raoultella	*Raoultella planticola*
Rhizobium	*Rhizobium radiobacter*
Roseomonas	*Roseomonas mucosa*
Serratia	*Serratia liquefaciens* *Serratia marcesens*
Sphingomonas	*Sphingomonas paucimobilis*
Stenotrophomonas	*Stenotrophomonas maltophilia*
Acid Fast Environmental (AF ENV)	
Mycobacterium	*Mycobacterium chelonae*

Appendix C: Paediatric Trigger Tool Score Sheet

PAEDIATRIC TRIGGER TOOL

www.institute.nhs.uk/safercare/portal

Trigger Tool Paediatrics

Patient Age _____ years, months

Date Of Discharge: _____

Length Of Stay: _____ days

NHS Institute for Innovation and Improvement

		Full Description	Trigger	Adverse Event	Severity of Adverse Event	Comment on this trigger
General	PG1	EWS or baseline obs missing or incomplete OR score/observation requiring response	No Yes	No Yes	N/A E F G H I	
	PG2	Tissue damage or pressure ulcer	No Yes	No Yes	N/A E F G H I	
	PG3	Readmission to hospital within 30 days	No Yes	No Yes	N/A E F G H I	
	PG4	Unplanned admissions	No Yes	No Yes	N/A E F G H I	
	PG5	Cranial Imaging	No Yes	No Yes	N/A E F G H I	
	PG6	Respiratory/Cardiac arrest/crash call	No Yes	No Yes	N/A E F G H I	
	PG7	Diagnostic imaging for embolus/thrombus +/- confirmation	No Yes	No Yes	N/A E F G H I	
	PG8	Complication of procedure or treatment	No Yes	No Yes	N/A E F G H I	
	PG9	Transfer to higher level of care (inc admission to specialist unit, ICU/ HDU)	No Yes	No Yes	N/A E F G H I	
	PG10	Hypoxia O_2 sat <85%	No Yes	No Yes	N/A E F G H I	
	PG11	Cancelled elective procedure/ delayed discharge	No Yes	No Yes	N/A E F G H I	
Surgical	PS1	Return to theatre	No Yes	No Yes	N/A E F G H I	
	PS2	Change in planned procedure	No Yes	No Yes	N/A E F G H I	
	PS3	Surgical site infection	No Yes	No Yes	N/A E F G H I	
	PS4	Removal/Injury or repair of organ	No Yes	No Yes	N/A E F G H I	
ITU	IP1	Readmission to ICU or HDU	No Yes	No Yes	N/A E F G H I	

Adverse Event Score (Measure of Harm)

- **E** Temporary harm to the patient and required intervention
- **F** Temporary harm to the patient and required initial or prolonged hospitalisation
- **G** Permanent patient harm
- **H** Intervention required to sustain life
- **I** Patient death

PTO

		Full Description	Trigger	Adverse Event	Severity of Adverse Event	Comment on this trigger
Medication	PM1	Vitamin K given (except for routine neonatal dose)	No Yes	No Yes	N/A E F G H I	
	PM2	Naloxone given	No Yes	No Yes	N/A E F G H I	
	PM3	Flumazenil given	No Yes	No Yes	N/A E F G H I	
	PM4	Glucagon or glucose ≥ 10% given	No Yes	No Yes	N/A E F G H I	
	PM5	Chlorphenamine given	No Yes	No Yes	N/A E F G H I	
	PM6	Anti-emetic given	No Yes	No Yes	N/A E F G H I	
	PM7	IV Bolus ≥ 10ml/kg colloid or crystalloid given	No Yes	No Yes	N/A E F G H I	
	PM8	Abrupt medication stop	No Yes	No Yes	N/A E F G H I	
Laboratories	PL15	Thrombocytopenia (<100)	No Yes	No Yes	N/A E F G H I	
	PL1	High INR (>5) or APTT > 100 sec	No Yes	No Yes	N/A E F G H I	
	PL2	Transfusion	No Yes	No Yes	N/A E F G H I	
	PL3	Abrupt drop in Hb or Hct (>25%)	No Yes	No Yes	N/A E F G H I	
	PL4	Rising urea or creatinine (>2x baseline)	No Yes	No Yes	N/A E F G H I	
	PL5	Na^+ <130 or >150	No Yes	No Yes	N/A E F G H I	
	PL6	K^+ <3.0 or >6.0	No Yes	No Yes	N/A E F G H I	
	PL7	Hypoglycaemia (<3mmol/l)	No Yes	No Yes	N/A E F G H I	
	PL8	Hyperglycaemia (>12mmol/l)	No Yes	No Yes	N/A E F G H I	
	PL9	Drug level out of range	No Yes	No Yes	N/A E F G H I	
	PL10	MRSA bacteraemia	No Yes	No Yes	N/A E F G H I	
	PL11	C. difficile	No Yes	No Yes	N/A E F G H I	
	PL12	Vanc resistant enterococcus	No Yes	No Yes	N/A E F G H I	
	PL13	Nosocomial pneumonia	No Yes	No Yes	N/A E F G H I	
	PL14	Positive Blood Culture	No Yes	No Yes	N/A E F G H I	
	PO1	Other (specifiy)	No Yes	No Yes	N/A E F G H I	
		TOTALS				**Completed portal entry**

Appendix D: Data Synthesis Template

Part 1- Dataset:

UPN (GC)	EPISODE	DATES OF PANEL REVIEW	
DATASET ITEM Ref No.	DATA ITEM DESCRIPTION	FINDINGS & COMMENTARY	ACTION REQUIRED / ADDITIONAL INFO.
OTHER			
3.0	GENDER		
4.0	DOB		
CANCER DIAGNOSIS			
5.0	DIAGNOSIS NAME		
6.0	DATE OF DIAGNOSIS		
7.0	AGE AT THIS DIAGNOSIS		
8.0	TREATMENT PROTOCOL		
9.0	DATE TREATMENT ON THIS PROTOCOL FIRST STARTED		
10.0 & 10.1	DELIVERY OF TREATMENT FOR CANCER IN THE PAST 30 DAYS PRIOR TO INFECTION / CLARIFICATION		
MICROBIOLOGY			
11.0	ORGANISM		
12.0	CATEGORY FOR INCLUSION IN REVIEW (Group 1, 2 or 3)		
13.0 & 14.0	DATE (& Time) CULTURE TAKEN (Defines date of infection)		
15.0	SITE OF CULTURE		
16.0 & 16.1	WHY WAS CULTURE TAKEN?		
17.0 & 17.1	ORIGIN OF INFECTION (HAI, HCAI, Community, Other)		
18.0	OTHER POSITIVE CULTURES (30 days pre or post index infection)		
18.1	DATE OF SPECIMEN		
18.2	ORGANISM		
18.3	SITE		
INFECTION EPISODE			
19.0	DATE OF ADMISSION (Relates to date infection was recognised and / or treated)		
20.0	PLACE ADMITTED FROM		
21.0	REASON FOR ADMISSION		
22.0	DATE OF ONSET OF SYMPTOMS		
23.0 & 23.1	DATES OF ADMISSION & DISCHARGE FOR PREVIOUS IN PATIENT STAY AT RHC/QEUH IN PREVIOUS 30 DAYS		
23.2	DISCHARGE DESTINATION AFTER PREVIOUS IN PATIENT STAYS AT RHC/QEUH		
24.0	DATE OF PREVIOUS ATTENDANCE AT RHC/QEUH CLINIC OR DAY CARE IN PREVIOUS 30 DAYS		
25.0	WARD & BED LOCATION ON DATE OF ONSET OF SYMPTOMS		
25.1	ISOLATION / PROTECTION PRECAUTIONS IN PLACE AT THAT LOCATION		
26.0	WARD & BED LOCATION ON DATE OF INFECTION		
26.1	ISOLATION / PROTECTION PRECAUTIONS IN PLACE AT THAT LOCATION		
27.0	CLINIC, DAY CARE AND WARD & BED LOCATION IN PREVIOUS 30 DAYS		
27.1	ISOLATION / PROTECTION PRECAUTIONS IN PLACE AT THAT LOCATION		
28.0	AGE AT DATE OF INFECTION		
29.0	NEUTROPENIC ON DATE OF INFECTION		
30.0 & 30.1	ANTIBIOTIC PROPHYLAXIS (at time of infection or in previous 30 days)		
31.0	DATE ANTIBIOTICS COMMENCED		
32.0	FIRST LINE ANTIBIOTIC THERAPY		
32.1	IN LINE WITH LOCAL POLICY / MICROBIOLOGICAL ADVICE		
33.0	SECOND OR SUBSEQUENT LINE ANTIBIOTIC THERAPY		
33.1	DATE SECOND OR SUBSEQUENT LINE ANTIBIOTICS COMMENCED		
33.2	IN LINE WITH LOCAL POLICY / MICROBIOLOGICAL ADVICE		
34.0	DATE ALL ANTIBIOTICS DISCONTINUED		
35.0	CENTRAL VENOUS ACCESS DEVICE IN SITU		
35.1	DATE INSERTED		
36.0	PROBLEMS WITH DEVICE (Recorded within 30 days prior to date of infection)		
37.0 & 37.1	DATE REMOVED FOR THIS INFECTION		
38.0	OTHER DEVICE IN SITU		
38.1	DESCRIPTION		
39.0	DATE OF PRIOR SURGICAL PROCEDURE		
39.1	DESCRIPTION		
39.2	THEATRE LOCATION		
40.0	DATE OF DISCHARGE		
41.0	DISCHARGE DESTINATION		
42.0	DURATION OF ADMISSION		
PAEDIATRIC TRIGGER TOOL			
43.0 & 44.0 & 45.0	TRIGGER CODE/DESCRIPTION		
46.0 & 46.1	ADVERSE EVENT? / SCORE		
OUTCOMES			
47.0	REQUIRED PICU ADMISSION		
47.1	DATE ADMITTED		
47.2	DATE DISCHARGED		
47.3	DAYS IN PICU		
48.0	DATE NEXT SCHEDULED CANCER TREATMENT WAS DUE TO START		
48.1	CLARIFICATION		
49.0	DATE ACTUAL START		
50.0	DURATION OF DELAY		
51.0	TREATMENT MODIFICATION REQUIRED		
51.1	CLARIFICATION		
52.0	EVIDENCE OF PERSISTING SEVERE TOXICITY		
52.1	DESCRIPTION		
DEATH			
53.0	DATE OF DEATH		
54.0	CAUSE OF DEATH - HOSPITAL		
55.0	CAUSE OF DEATH - DEATH CERTIFICATE		
56.0	AGE AT DEATH		
57.0	TIME FROM DATE OF INFECTION		
58.0	PLACE OF DEATH		

Part 2- Summary:

UPN	EPISODE	DATES OF PANEL REVIEW
CLINICAL TIME LINE:		
DATE	EVENTS	
TABLEAU TIMELINE (Infection clustering in relation to date and location of care):		
ICNET:		
TELEPATH:		
IMT & PAG MINUTES:		
DATIX:		
ENVIRONMENTAL MICROBIOLOGY (Surveillance cultures):		
HAI-SCRIBE (Maintenance / Building activity):		
OTHER INFORMATION / OBSERVATIONS:		

Part 3- Conclusions:

UPN	EPISODE	DATES OF PANEL REVIEW
1. Are the data provided sufficient to complete the review as intended and to reach a conclusion?		
2. Does the infection episode fit within the criteria for the review? (Yes / No)		
3. Is it possible to link this infection episode with the environment of the RHC/ QEUH? (Unrelated / Possible / Probable / Confirmed / Unable to determine)		
4. Was there an impact on patient care and outcome in relation to the infection? (Yes / No / Unable to determine)		
5. If so, grade severity (Minor; Significant; Severe; Critical)		
6. What lessons might be learned from this case? a) To strengthen IPC measures for the future		
b) In any other respect		
7. Are there any other points arising from this review?		
8. Panel's response to questions or comments raised by patient / family		

Greater Glasgow and Clyde NHS Board

JB Russell House
Gartnavel Royal Hospital
1055 Great Western Road
GLASGOW
G12 0XH

Tel. [redacted]
Fax. [redacted]
Textphone: [redacted]
www.nhsggc.org.uk

Professor Michael Stevens
Emeritus Professor of Paediatric Oncology
University of Bristol

Date: 1st March 2021
Our Ref: [redacted]

Enquiries to: Jane Grant
Direct Line: [redacted]
E-mail: [redacted]

Dear Professor Stevens

Thank you for providing us with the Case Note Review – Overview Draft Report. We are grateful to the authors of the report for all the work that has gone into the Review, both in the actual Case Note Review and also their wider enquiries. We also appreciate the time taken to meet with our senior clinicians on a regular basis. Whilst we welcome the opportunity to comment on factual accuracy, there are also a number of issues that we believe should be highlighted to ensure a full and accurate reflection of the overall position. The views outlined in our response reflect those of a range of colleagues, including the Executive and senior management teams and also the clinical teams, including doctors, nurses and members of the infection control team. The report has the potential to bring important learning for GGC, and for Scotland, which is why we are going into great detail to respond to the report on factual accuracy and to provide clarity in sections of the report that read as subjective, or the opinions of others.

This has been a challenging period for the Board, with the Case Note Review being undertaken amidst a global pandemic, in which Glasgow was severely impacted, more so than all other Scottish Boards. Ensuring a balanced report is critical, to support and assure our patients and families, but also our staff and the wider public in terms of confidence in the services we provide. It is also essential that its contents are used as a mechanism for further improvement and learning and we are fully committed to that course of action.

The context for the report is well documented; an unprecedented set of circumstances that had not previously been faced in Scotland. It would, therefore be surprising if there was not important learning for GGC and PHS given this context. It is reassuring for us to see that many of the issues raised in the report have been previously recognised and that changes and improvements are already being implemented.

As requested, the factual accuracy template has been completed, however it is important that consideration is given to the wider context for a number of reasons, including the forthcoming Public Inquiry. I will now lay out some of the issues that we consider merit some further deliberation and discussion to ensure the report is as robust as possible in terms of conclusions reached, acknowledging the wider context.

<u>Involvement of external agencies</u>
During this whole period, we have relied on PHS (previously HPS) for expert advice and they will continue to be the source of that advice for Scotland. HPS staff were part of all of the IMTs and their report in 2019 influenced local decision making and action. We believe it is important that their input, including their report, is fully acknowledged as GGC was actively seeking advice due to the challenging set of circumstances and fully appreciated the need to utilise all available expertise. We are committed to ongoing work in partnership with them to continue to improve the position within GGC and throughout Scotland and, thus, ensure there is joint learning for the future.

A number of observations have been made throughout the draft report that suggest the Board did not respond swiftly, alter process or that decision making was flawed. To ensure balance, it would be helpful to be more explicit within the report that GGC was supported throughout the period by HPS, HFS and the Scottish Government. Indeed the CNO enacted the IPC National Framework in March 2018. An illustration of this is within 'Example 8.4' where decision making is questioned regarding the standing down of an IMT. In response to the question …*Why was the IMT stood down*? - We would draw attention to the IMT minutes of 21/6/18 at which HPS were in support.

"*The group agreed that for the next 2 weeks if another case is reported then the IMT will be reconvened. If no cases after 2 weeks then the IPCT will resort back to their normal surveillance of 2 cases that fit the case definition*."

The minute also notes that the… ''*Scottish Government has requested all HIIORTs and PAGs regarding RHC including any green scoring HAIIT for 2018 to be sent to themselves by close of play on Monday 25th June*." This highlights the involvement of external agencies and upwards escalation. Further examples are presented within the template referencing previously provided evidence.

HPS Report 2019

It appears to us that the purpose and findings of the HPS Report of 2019 have been discounted, and as noted above, this influenced major decision making within the Board. HPS were commissioned to carry out data analysis that included statistical comparisons of infection rates within the GGC Unit to both the Aberdeen and Edinburgh Units prior to the reopening of Ward 6A. This was in the full knowledge and agreement of the Scottish Government, with the Board previously attempting to source national experts across the four UK nations to undertake this work. This HPS report concluded that there were no patterns or trends which could have predicted the water contamination and, most importantly, that it was safe to reopen the ward. It would be helpful to reflect these findings in the report.

Patient Numbers

Our clinical team have, of course, reviewed the report and there is anxiety about the findings in respect of the circumstances of the death of one of the children. We appreciate that identification is not easy in an anonymised report, however if this case is the child the team think they may be, the transplant team is of the opinion that the cause of death was progressive EBV driven PTLD and not infection. It would be helpful if there could be some further discussion to ensure clarity. There is a detailed account within the factual accuracy template section 6.3 line 1808.

Whole Genome Sequencing.

The report acknowledges the difficulty in assessing links to the environment as the cause of infections.

The assessment of pathogen transmission and identification of sources in outbreaks has benefited vastly from the introduction of whole genome sequencing (WGS) that provides the most robust microbiological evidence. Public Health England introduced WGS in 2014 in foodborne outbreak investigation and Glasgow University has developed the technique locally to help manage outbreaks. The WGS analysis carried out in September 2019 allowed the IMT to understand the degree of relatedness among cases and, together with the Root Cause Analysis findings, make final recommendations for the incident. It would be beneficial for the findings of the WGS carried out for the common pathogens to be included in the report, as robust microbiological evidence that helps map the causality relationships among the infections seen and also avoids publication bias. The Review team have received further WGS evidence, using international comparators, in respect of a number of gram negative bacteria and it is disappointing to see that this work is not credited within the report.

Due process

Although at times the report acknowledges there may not have been explicit guidance on the situation, there is the implicit suggestion that GGC should have done something different, even although national experts were involved and offering advice. The report appears to criticise GGC for following the NIPCM and due process. While we recognise that GGC faced an unprecedented set of circumstances, GGC considered that, in addition to the external advice and our own internal

actions, it remained important to adhere to the national guidance and, therefore, the comments in your report may be perceived as ultimately criticising these organisations and consideration could perhaps be given to this point prior to publication. We would be happy to discuss this further if that would be of assistance.

Anecdotal references

We consider the use of individual opinion and statements within this factual, evidence based report quite challenging. Phrases such as *'we have heard'* or '*some feel'*, do not provide a balanced and factual position and we would ask that further consideration be given to the relevance of their inclusion. There are a number of areas where subjective comments have been made but there has been no discussion with GGC to ascertain the facts of some statements.

An illustration of this relates to the concerns referred to in lines 1299-1304 regarding an SBAR. All actions were minuted in the IMT on 6/9/19 and were acted upon however this is not noted. There followed an extremely robust process prior to the reopening of Ward 6A involving the work of HPS (2019 Report) and the Scottish Government. There are broader issues regarding the change in the IMT chair in August 2019 that we consider warrant discussion to provide a balance rather than inference within the report.

There are significant concerns about the situation described in lines 2564 to 2570 and we consider it to be judgemental and unbalanced with no effort sought to understand the facts.

It reads….*but we have also seen evidence that Infection Control management within NHS GGC actively sought to discourage this – a position that seems entirely inappropriate. Whilst it might be argued that this could be a workload issue, and that direct patient care was not adversely affected, this stance would have excluded the IPC Team from the management of some Gram-negative environmental infections at NHS GGC, which, at the very least, limited awareness of the problem. More importantly, perhaps, it may also reflect a culture of denial about the nature, scale and importance of these infections within the organisation*.

We are of course unable to see this evidence, however the Review Team should be made aware that in 2018 several members of the IPCT senior nursing team met with the Royal College of Nursing with concerns about the behaviour of one microbiologist in QEUH. The RCN thereafter met with the GGC Board Nurse Director and Medical Director to advise of their intention of raising a grievance through the appropriate policy. Following discussion, it was agreed to seek to resolve the position through early resolution resulting in alternative contact arrangements between the microbiologist and the ICNs. We, therefore, consider that such an approach in the Review can lead to misconceptions that require further consideration to ensure an unbiased position. Again, we would be happy to discuss and provide evidence of that position.

Data/Information and Response

There are a number of comments around availability of data throughout the report which, to the reader, may appear that GGC were being obstructive around providing data and access to systems. The report may be more evenly balanced if it were to focus on the scale of the task in preparing the environmental data alongside admission / length of stay data in order to support the Case Note Review. There is learning within the Review for GGC to embrace around focusing on creating a data environment to make detailed, retrospective analysis less challenging in the future.

The existing focus of the report describes that GGC were not responsive to system access requests and the provision of data. Clearly this was not the Board's intention and we do not believe it to be reality. We have carried out a review of interactions with the Review team and prepared a full narrative around these issues which is threaded through the factual accuracy template by appropriate line, and this is also appended to this letter.

In this context, Recommendation 11 - Patient records, *suggests that NHS GGC should clarify their strategy for further evolution towards fully digital records.* In this area it is important to understand the national context in which GGC operates and the national convergence around systems and strategy which we have provided details of in the attached appendix.

In addition, the Board is also looking to replace the Laboratory system, as part of the national review, with the OBC having been agreed and proceeding to FBC with the anticipated procurement taking place early in 2022, subject to FBC approval. Having the ability to focus on creating a data environment to make retrospective analysis less challenging in the future will not only benefit GGC but Scotland as a whole.

In closing I would like to reassure you how seriously the Board has taken this evolving, iterative and complex situation. Indeed, the Board committed approximately £6million of expenditure to deal with the matters associated with water and was absolutely committed to addressing these issues. Strenuous efforts were made to address the situation and, although, it is fully recognised that there is further learning for GGC, and other agencies, it is unfortunate that these efforts are not reflected at all in the report.

We have put in place long term and significant engineering changes to the water system which was recognised in the QEUH Independent Review; we have also ensured that numerous actions were put in place, including a decant of patients to Wards 6A and 4B which has resulted in the continued provision of high quality care to patients from across Scotland for Bone Marrow Transplantation and treatment of haemato-oncology disease. In addition, a whole series of changes were enacted to provide early warning of any issues, data was shared with HPS and benchmarks sought, as well as a root and branch review of Ward 2A with significant investment to address serious infrastructure failings. You will be aware that the Board has lodged legal action against those with responsibility for the hospital design and build.

We would like to work constructively with the authors of the Review to ensure it represents a fully factual reflection of the situation. It is important that GGC uses the Review to further improve its systems, processes and approach and also to accept where we could have acted sooner, such as in the operating of the IMT. In order to achieve this, it would be beneficial to meet to discuss the overall position and, if you are agreeable, I will ask my office to organise this as soon as possible.

Yours sincerely

[redacted]

Jane Grant
Chief Executive
NHS Greater Glasgow and Clyde

Greater Glasgow and Clyde NHS Board

JB Russell House
Gartnavel Royal Hospital
1055 Great Western Road
GLASGOW
G12 0XH

Tel. [redacted]
Fax. [redacted]
Textphone: [redacted]
www.nhsggc.org.uk

Professor Michael Stevens
Emeritus Professor of Paediatric Oncology
University of Bristol

Date: 5th March 2021
Our Ref: [redacted]

Enquiries to: Jane Grant
Direct Line: [redacted]
E-mail: [redacted]

Dear Professor Stevens

Thank you to you, and your colleagues, for taking the time to meet with us yesterday to go through the specific areas of concern that we had outlined within the Case Note Review – Overview Draft Report. As discussed, we welcome the report and our overall focus is to ensure we provide the best possible service to our patients and their families, ensuring there is learning and continuous improvement. We entirely understand that this is an independent report and it is for you to consider the content, however we appreciate any appropriate amendments that can be made further to our discussion.

I do not intend to reiterate the issues we discussed, however as we highlighted, the organisation has been under significant scrutiny for some time. Rebuilding public confidence, supporting our patients, their families and our staff is a priority for us. Offering some reassurance within the report as to the current position within the Paediatric Oncology Service as regards infection levels would be helpful. Our staff continue to work tirelessly to maintain the low levels of infections that we see today. I understand that some of this data has been shared with you, and, as we noted yesterday, CLABSI rates of less than 1 per 1000 line days' benchmarks positively with international comparators, as referenced within your report. As noted, learning from this period is of critical importance and I understand the work of the Clinical Review Group has been previously shared with you. As well as providing assurance, the group has been highly effective against a range of aims including improving communication across partners, tightening local policy and guidance and commissioning new initiatives to maintain low infection rates within the population. This triumvirate approach of QI, Infection Control and the Clinical Review Group ensures ongoing robust focus on continuous improvement across the population.

I recognise the challenges of being given information by individuals when you have not had the opportunity to verify the overall position. As highlighted, this has been a difficult period with challenging team dynamics. Further to our discussion, there was one issue that required clarification in respect of lines 2564 to 2570. The below narrative, in italics, is an extract from correspondence received from three microbiologists in September 2017. This highlights that the ICDs set up a process and generic mail box so that the IPCT did not email them directly.

- *A generic email address will be set up, manned by ICNs for any lab results, typing results, new CF results, queries from clinical microbiologists or clinical scientists, to be vetted, dealt with and then if appropriate or necessary, raised through ICDs during working hours, or to be forwarded to data team by ICNs if relates to local epidemiology and surveillance enquiries to be handled and the queries answered. If a generic email address is not possible, then any such queries will be directed to the lead ICNs or any designated person.*

- *A generic email address will be set up to receive any ICN or other enquiries directed to ourselves, which we will check and reply to individually or collaboratively as required.*

In order to support all our staff, not just the few, again it would be appreciated if some consideration could be given to a more balanced approach within those key areas we discussed.

In closing, your offer of assistance with implementing some key recommendations is appreciated and I will ensure we maintain contact to facilitate this at an appropriate juncture. I look forward to receiving your final report and ensuring ongoing improvement as we strive to deliver a high quality person centred service.

Yours sincerely

[redacted]

Jane Grant
Chief Executive
NHS Greater Glasgow and Clyde

Line No	**Section Heading**	**GGC Comment on Factual Accuracy**	**Our Comments/Response** (Note that the line numbers quoted here relate to the draft report sent out for consultation> The line numbers will shift in the next version I send out for checking and will be removed prior to publication)
1 Background to the Case Note Review			
39	1.1 Timeline of key dates leading up to the Case Note Review		We have made some changes to the introductory timeline and added text to explain that this is our timeline and that others may see things differently. We have also referenced our use of the Super Timeline as well. We do not feel we need to respond to all the suggestions below
46		For context and accuracy the following should be included in line 46; Changes to the NICPM alert organism list were made in July 2107 and some gram negative organisms were being used as triggers before this (serratia and pseudomonas in particular, with extensive work on serratia done with HPS in 2016).	
57		For context and accuracy the following should be included in line 57; 26.3.2018 CNO invoked the HPS National Framework – currently the order and wording in the timeline has the potential to omit some of the important time points.	
72		For context and accuracy it should be added that the children were transferred back in February.	
85		It would be useful to add that the IMT restarted on 19th June 2019.	
90		For context and accuracy it should be added that this SBAR was	

		reviewed in detail at the IMT on 6.9.2019 (Review Team have these minutes). As it stands line 89 is using selective information and presents an inaccurate and incomplete version of the facts.	
127	1.2 Blood stream infections in paediatric haematology oncology patients	We append a Public Health Commentary on a number of issues, but will also reflect comments through this factual accuracy template as there is clear relevance to accuracy and context. There is published evidence of morbidity and mortality associated with blood stream infections and sepsis among paediatric haematology oncology patients. For context and a balanced presentation, it would be useful if the expected rate of BSI could be calculated for the NHSGGC unit, based on published data, could be included. The HPS Report (Nov 2019) published comparative data with GGC and 2 other Units in Scotland. This is not referenced within the draft Report and is of critical note in terms of decision making, expert advice and indeed Scottish Government support throughout the period. We believe that the lack of reference to this report is of material significance.	We will add a short discussion of the HPS 2019 report. Our prior position was that this represented someone else's analysis and we have been charged with doing our own. NHS GGC seem to set great store by this report although it is not, we think, as definitively supportive of their position as they appear to portray. There are also criticisms of its approach. We also know that it was written at very short notice. Also, as it was published in the latter part of 2019, it does not preclude our separate observations on the whole period from 2015
154-55		Again for context and balanced presentation, we request that the NHSGGC central line associated infections per 1000 CVC days be compared to rates in similar units and best practice. GGC CVC rates are currently - 0.77/1000 line days. Of note for accuracy, the clinicians highlight that peripherally inserted central catheters have not been shown to have lower infection rates compared to other types of central lines. The evidence is poor, but that which is available, supports the view that PICCs have a higher infection and failure rate. This is why they are not placed as standard in the paediatric oncology population.	We are happy to include the current rate in the report but not in this section (in the good practice section) as the NHS GGC data have not been published (we will check) OK happy to amend

2. Terms of reference and membership of the Panel			
292	2.4.1 Identification of cases	We consider this statement to be inaccurate as we believe this should state 2 patients not 3 as per cases reported in IMT minutes 25.06.2019 (Review Team have these minutes)	This is wrong – there were three cases of M. chelonae in total
296-314	2.4.2 Epidemiological and clinical outcome review	Given the known and well published risk of infections among this group of patients, it would be useful to add to the descriptive epidemiology (time, place, and person) comparison data to similar units and trends in infections along the years. This was done in the HPS Report (Nov 2019) and would present a more balanced view.	I think it fair to say that they do not understand that this section represents our TOR and is not up for change
350	2.4.2 The Paediatric Trigger Tool	For fairness and accuracy it should be stated that, even an adapted PTT has not been validated for the purpose with which it was used in this Review and the local clinicians have expressed significant concern about its use.	We will enhance our description of the PTT and its use in the CNR – but not here
3. Methodology			
442	3.1 Overall timeline of the work undertaken for the Case Note Review	We consider that significant elements of the data were not requested until August 2020 and that clear requirements and expectations for environmental and microbiological data were not articulated fully until October 2020.	We are equally clear that the requests were initiated in April 2020 and we stand by our version of the timeline
449		As noted in the CEO's covering letter, it is unfortunate that such a detailed focus is included within such a report as this on access to systems, data quality and response. There are a number of comments around availability of data throughout the report –	NHS GGC have been on this journey for 5 years and had failed to make changes to their approach to data collection and integration.

		which to the reader may appear that, GGC were being intentionally obstructive around providing data and access to systems. Clearly this was not the Boards intention and we do not believe it to be the reality. A full summary of all issues is appended however relevant sections to ensure an accurate representation are highlighted throughout this template. We do, however, accept that, in line with Boards across Scotland, the ability to link data has been limited and acknowledge that, going forward, this is an area for further action. The timeline below outlines timescales for providing access to data and systems. 19/08/20 • Elaine McCormick, Laboratory Information Systems Manager, first engagement with Marie Brown, regarding Telepath patient notepad information. • Specific patient details were provided on a weekly basis & the Telepath Patient Notepad information for the dates specified were provided back to Marie Brown as required. As described in the report the telepath notes is an internal laboratory annotation that microbiologist utilise to share information amongst this professional group to outline what they have communicated to medical staff within wards or across the organisation. PMP is an internal communication tool to enable notes to be visible to other colleagues involved in cases. This is not incorporated into the Boards portal care record as the clinical information is the detail of tests carried out as opposed to a "notepad". This continued through August – October as required with no significant concerns being raised to the GG&C team by the review team. 21/08/20	Agree – will review if we can strengthen / highlight in our recommendations. We are confident in our account of the timeline for access to systems and to requests for data

		• Elaine McCormick provided information regarding the display of results for specific patients in ICNet to Marie Brown. 22/09/20 • Data sharing agreement passed onto Elaine McCormick via Marie Brown, with regard to Telepath access for case note review staff:- - Peter Davey - Fiona Murdoch - Hayley Kane • Telepath Access Request forms were passed back to Marie Brown for completion by staff requesting access. – Access Request forms received back on 24.9.20 • Telepath training was organised on the 30.9.20 via Teams • Only Peter Davey attended. Telepath login was provided & training took place which included how to access the patient notepad. 9/10/20 • Telepath logins were provided for Fiona Murdoch & Hayley Kane. • Provided training documentation for Fiona Murdoch but login has never been used. • Hayley Kane was familiar with Telepath, as she had used the system previously in her role as an ICN. 12/10/20 • Email from Peter Davey to Elaine McCormick (with Marie Brown copied in) stating that it would be best to get labs to download the full patient notes for each of the case note review patients CHIs provided, and agreement that	

		Elaine would be able to provide the information.	
511	3.2.1 Datasets and definitions used to identify patients for inclusion in the Review	This section indicates the use of epidemiology data used in HPS 2019 review but dissents, without explanation, from its conclusions. It would be helpful if the rationale for this dissent could be made explicit in the report to ensure a full picture for accuracy.	I'm not sure I understand how it dissents but we will include a short critique of the HPS report (see also our response to page 127)
627	3.4.3 The Paediatric Trigger Tool	As in line 350, we consider it would be prudent to indicate in the methodology that the Paediatric Trigger Tool is not validated in this situation.	We will supplement the methods section with this: The UK PTT is the same as the Canadian Paediatric Trigger Tool (CPTT). The validation study for the CPTT showed that inter-rater reliability was high when triggers were identified by a nurse and adverse events confirmed by a doctor (Matlow 2011). This is the method that we used. The positive predictive value of the additional triggers in the adapted PTT was high (details are in the PTT report for the Chief Nursing Officer). We can see no reason to question the validity of the adapted UK PTT for detection of adverse events Matlow AG, Cronin CMG, Flintoft V, et al. Description of the development and validation of the Canadian Paediatric Trigger Tool. *BMJ quality & safety* 2011;20(5):416-23. If this comment relates to sampling rather than validity then the Methods already contain a statement about comparability of the GGC results with those from published studies with random sampling (lines 694-7). The same caution is repeated in Section 8.6.1, lines

			2706-9
772-3, 786		Whilst it is recognised there will always require to be judgements within a review such as this, it appears in this section, and elsewhere in the report, that judgements made are of a subjective nature without conclusive evidence which could question the accuracy of conclusions drawn.	I think this fails to realise that that there is no way to make entirely objective assessments of the situation given it is retrospective and reliant on data which are not necessarily informative or complete. We have explained the basis of our judgements in the report and we are entitled to have defined our own methodology
803	3.6 Expert Panel Review Process 3.6.5 Final Outcome Reports	It is evident that without tightly defining 'the environment' this could apply to all patients.	We knew what this meant as it relates to one of the principal questions in the TOR and it doesn't need clarifying
828-829	3.6.6 Categorising the likelihood of an environmental source for an infection	A key omission for context; there is no reference to published literature on the methodology utilised by the panel given that causality is assessed using the Bradford-Hill criteria (J Roy Soc Med 1965:58:295-300) as any observed association may in fact be due to the effects of one or more of the following: chance (random error) ; bias (systematic error) ; or confounding https://www.healthknowledge.org.uk/e-learning/epidemiology/practitioners/causation-epidemiology-association-causation As noted previously, the report lacks an explanation of why the HPS report of November 2019 is not discussed and not referred to as part of the information utilised by GGC which is considered as a key document by GGC / HPS and Scottish Government colleagues.	We can look to see if we can qualify our text to express such cautions but I think it's already implicit in the approach we have set out. We will discuss it

836		It would be useful if clarification could be given if the methodology used was validated in terms of decisions made or the credibility of the overall findings could be challenged.	We don't think it is necessary to 'validate' a decision to allocate conclusions in this way: the use of the terms Unrelated, Possible, Probable or Definite is both logical and self explanatory.
868 onwards		There are problems of definitions in the time periods that are being used. Species level clustering is not evidence of transmission events. Typing evidence that the 2017 stenotrophomonas cases were not linked to each other or to water were given to the Review 16.12.2020 and the stenotrophomonas whole genome sequencing sent on the same date with a presentation on the data on the same date. Overall unique typing evidence has been dismissed within the Review report which we consider leads to conclusions being incomplete with a selective use of available hard data.	Species level clustering is indirect evidence of transmission. We have clearly stated that other factors were included when making our assessments (Section 4.3 and lines 868-876). We have commented on the typing information and the limitations of the data provided, and crucially how such limitations relate to the sampling of the environment (water sources (see 877-896 and we do not believe we have 'dismissed' the typing evidence. Rather we have critiqued this evidence.
868-876		In terms of context and transparency to understand the patient population, it would be important to highlight that *only* hospital sources were examined. In view of the extensive time such patients spend not only off the ward but 'on pass' at home, within an inpatient episode, it is considered that the current presentation of the position is misleading.	In line 873-875 we have stated 'The latter point was complicated by the often multiple placements (wards, units and rooms) used for both inpatient and outpatient care of each patient.' The point about non-hospital potential sources of bacteraemia is valid and we comment as such in our individualised child/bacteraemia reports. We will amend this paragraph by adding at the end the following sentence. 'Given our remit, we focussed on potential hospital sources of infection, but we acknowledge that community sources of infection were possible; we did take into account the extent of out of hospital exposure

			prior to a bacteraemia when assessing infection source likelihood.'
877-883		Context and accuracy; We are concerned that claims made in the IMT meeting 14.08.2019 as to limitations of sampling are influencing thinking here, and there are major national implications for infection control if the lack of positive samples during investigations can be dismissed. All gram negatives were tested for in March 2018 and positive samples would have been found if they were there. It is considered that there is a methodological problem overall if the view is that positive samples could nonetheless exist despite negative evidence. NHSGGC followed normal practice in sampling and typing.	Are the line numbers provided here incorrect? We have discussed concerns about the consistency of sampling in chapter 5
884-895		This section is critical when the process followed is as per national protocol. The PHE protocol was followed, which was explained to the Review Team. The clinical microbiology report wording makes it clear what the comparator is at the time of typing – unique means unique, as in not found before. Whole genome sequencing builds on this but typing shows relationships in real time at IMTs and we believe it should be considered within the Review Team report.	We were unable to determine from many of the reports which strains had been compared. We understand the term 'unique' but this is a relative term in as much as unique among what? We have been clear on this point (891-895).
1021	3.7 Communication with stakeholders 3.7.3 NHS GGC	To ensure transparency of communications, it should be noted that there was no engagement and involvement with the wider IPC Team involved in these incidents, so unlike the team within the Paediatric Haematology oncology service, no opportunity was given to the IPC Team to raise concerns or ask questions, or	This is true in terms of the wider IPC team but we had several meetings involving IPC leadership.

	Clinical and Medical Staff	indeed clarify linkages and context.	
1035	3.7.4 NHS GGC Senior Management	Individual staff names should be removed from the report.	OK we will remove
4. Descriptions of cases and episodes in the Review			
1116 1136-1138	4.2.3 Diagnosis	The report states that that there was an excess of leukaemia in cases of bacteraemia compared to international studies. We believe this can easily be explained by the fact that HSCT patients are at higher risk of infection and leukaemia dominated the transplant cohort. It is surprising that transplant and non - transplant patients are not separately reported. We would appreciate it if this section was reviewed to ensure clarity. The population of patients seen in the case note review, while representative of the case mix seen in a nationally designated centre for BMSC transplant service, would be more susceptible to infections compared to other Units in Scotland – and we would believe the omission of this fact does not, therefore, provide a true reflection of the facts and, therefore, this should be altered.	No it doesn't say that, and it also explains why an excess of leukaemia is expected but I can add a comment about SCT and case mix The problem here is that patients were not all readily identifiable has SCT patients; when they were, they were at different stages – pre, peri and post; they also contained patients with non malignant diagnoses requiring SCT
1140-2	4.2.4 Frequency of infection episode	As the Review Team are aware CLABSI work reduced infection rates suggesting that 2017 incidents were not environmental. The lack of a baseline for this patient group is an issue here. Evidence of current 6A infection rates was provided recently- the latest SPC chart was sent to the Review Team on 24.2.21 and we believe that this omission, again, does not allow for a factually accurate statement and, therefore, this should be reflected.	We don't agree this statement follows. CLABSI rates prior to the QI group were very high and could only really go down The latest CLABSI chart may have been sent but this was after we had written our draft. We will however ensure that current rates are identified within the report – we have already identified the work done as

			being evidence of good practice
1153	4.3 Microbiology profile of the isolates identified in the Review	We consider this to be inaccurate as it is unclear why May 2015 was used when the move to RHC took place in June.	The data collection started in May so as to ensure that all infections were captured – in fact the first infection in the series was 21.10.15. We can add a footnote
1186	4.3.1 Enterobacter spp.	We consider that there are some facts that should be included in the narrative; Whole Genome Sequencing (WGS) was done on this and data sent to the Review Team on 5.10.2020.	This is not relevant here and is discussed elsewhere
1206-1220	4.3.5 Conclusions	Terms 'normally' and 'clusters' are undefined. The conclusions contradict HPS's own 2019 report ('*The data presented in this report do not provide evidence of a single point of exposure and there is a need to continually monitor the risk in this patient population*") which demonstrates that environmental infections were not newly seen after the hospital move – the report considered data from 2013 to 2019. 2015 was an abnormal period with low admissions due to the hospital move. There is no baseline and the Review is following a hypothesis despite existing evidence not supporting this. We are unclear what 'observations' mean. There is obviously a place cluster because only wards 2A/B population are under examination in this report. This evidence, which lacks certainty, is used to support a hypothesis, yet robust WGS and typing are not included in the analysis.	The term normally does not need defining as it is used in line 1212; it is used to describe uncertainty regarding the frequency of bacteraemias caused by two groups of bacteria. A cluster/clustering refers to more than one episode linked in time/place. This is clear from the text in lines 1213-1215, and indeed is stated in line 1218. 'The data presented in this report do not provide evidence of a single point of exposure and there is a need to continually monitor the risk in this patient population'. At no point have we claimed here that there was a single point of exposure. We stand by the carefully phrased/explained text in this section. We are clear that the data reviewed in this section represent 'a simple analysis of the epidemiology of a large proportion of the bacteraemias in this

		This must be made clear in the report to ensure the full picture is provided and to ensure factual accuracy. Throughout our own extensive review and, now genome sequencing, we have only ever been able to link the environment to infection in two patients, firstly in 2016 when Cupravadis was identified in the Aseptic Dispensing Unit and secondly a cutaneous case of *Mycobacterium. chelonae* in 2019. This position was highlighted to you in correspondence at the end of last year, however this is not noted within the report and it is not clear how this fits with the methodology.	Review'. The specific significance of microbiological typing to consolidate a relationship between isolates from different sources is discussed in detail in Chapter 8, particularly section 8.3.1, together with the inconsistent environmental sampling (Chapter 5). The Cupriavidus WGS data are referred to in our report (line 2512). We also use the data in some of our individualised child/bacteraemia reports (not provided here). Similarly, we have discussed M. chelonae data in an individualised child/bacteraemia report. We will amend the following paragraph (line 2514) as highlighted in yellow. 'We note that the typing instigated by GGC was able to definitively link the environment to infection in only two patients; firstly, in 2016 when *Cupriavidus* spp. was identified in the Aseptic Dispensing Unit, and secondly a cutaneous case of *Mycobacterium chelonae* in 2019. However, we conclude from the above that there are too many gaps in terms of which isolates were included (alongside the inconsistent environmental sampling – Chapter 5) to be able to interpret from these WGS results the true extent of relatedness between patient and environmental isolates.'
1210		There is a contradiction here noting that Klebsiella is the second most frequent cause of bacteraemia and that it can't be said if the numbers are higher than would be expected normally, and	We will review the wording (I think this point arises elsewhere in feedback too)

		yet later in the report, you advise we should have spotted clusters. See later comment on Example 8.2.	The point of this example is that there should have been an investigation not that we are saying these are definitely environmentally acquired
1211-1215		The use of statistical methods (like indirect standardisation) would be more suitable to assess the chance of a real excess number and to avoid the cognitive bias of "Clustering Illusion".	
5. The Role of the hospital environment as a source of infection			
1260	5.1. Context	This should be corrected to read *Scottish Hospitals Public Inquiry.*	No its called the Scottish Hospitals Inquiry – I will check again
1299-1304		As noted in the CEOs covering letter, we are concerned that, in such a scientific and fact-based report that statements such as 'some feel' are included, rather it is important to present in a factual manner. Without balancing these statements with the overall views of the clinical teams, it cannot reflect the overall clinical views. The response to concerns referred to in this section were minuted in the IMT on 6/9/19 and were acted upon. There followed an extremely robust process to reopen 6A involving the work of HPS (November 2019 Report) and the Scottish Government. (Review Team have these minutes). Factual accuracy here is critical acknowledging the Public Inquiry now underway. Of interest is that one of the microbiologists, known to the Review Team has recently published an article noting that infection rates have remained low in 2020: Inkster, T, Cuddihy (2021) Duty of Candour and communication during an infection control incident in a paediatric ward of a Scottish Hospital: how	Nevertheless that's what some feel….. but we will review and tighten up language as seems appropriate This section refers to SBAR reference 49 not IMT notes The inquiry has been referenced previously in the report This is interesting but not of relevance to our observations

		can we do better? J Medical Ethics 2021;0:1-5 We refer to the most up to date safety data as detailed in Appendix 4.	Not dated and no author , how does this link ?
1320-9	5.2 The built environment and its maintenance	As explained to the Review the limitations of the Estates and Facilities systems are the same across NHS Scotland and the result of the national system in use.	The 1320-9 is factually correct regardless of whether this is the same across Scotland . In the context of learning this is a point of learning for Scotland
1334		We would be interested to know of any examples of links of this type as this seems to contradict the hypothesis of an environmental link.	This is not a factual accuracy comment.
1345-7		This is inaccurate. An Estates Action Plan, which details actions in relation to 6A 2019 IMT hypotheses including chilled beam work, was sent to Review 14.10.2020	This refers to an action plan, from an IMT (incomplete) The report statement stands as we are referring to planned maintenance not in response to incidents .
1356 etc, 1399	5.3.1 IPC audits	1378 : IPCAT audits were sent to the Review team on 4.9.2020 in response to request of 26.8.2020. No evidence that requests for something different were made by the Review Team. Facilities audits were supplied with Estates data later in 2020. The narrative is suggesting poor practice and this is inaccurate. The Scottish Government reviewed this process during the work of the Oversight Board so it is surprising that this is again being included in a parallel process. *Facts noted below in terms of Audit process;* IPCAT provides the Board with a profile of staff knowledge and practice with assurance in areas such as SICPs implementation and the implementation of care plans to reduce the risk of	We acknowledge this is an inaccuracy and will review and amend as audits are called FMT audits and saved in the maintenance data folder , received from 2015-18 all score highly . Delete paragraph 1376-1381 Replace with this new text We have reviewed the domestic and estates facilities management tool audits made available from 2015 to 2019. All the audits we reviewed demonstrate high compliance to the standards set in the National

		infection by invasive devices. (IPCAT - Safe IPC Practice in Acute Care was rolled out across NHSGGC Acute inpatient wards during 2015/2016 and comprises four sections; standard infection control precautions (SICPs), transmission based precautions (TBPs), safe patient environment (SPE) and quality assurance (QA) and this process was reviewed and following feedback from HIS report in 2019, we rationalised yet strengthened the process in May 2019. In addition the IPCAT Strategy was also reviewed to ensure alignment with National Monitoring Framework (NMF); thus establishing a framework which adds value to the audit process and supports a quality improvement approach. Following an IPCAT an action plan is automatically generated on the day with a timeframe for completion and separated into three clear categories (short, medium and long term). A lead is identified to ensure completed actions are recorded to provide a brief summary of rectifications/action taken including any further investigations and highlight local changes/interventions required to achieve reliability. One month following completion of IPCAT the IPCN and SCN/Departmental Manager will re-audit together any red or amber sections of the audit. Audit results and an action plan will be available on the IPCAT dashboard immediately following any re-audit and actions/findings followed and actioned up with Lead Nurse/Head of Department and agree an ongoing programme of re-audit locally to monitor for sustained improvement. All reports and related assurance information/data are available and a sample previously forwarded to the team. Once the follow up audit is complete the SCN should discuss with their lead nurse and agree and ongoing programme of re audit locally to monitor for sustained improvement (tools available	Cleaning Services Specification (need to change reference 54 to the reference for national cleaning standards). IPCAT line 1399: delete “no action plan was identified and Restart As a gold standard was reached …….. It has been included as the IPC practice, compliance and improvement culture has an influence on the susceptibility of infection acquisition This was not shared during the review , we cannot include this after the event and we are commenting only on the information we were given having requested any IPC documentation at the time We did not see assurance of complete audit cycles , ones we saw were incomplete This is a description of a process of what is supposed to happen but we did not see evidence that this occurred from the documents we observed. We are now

		online). The frequency of this should be agreed with the SCN/LN.	informed we have seen a sample not all Again describing process not changing the context of the findings
1388		All NHS GGC audit activity has been subject to scrutiny by the HIS Inspectorate during unannounced HEI inspections benchmarking NHS GGC audit activity against HAI Standards (2015) used to drive improvement. IPC audits are available for both wards 2a and 2b for 2016, 2017 and 2018 and for Ward 6a in 2018 and 2019, with audit results and action plans to be taken forward by the SCN to undertake improvement strategies. Completion of this work is recorded in the returned completed action plan within 1 month of IPC audit. Some criteria are identified as critical. Non-compliance with any critical criterion must be actioned with evidence of improvement within 24 hours. Please see actions completed within the IPC audit results and actions plans for each year. The IPC audit results are reported in the monthly sector / directorate activity reports. Lines 1385; 1395. Following an unannounced inspection undertaken at Queen Elizabeth University Hospital January 2019 the report highlighted a risk of overall IPCAT scores giving false assurance and not being reflective of individual elements of the audit where a score is low. The NHS GGC IPCT were invited to join a national group to write the National Monitoring Framework(https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2678/documents/1_national-monitoring-framework.pdf)and subsequently took a proposal to the Board IPCC in November 2019 for approval. The IPCT revised the IPCAT audit tool and process as described in	This is a statement of what should happen - reviewed and text revised Not shared or seen We agree with this and this is what our perception demonstrates within the report. This does not change factual accuracy of the report

		an SBAR and revised strategy SOP: Embedded docs taken out- See separate files for attachments This new process was being tested at the point of the COVID-19 pandemic.	 Outside of the review timescales. irrelevant to the report
1407		In terms of context please note the below details. 2A/6A underwent frequent IPC, SCIPS and hand hygiene audits during 2015 and 2019 SCIPS – 27 audits undertaken by senior nurses within the ward between 2017 and Dec 2019.This was at a greater frequency than prescribed by the process given the focus in infections, infection control and continuous improvement. Of the 27 completed audits 26 were gold (a score over 90%) and one was green (80-90%. Nonetheless, action plans were undertaken in 20 of the 27 audits. All IPCATS undertaken had action plans as described above, these reports were tabled and discussed at the W&C directorate local Hospital Control of Infection Group as per examples stated below. IPCAT Audits were undertaken with more frequency than the tool required given the concerns and focus on infection control and improvement. All Audits had action plans completed as per the dates below.	This did not demonstrate improvement, Frequent? How frequent and not shared (mcgs – I need to check this) Not shared Not shared Not shared Reviewed and changed in text 1399

Year	Ward	Date of audit	Score	Date all improvement actions completed
2016	2a	01.02.2016	94	02.02.2016
2016	2b	13.09.2016	97	13.10.2016
2017	2a	10.02.2017	89	10.03.2017
2017	2a	19.04.2017	87%	19.05.2017
2017	2a	04.05.2017	96%	04.06.2017
2017	2a	07.11.2017	93	07.12.2017
2017	2b	22.08.2017	94	22.09.2017
2018	2a	01.08.2018	96	02.08.2018
2018	2b	22.08.2018	98	22.09.2018
2018	6a (2a)	01.11.2018	94	01.12.2018
2019	6a (2a)	30.10.2019	97	30.11.2019
2019	6a DCU (2b)	18.12.2019	97	18.01.2020

We have not seen these reports

Embedded docs taken out- see separate docs

The IPC audit reports are included in the sector/directorate reports to the senior management team for the Directorate which are tabled at discussed at the W&C Clinical Governance Committee.

Nor these

Embedded docs- see separate docs folder

		The audit reports are also tabled in the report to the Acute Clinical Governance Committee and the IC committees Embedded docs taken out- see separate docs folder In 2016 the IPCT tabled an SBAR at the BICC describing the local responsibilities to ensure a clean safe environment. To support this a bed space checklist was created for use by nursing staff to ensure that the patient bed space was clean. A weekly assurance checklist was also developed for use by the SCN weekly to provide assurance that patient equipment is clean and safe. These forms are completed in ward 2A/ 6A. Embedded docs taken out- see folder The completion of these audit tools is monitored as part of the IPC audit programme. In light of the Vale of Leven Report and recommendations, NHS GGC IPCT developed a process by which key elements of SICPs would be monitored jointly by members of the Facilities team, IPCT and our public partners. The public partner would chose a ward to visit on the day. The audits were devised to allow direct observation of the clinical environment. Please see attached examples: Embedded docs taken out- see folder	I am not sure we have seen these - check
1412-8	5.3.2 Enhanced supervision	To ensure an understanding of the approach we would note the following;	No change as there isn't any assurance and there were

		Enhanced supervision sessions were set up to ensure a multi-disciplinary approach (nursing, IPC, estates and facilities focused on scrutiny and real time action. This MDT process took place weekly and immediate actions and improvements taken. The nature of these sessions was supportive and improvement focused and consequently actions not always recorded. From late 2019 the paperwork was amended to include a section for completed actions. These are reported thought the 6A clinical review group. The process has proved effective at maintaining close working relationships and speedy responses to issues as they arise.	repeated failings and no sustained improvement Change of paperwork noted No evidence of further assurance received, this is new additional information
1453	5.3.3 Hand hygiene	A list of hand hygiene audits with dates were sent to the Review on 4.9.2020. In addition, the enhanced supervision process includes hand hygiene surveillance. Since 2008 all Senior Charge Nurses are required to complete a Hand Hygiene (HH) audit every month. This is linked to MQCIC and submitted nationally. 52 were undertaken locally between 2015 and 2019 All were above 90% with the exception of one which was 88%. In addition the HH co-ordinator was required to submit compliance data on a random selection of wards nationally for many years however this was stepped down. However importantly, NHSGGC continued to employ a dedicated HH coordinator (HHC) and in response to a HEI inspection recommendation the Board HHC undertook to conduct audits in area who locally reported 100% compliance to assure the organisation that this is being correctly audited. The HH coordinator undertook audits within ward 6A and n 2019 alone	Not an issue of factual accuracy This is describing the process, No change in text considered necessary New information and no change to text considered necessary

		undertook 29 audits all of which were 95% or over. IPC audits also included HH and action plans were completed as required. When a HH failure was picked up on within the unit the member of staff was immediately alerted to this and the SCN incorporated it in to the ward safety brief and team meetings. The audits identified the professionals involved and were focussed on learning.	No change considered necessary
1470-5	5.3.4 Conclusion	In light of the above evidence we would consider this conclusion inaccurate.	There is no evidence in the IMT that IPC audit was used to drive improvement . The above statements are not evidence they are statements of process not what actually happened and was subsequently shared with the panel
1477	5.4 Environmental microbiological surveillance	There is no agreed national standard on environmental sampling but there is a local SOP. A detailed email was sent on 31.12.2020 detailing laboratory processes.	We accept this point; but we have not claimed that there is a national standard. We had asked for clarity on such methodology on several occasions.
1490		Water samples were tested for all gram negatives by March 2018 and environmental sampling was directed by the LICD on the basis of IMT decisions, with action as per the above email sent 31.12.20.	No change to the text is considered necessary.
1492-8		As already noted, a decision to take a lack of positive samples as indicating a lack of evidence rather than a lack of microorganisms in the environment, has major national implications for infection control. We would note that there is no national guidance on drain swabbing and there is evidence that other NHS	No change to the text is considered necessary. At the start of section 5.4 we state: 'In contrast to water sampling (section 5.5), we recognise that routine microbiological sampling of so

		organisations do not do it. The Interim IPC Director stopped the process early in 2020.(Email evidence available)	called 'hard surfaces' offers little to routine IPC practice but we consider it relevant in the investigation of outbreaks of specific or unusual infection providing it is undertaken systematically.'
1505		This was undertaken at the behest of the IMT so systematic in that sense and, as previously highlighted, these were undertaken in real time for IMT decision making. Routine environmental sampling is a major resource issue and we are unaware of any NHS organisation doing it. Any guidance should come from HPS and national bodies. Serratia was added to the alert organism list within GGC on advice from HPS in 2016 and this organism did not appear in the NIPCM until 2017.	We do not agree that IMT recommended sampling constitutes a systematic approach. The key point here is that for several years there were heightened concerns about the potential contribution of water sources to infections in children. The water sampling in place did not appear to us to be commensurate with such concerns – it was not systematic.
	5.5.1 Water testing policies and practice	To ensure the GGC position is accurately reflected please note the below; Embedded doc taken out- see folder HPS guidance on pseudomonas was issued in 2014 SHTM 0401 Part c which GGC adopted in 2016. The fact that HPS did not put it into policy until 2018 did not deter GGC from testing. Please see attached document prepared by one of the microbiologists in 2018 providing demonstrable evidence of testing.	We discussed this specifically with LICD and were not told this. Why did NHS GGC not put it into policy? How are we able to tell that this is as they say it is. We can change the text but add this reservation
1554-1566	5.5.2 Water testing at NHS GGC	To suggest there is no water testing strategy is entirely inaccurate. The GGC water sampling schedule was sent to the Review on 25.09.2020. HFS have signed off the testing regime with the Authorising Engineer (AE) affirming the position. This process has been in place since 2018. As noted the organisation have been testing for all Gram neg bacteria since 2018.	We have not stated that there was no strategy. Rather, we have stated that we do not understand its rationale given the concerns in place. The text and examples in lines 1554-1602 set out the reasons for this position.

1559		The laboratory SOP has clear guidance on communication – see above re email. We would welcome evidence to show staff were denied access to water sampling/testing as none has been presented to GGC to date and inclusion of such statements without verification in a report of this nature is considered factually inaccurate.	Verbal information from one of the NHS GGC staff we met
1580 onwards		We request that this section be removed. Specifically: **Line 1582** All samples are booked in as potable and are reported according to drinking water standards. In the LIMS (Telepath) system POTABLE is the code for all such waters, other types of waters we receive are POOL and ENDOSCOPY etc. These codes determine how they are set up and what is reported as per the associated standards and SOP. **Lines 1584-1587** The 'target organism' is presumed to be taken from the column on the DMA part of the spreadsheet 'Analysis Required' and does not represent what was tested as this is information is from the DMA files (which we merged to the laboratory dataset to allow for location) and not from the laboratory system. The lab would look for and report everything (all or any Gram negatives) unless directed otherwise by the ICD. On occasions when a specific organism was requested by the ICD then most of the time that being isolated or not would be the only thing reported, again this would be under the direction of ICD.	We repeatedly asked for clarity about was sampled/tested/when. From the reasoning provided here, I believe we should retain this section.
	5.6 The	As noted previously, it should be made clear that the	See also our responses to: line 836 regarding

	likelihood that infections were linked to the hospital environment.	methodology used is not validated. The time frames used to link cases are unclear and it is not clear if non-hospital patient locations were being allowed for.	methodology and line 868 regarding non patient locations. As far as time frames is concerned we looked simply at patterns of cases over time and commented when we considered these likely to be excessive
1613		There is contradiction here, the report states that patients with possible or probable environment related infections add up to 100% of the relevant cohort. This cannot be correct because 9 patients were in neither category.	I will check to ensure there is no arithmetic error
1621-1626		The implication is that 'definite' links could have been made with more and better data. As previously indicated, GGC have made 2 definitive links (as stated in the email of 31.12.20) so it is unclear how the methodology actually worked and how conclusions have been drawn. Clearly, in the future, lessons will be learned in relation to the availability and issue of data quality but, as outlined, this is a complex area in an unprecedented set of circumstances which GGC was seeking to proactively address with input from a variety of external agencies and experts.	We think this comes down to the adequacy and frequency of environmental sampling and the patchy data that ensues. There seems to be a difference of view between us and GGC. We say that the lack of positive samples to provide environmental links does not exclude that one exists; they seem to suggest that the lack of positive samples establishes there is no link. The Cupriavidus WGS data sent to us on 31.12.20 included one patient from Ward 2A with a sample from 25.2.18 (which doesn't match the date of infection or either of the patients with Cupriavidus in the CNR) and 7 environmental samples from ward 6A taken on three dates 18.11.19, 7.1.20, 14.1.20. This is far from an adequate sample to exclude an environmental source. Should we add this?
1640		It is unclear what the statistical claims here are based on and would benefit from clarification for accuracy and transparency.	Not sure why clarification is required (or that there is any issue of transparency to address) – it merely shows that there are more Stenotrophomonas infections in the group we consider "Most Likely" than might be expected by chance. We comment on this later in the

			report
1643-8		This is an inaccurate summary of the situation. This reflected when water tests were positive and is when NHSGGC took major action with reference to the water system.	I don't understand the objection. It is merely an observation
1649-57		We would request that this paragraph notes that GGC took major and proactive action at this period. Supported by external agencies and national experts.	Happy to amend the text to read: "…. we suggest NHS GGC, acting with the support of external advisers, also recognised that some links with the environment were likely on the basis of the interventions…."
1652-1654		We consider this to be inaccurate. The control measures were instituted on the basis of the precautionary principle and should not be used as evidence of causality. This should be reflected for completeness and also the fact that GGC were responding to what was a very complex, evolving situation.	We were intentionally cautious with our language here: "…NHS GGC also recognised that some links with the environment were likely…". We don't specify causation, but one might expect that control measures of this magnitude require more conviction of causation than suggested by a "precautionary principle"
6. The impact of infection on patient outcomes			
1674	6.1 Background	Inaccurate - there were 22 deaths	As we now know – NHS GGC failed to notify us of the 22nd. Indeed, of the 4 deaths that occurred since the CNR has been running, they proactively informed us of only 1. We will now update all the relevant figures in the text
1808-1825	6.3 Details of the children and young people who have died	Key issue of accuracy and also potential for overall conclusions drawn. The report repeatedly states that of 21 deaths 2 were related to infection. One child we can identify and agree with the conclusion. It is difficult to identify the second child and appreciate that patients must be anonymised. [redacted]	These comments refer to GC03 and GC04. I have again been through the clinical information that contributed to our timelines, have reviewed death certificates and M&M reports and remain confident about our conclusions but I have suggested an adjustment to the

1816 and 1823		[redacted] We would welcome the opportunity to discuss this with the Review team. [redacted] to acknowledge that the stem cell transplant clinical team at the time was of the opinion that the main cause of death was progressive EBV-related post-transplant lymphoproliferative disease. Although there is no doubt that the reported gram negative infection contributed [redacted]	text in Section 10 (see below). I will amend the text from lines 1812-1819 to ensure consistency (I will also need to change this section to reflect the increase in deaths from 21 to 22)

		[redacted]	
1859 1883	6.4.2 Datix system data	This refers to a patient with a megacolon from C diff and the wrong categorisation of the Datix. Again we can't confirm, or refute because we can't identify this patient, but again, we would welcome the opportunity to discuss this. This entry refers to the infusion of bacterial contaminated stem cells. Stem cell collections are tested at time of collection, processing and at infusion. Contamination is often at laboratory level and not actually in the product. Infusion of a contaminated product would be reported to the HTA which is the regulatory body. We can confirm that any contaminations whether in laboratory samples or product have been reported to the HTA. Furthermore we understood this review to deal with gram negative bacteraemias, so not clear on the point being made. All contaminants have been gram positive skin contaminants.	The patient is easily identifiable from the Datix reports that you sent to the panel. The incident is described as "Severe Clostridium Difficile Infection" but severity is coded as Moderate. The point being made is that bacterial contamination of stem cells is an infection control issue. The decision about reporting this incident on Datix in addition to HTA was made by GGC. We are suggesting that if you are reporting these incidents on Datix you might identify them as infection control rather than Laboratory/Specimen incidents. We will review the text to see if we can clarify this
8. Areas of concern			
	8.1 Data availability and data quality 8.1.1 Access to NHS GGC Information systems	As noted in 3.1 accurate timescale for data access. The process and timescales for the original ISA were as follows: 14/02/20 Caldicott Guardian and Director of Public Health Linda de Caestecker sought advice from DPO on DP/IG requirements re case note review. 17/02/20 Emilia Crichton, Deputy Director of Public Health asked the Board Data Protection Officer to put an Information Sharing Agreement in	We have no concerns about these dates

			place 19/02/20 Draft ISA completed but further details were required from others to conclude the agreement 20/02/20 Meeting with Information Governance Team (Jackie Henderson), Professor Bain and others to discuss ISA and finalise information required. During the week commencing 24th February the Board Information Governance team discussed outstanding requirements and kept in touch with Profession Bain via email on 27/02 with regard to a key meeting planned on 03/03 with the Board Head of Information Service, Jonathan Todd and Dr Patricia O'Connor and Shona Cairns who were progressing things on behalf of Profession Bain. The purpose of this meeting was to discuss the clinical information required for review and to seek clarifications required to complete the Information Sharing Agreement. 04/03/20 Emilia Crichton, Deputy Director of Public Health, queried why so many people required access and asked if they could be given pseudo anonymised data. J Todd explained why this was not possible. 05/03/20 Emilia Crichton requested further detail on methodology on appendix in ISA which Jonathan Todd followed up on. **06/03/20** **Information Sharing Agreement was signed off by Emilia Crichton** There were subsequent requests for changes and additions the majority of which were dealt with quickly. However, there were areas that took a little longer - the detailed timeline is set	

			out in a separate tab refer to appendix. The Board's Deputy Director of Public Health, Emilia Crichton was initially concerned about the amount of people being given access and therefore she requested that all of the requests and changes were approved through her and not delegated to the Board Data Protection Officer. There has been learning from this exercise in that changes were not anticipated and with hindsight, to avoid unnecessary delays, a change process should have been considered and approved and this will be done for any future complex projects or enquiries.	We are pleased that there has been learning from this experience
		02/3/20	Email from Dr Patricia O'Connor to Jonathan Todd – Head of Information Management Hi Jonathan, Thank you for your time and support this morning. We have made tremendous progress on sorting out the processes we will need to access the records required for the case note review. Shona will forward the HPS protocol under separate cover along with the additional individuals required for the GG&C accounts from an epidemiological perspective . From the PPT perspective the individuals requiring access to the clinical records and portal are: **Paediatric Nurse**: Mr. Peter Campbell, Associate Director of Nursing, NHS Lothian. [redacted]	We are not sure why this has been included

2087		[redacted] **Paediatrician**: Dr Linda Clerihew, Consultant Paediatrician, NHS Tayside, [redacted] **Haemato-Oncologist**: Professor Hamish Wallace Hamish (NHS LOTHIAN) [redacted] **Infectious Diseases Consultant**: Professor Peter Davey [redacted] **ICP Nurse**: Lesley Shepherd [redacted] **Paediatric Pharmacist:** Dr Jacqueline Sneddon, Project Lead for Scottish Antimicrobial Prescribing Group, Healthcare Improvement Scotland, [redacted] **Review Co-ordinator**: Dr Patricia O'Connor I already have access(including remote) I just need the permissions levels to access the clinical portal and trackcare [redacted] Let me know if there are any other details you need. I look forward to next steps to test out access and use of the tools next week. Kind Regards Pat Dr Pat O'Connor RN, RM, BSc, MBA, PhD Honorary Professor University of Stirling Faculty of Healthcare Sciences and Sport Executive Director QI Discovery M: [redacted]	

		email: [redacted] skype: [redacted] 02/3/20 The Board's eHealth Directorate received the names of those involved in the review and a request to set up accounts submitted on 3/3/20. Clarifications received from user provisioning team on 4/3/20 re level of access required. Confirmation of accounts set up was issued on 5/3/20. 02/7/20 Accounts were originally set up to expire on 30th June 2020 when it was anticipated the review would be completed. A request was received on 2/7/20 to extend access as work was ongoing. Access to accounts was extended on the same day (2/7/20). <u>It was however noted that on the 25/8/20 the Review Team and Board agreed to add additional system access request to the Information sharing Agreement. This would imply that at this stage there was a recognition that a deep dive into the laboratory system was required – as opposed to the clinical information contained within the case notes.</u> - Telepath (Board Laboratory system) - eViz (is a system for files shared through secure project within eViz Tableau, a server operated by NSS BI to support secondary use of data manipulation in order to carry out retrospective review) Access to both was approved by Emilia Crichton, Deputy Public	

		Health Director on 1st September. Training and completion of access forms required for Review Team: • Hayley Kane (Infection Control Manager, NSS) • Professor Michael Stevens (Expert Panel) • Professor Mark Wilcox (Expert Panel) • Gaynor Evans (Expert Panel) 01.10.20 Marie Brown asked Wilma Kilroy to extend access for 4 team members until 31.03.21. 01.10.20 J Todd confirmed to W Kilroy that this access was required 01.10.20 W Kilroy confirmed to J Todd she would arrange this once she received the login names with M Brown and others cc'd in. However, no-one confirmed the login names to W Kilroy, so the accounts were never extended. The Board DPO was on sudden bereavement leave from 19.10 - 08.11 and access was approved the day she returned on the 9th November. However given there is a wider governance infrastructure and she has deputies who were known to the Review Team and an escalation within the eHealth Directorate/Caldicott Guardian route exists this feels like a breakdown in communications from both the Review Team and the Board and to highlight this in the review report feels uncomfortable for both parties.	On 1st October, we raised an urgent request for access to be extended (after the initial request on 4th September 2020 was agreed but the team still lost access on 30th September 2020). This is inaccurate and we have the email trail to evidence this. Including the original email request, 3 emails were sent to Stewart Whyte and Isobel Brown on this occasion.

2117	8.1.2 Environmental microbiology and facilities work data	See previous, we would appreciate it if this could be put context that senior management were not apprised of actual data needs for estates and microbiological sampling until well into August 2020, or told that earlier communications directly to GGC departments had not provided what was needed. Whilst not factually incorrect a conversation with appropriate senior management could have made this clear at the start of the Review process and it is unfortunate this did not occur. 2114 is misleading in view of actual communications that took place especially role of Interim IPC Director. First explicit data request via her was 4.8.2020 – earlier communications seen suggest 'chat' or 'meeting' with no clear ask.	Email requests for data were sent by Professor Marion Bain to Sandra Higgins 'for all environmental microbiology sampling data' and to Gerry Cox for HAI-SCRIBE data from April. Initial requests were from Prof. Bain. (Director of Infection Prevention and Control NHS Greater Glasgow and Clyde at that time). GGC need to liaise with S Higgins and G Cox to understand the full history of the data request, they are missing parts of the 'jigsaw'. We are confident that the data in our time line (Appenndix A) is correct)
		Full case note review labs Information:- Sandra Higgins, the Microbiology Service Manager & Elaine McCormick worked on data provided by DMA (3rd party) & Telepath extracts to identify every water sample taken during 2016 – 2020. An extensive piece of work was carried out, to marry up the Telepath data & DMA (third party data), to identify what location each water sample had been obtained from 2016 onwards where Telepath data was combined with data from DMA (Third Party Supplier responsible for Water Sampling). The reason for the delay was that all Telepath records prior to 2017 were manual and not electronic therefore there was a lengthy and manual process to review all paper records and marry up	Agree

		with samples and add to the requested consolidated data set. This was provided to Alastair Leonard on completion for submission to the review with the process undertaken explained to the Review Team. **Page 64 – Section 8.1.2 around 2101** **File Description — Final Submission Dates** 2015 Potable Water Samples — 13/11/2020 2016 Potable Water Samples — 13/11/2020 2017 Potable Water Samples — 13/11/2020 2018 Potable Water Samples — 13/11/2020 2019 Potable Water Samples — 13/11/2020 For Potable Water samples this involved merging LIMS (Microbiology Telepath Records) & DMA external company records. We also reviewed these once completed alongside the paper records to ensure there were no omissions or inaccuracies due to merging different data sets. In addition to this pre April 2017 the laboratory was working on a paper based system and only introduced the LIMs system therefore all records up to that date had to be transcribed from paper records. **File Description — Final Submission Dates** 2015- Nov 2020 Environmental Surfaces — 13/11/2020	

		File Description **Final Submission Dates** 2015 Reference Lab File 16/12/2020 2016 Reference Lab File 16/12/2020 2017 Reference Lab File 21/12/2020 2018 Reference Lab File 10/12/2020 2019 Reference Lab File 11/12/2020 The reference laboratory files involved extracting samples from the LIMS that had isolates referred to PHE for typing. To ensure nothing was missed GG&C requested from PHE all Gram Negative Isolates that had been referred to them from the QEUH. This formed the master files that GG&C then had to request administration staff to transcribe the complex reference laboratory results. This was a long process due to the amount of information and as we stated is not something that GG&C staff routinely do. However the Case Note Review report implies that (page 15 449 – Communication and engagement with NHS GGC) requesting critical data for Panel consideration began 8.4.20 and continued until a final set of data was received on 21.12.20) but doesn't clearly articulate the work required to map a vast dataset of a 3rd party to that data which the Board was able to generate and provide. Again under 3.1.1 the report outlines (line 464) that data extraction had been successfully established, but (line 470) the	I think our principal question is why NHS GGC didn't have these key data already available in a form that would not only have been helpful for us but would have been an integral part of them being able to investigate the situation for themselves

		extent of the lack of data to support the Review was becoming apparent. All these points do not actually reference the work GGC was undertaking to marry up external and internal data sources for extraction however the report is written to imply multiple requests were not fulfilled – with no recognition for the size and scale of the task - despite the time taken for DMA to submit data as they had also had their own manual process in place and it took a few meetings led by GG&C in order to get the data in the required format. **Reference Laboratory Reports:-** Reports for isolates sent to external Reference Laboratories, for both patient & environmental samples were stored locally. Any reports associated with a patient, were scanned locally onto Dart (an internal laboratory system which associated a record with the original Telepath laboratory number) and scanned into the Board electronic record so viewable by all. This allows scanned documents to be viewed in tandem with the Telepath result. Reference Laboratory results are not transcribed into Telepath. A report is issued saying the report is available on Portal & the original Reference laboratory result will have been scanned to Portal against the patient record. This is in keeping with UKAS guidelines and practice in other NHS Boards.	
2128-2138 2130	8.1.3 Laboratory information systems	The request for access was not cascaded down to the IPC Team. ICNet is a Live application and all users have had training on how to access and use the system. Ann Kerr received an ad hoc	Only after Pat O'Connor was advised that this would be the only option (until the matter was escalated on 13th

2131 2137		telephone call (August date) from Patricia O'Connor asking how best they could obtain the required information to assist with the Oversight Board Review in the easiest format for all. Individual patient records can be easily converted to a pdf format (Complete patient records report) and this was agreed by Patricia O'Connor to be a viable solution. The requested pdfs for each of the five cases were provided timeously and contained all information held on ICNet for that individual at that point in time. We consider this to be supposition and not factual. Ann Kerr had explained to Patricia O'Connor that the ICNet Complete patient records report held all information recorded on the system for that patient. Read only access was given to five Oversight Board review team members on the day of request (04/09/2020) by the IPC Data Team, however only one person has accessed the system (audit trail available) Embedded doc- see folder	August). We asked for a 2nd opinion from someone who worked with ICNet and their advice was that 4 out of 5 downloads did not include all information the Panel would require.
2169	8.1.4 IMT and PAG meeting records	Timeline of IMT actions September 2018-October 2019 as sent to HPS in 211119 action plan was sent to Review 14.10.2020 This requires to be reflected in the paragraph.	But the case we refer to, was in March 2018 and not in the period from September to October. The example we give shows that whilst the IMT said water samples were positive, we couldn't locate it in their original records – it was only apparent after the work done in the autumn of 2020 now showed it to be present. This did not give us confidence that data collection and storage in relation to IMT business was robust
2205	Also 8.6 Adverse event reporting	We acknowledge that the SOP states that the incident should be reported on Datix. However, Datix is really a tool for the investigation of individual cases and we are not aware incidents in other boards are recorded on Datix. The requirement within	It is not clear why reporting one or more of the cases from an outbreak investigation on Datix is not workable. Investigation of individual cases via Datix could identify valuable learning points.

		the SOP has not proved workable and will be removed once discussed with the BICC.	
2242	8.2.2 Compliance with the process		
2233-34		The incidents were investigated in line with national guidance available to GGC and all incidents were reported to HPS in line with guidance. The progression of an incident from the PAG to the IMT was at the discretion of the LICD using the available data at the time.	The point we are making is that there was a lack of breadth in the thinking at GGC if they were indeed only responding to what was obviously a difficult situation by relying on the 'letter' of national guidance. In fact the NIPCM gives a degree of flexibility (see line 2240). GGC would not have been penalised for investigating more readily; the fact they didn't suggest they didn't believe there was a problem
2242		The term HAI is a national term.	OK but the point is that they debated whether or not cases should be investigated on the distinction between the two definitions used and, in our view, shouldn't have done
2251		The report notes reservations on the use of SPC charts, however this is the recognised and advised method used by HPS/NHS Scotland which therefore presents challenge to GGC when we were taking the advice of our national experts in this situation. This requires to be reflected. • The rate per 1000 OBD SPC chart templates used in the October 2019 HPS report (Review of NHSGG&C paediatric haemato-oncology data) report were provided by HPS (ARHAI) to the IPC data team following report publication. We have continued to populate these each month using bed occupancy data from NHSGGC Business Intelligence. • Run charts with patient case numbers have also been	We are expressing caution in relying on SPC charts when the number of observations is very small (so that confidence limits around changes in numbers of observations are correspondingly large) and when the significance of an observation of a bacteraemia is complicated by the number of different types. Indeed, the HPS report itself says "In the monthly analysis of environmental bacteria positive blood cultures, the numbers were small and should be treated with caution. We will amend line 2251 as follows: We have reservations about the reliability of SPC charts

		produced since November 2019. • These charts are shared with W&C General Manager and Lead Nurse as well as IPCT. • SPC charts are not used solely as an individual means of data reporting, but are helpful in providing a visual graphical display which shows problems (but not the cause of the problem) and aid quality improvement over time. SPC charts are used extensively in healthcare but this was only one method used in the analysis of cases. In the HPS review published in November 2019 HPS commented "*Reviewing monthly SPC charts has been shown to be an appropriate method in identifying triggers and outliers when a stable period can be used to set the mean. In this review, the crude incidence rates before and after the move did not reflect the variation in incidence over time within this population. The changes in activity, in particular the occupied bed days, have highlighted the importance of considering activity when interpreting charts and where possible to use incidence rates in SPC charts. The use of grouped case definitions have allowed the data to be reviewed without reporting bias of selecting significant organisms or over reporting when multiple organisms are isolated from the one patient*." In addition to SPCs during the water incident, epidemiology curves and timelines were also used. Evidence was presented to clinicians on 26.09.19. The current methodology promoted by HPS and now used in 6A, PICU and NICU are chart based and add in occupied bed days. In addition triggers were in place from 2017 which were entirely dependent on small numbers. Part of the learning from these incidents and indeed reservations from the clinicians (set out below) led to a new	used in this setting (although GGC followed a process as recommended by HPS). The fact that their experience led to a new methodology is an acknowledgement that the original version was not optimal. We add some more text about the HPS 2019 report and also amend the text to read : "…..we have also found it helpful to look at simple timelines and clusters of individual Gram….." The clinician comment given at the end of this section is of interest and seems to reflect our view (I wonder why they included this?). Overall, there has been a lot of debate within GGC and at IMTs about the best way of monitoring trends and we are mirroring this.

		methodology recommended by HPS and is now being piloted by GGC with evaluation by HPS. In the IMTs, there was debate around this methodology among HPS, CPHM, Clinicians and microbiologists and this is reflected in comments from clinician below. In October 2019, a retrospective RCA was done by the Consultant Nurse in IC along with clinicians from the unit. From November 2019, all cases now subject to that approach. The IMT minutes of 14/11/19 show the controls agreed as part of re-opening the ward; this was then directly approved by the CNO and indeed the Cabinet Secretary thereafter. This methodology in this context was not relied upon as all organisms in all categories were included in the investigation. Descriptive epidemiology was supplied by public health colleagues and reports were produced by HPS in 2018 & 2019. *Clinician comment.* Lines 2251 and 2416: Despite the fact that it should not be expected to be an area of their expertise, clinical staff were knowledgeable epidemiological principals and made robust representation within the IMT that SPC charts were methodologically flawed when trying to confirm or refute an outbreak in these circumstances. They were similarly clear that the conclusions that resulted when this methodology was used, despite their reservations, had no validity.	

2254		This data was analysed by HPS and we are not clear what point is being made here.	See above – the issue is not who it was done by but whether it is the best or only way of identifying excessive infections
2258		Example 8.2 The fact in this respect are noted below. Klebsiella is <u>not</u> listed as an alert organism in the NIPCM. In 2017 when the four gram negative organisms were added Klebsiella was not one of them. In 2018 HPS advised a microbiologist to add Klebsiella as an alert for this cohort of patients and this was done. There is an expectation that if this was occurring in a specific area that clinical staff in that area could raise concerns and this would initiate an investigation. In 2018 the cases of Klebsiella were included in the overall timeline of patients (attached) and were part of the incident review. (Email confirming when Klebsiella was added to the surveillance system and appendix 13 of the national manual (downloaded today) Embedded docs taken out- see folder	The point we are making is not that there is unequivocal evidence of a cluster but that the figures should have triggered and investigation. We are unconvinced that Klebsiella was added to the alert list for ICNet as we have seen two Klebsiella bacteraemia in 2019, neither of which triggered alerts in ICNet (GC57 & GC58)
2260-2278		This is factually inaccurate and misleading in the following respects; • It is not clear that Klebsiella were higher than expected as this is the second commonest cause of bacterial infections and we note 'apparent' is used when describing clusters; • It is not included in the NIPCM alert system for NHS Scotland but GGC added to its alert system in 2018. • The cases were included in the 2018 water incident	We don't see why this Example shouldn't stand. A small adjustment to the text is justified "...We would have expected these possible clusters to have attracted greater attention. Our own assessment is that Klebsiella occurred in 10 of the 37 episodes 'Most likely' linked to the hospital environment…."

2260 2262		master copy of patients and discussed – see above master list. • Water sampling has rarely identified this organism. Example box 8.2 • *..There was no investigation into an increasing number of Klebsiella bacteraemias encountered between 2016 and 2018.* This statement is mutually contradictory to the statement in 1210-1212 • *Whilst Klebsiella bacteraemia is not infrequently seen in this patient population, and may be endogenously as well as environmentally acquired, we would have expected the evidence apparent to us for an increasing number of infections, to have triggered a formal investigative process.* Again this statement is mutually contradictory to the statement in 1210-1212. Investigation of incidents followed the National Manual. Note: In all water testing in 2018 and 2019 of 5,057 samples taken in QEUH and RHC 3 returned Klebsiella spp. Of these 2 of these samples were taken from the basement tank room and so represents raw water that has come into the hospitals from the mains. One sample was found from a water outlet in Wd 9A QEUH. As stated from March 2018 all water was tested for ALL Gram negatives.	See above our comments to suggest that Klebsiella was not on the alert list in 2019 We have not said or implied that water was the source We don't see how these statements are mutually contradictory….

2271-2278		It should be noted for accuracy that national guidance was followed in investigating the incidents. Again we were being supported by national agencies and water experts. GGC will be piloting a new approach on behalf of NHS Scotland with HPS which will consider this approach. From 2018 all positive gram negative BC were considered by the IMT. The HPS report from 2018 clearly states that *"Between the period of 29th January and 26th September 2018, 23 cases of blood stream infections (11 different organisms) with organisms potentially linked to water contamination were identified." So all organism potentially linked to the environment were considered''.* In addition the October 2018 HAIRT report, which is prepared for the NHS Board and is a public documents reported as follows: **OUTBREAKS / EXCEPTIONS** (Reported are those that are assessed as AMBER or RED using the HPS HIIAT tool) **February-June 2018** **QEUH and RHC** – Bacteria in Water System. Returned to HIIAT RED on the 13th September 2018. As of 28/09/18 the incident has been HIIAT AMBER. The issues relating to this on-going incident are both complex and evolving. The safety of the children is of paramount importance and the key consideration in all actions being taken.	Our text represents our view, whether or not GGC were being supported by HPS and others. This view applies in general and not just in 2018…. Not sure why GGC are linking this to the investigation of the 2018 infections. Given the comment in line 2277, we will omit the final sentence in this section starting from "Rather, when it was clear…."

		Members of the senior management team are fully engaged with the clinical, infection control and facilities teams and national agencies/ advisors in both the management of the situation and the implementation of a robust and permanent solution. We reverted to normal triggers for environmental Gram negative bacteria in August 2018 following a programme of drain cleaning and replacement. On the 5th of September the water Incident Management Team (IMT) was reconvened to discuss three additional cases of bacteraemias likely to be associated with drainage issues in ward 2a. As of 27/09/18 6 additional cases have been identified (1 Enterobacter, 1 Klebsiella, 2 Stenotrophomonas, 1 Serratia 1 Stenotrophomonas/Chryseomonas) .Total cases associated with the water incident are now 23. Organism breakdown is below; • 1 Cupriavidus • 1 Pseudomonas • 8 Stenotrophomonas • 7 Enterobacter • 1 Klebsiella • 1 Pseudomonas/Stenotrophomonas • 1 Serratia • 1 Stenotrophomonas, Acinetobacter • 1 Stenotrophomonas, Chryseomonas • 1 multi: Pseudomonas, Stenotrophomonas, Acinteobacter. Due to further bacteraemias with water associated organisms despite implementation of extensive infection control	

		measures, the recommendation from the IMT was to decant the ward. This was to enable a detailed assessment of the source and remedial measures to be undertaken.	
2277-2278		It should be noted that reviews were in fact undertaken with basic descriptive epidemiology used as to map all infections among the haematology oncology paediatric patients.	See note above. We will moderate the criticism in this section as shown
2276-2295		This appears to present a retrospective judgement which does not provide context nor detail of how cases were highlighted, indeed the HPS report of 2019 reviewed this in detail. GGC followed national process, engaged the expertise of HPS and the Scottish Government HAI/AMR Policy Unit throughout this period and is now engaged in piloting a new approach with HPS.	As above
2296		Note; List of IMT actions from September 2018 sent 14.10.2020 to Review (see above – same as sent to HPS 211119).	But an actions log only from September 2018 is insufficient to demonstrate that action logs were created, mainatained and completed.
2311		Example 8.3 This is a misleading example as it suggests GGC acted outwith national policy and did not follow advice. GGC did report and investigate all individual cases after we were advised to include them in the alert list by HPS in 2018. The CNO had invoked the national framework tool on 26th March 2018 giving HPS a leadership role. HPS and the Scottish Government were closely involved and received and advised on reports. It would be helpful to put this into context: • Enterobacter was added to the GGC alert list in 2018. • The HIIAT Score was not queried by HPS and seems to	The point we are trying to make here is that two separate PAGs were held at the same time (why wasn't the problem seen in the whole?); that the HIIAT was underscored (in our view); that the IMT was not started promptly; and that it was not continued despite 4 cases of Enterobacter in 16 days. In what way is this example misleading? We will add the National Framework being invoked to our time line

		us that this is a retrospective judgement. • 3 of the 5 cases were not considered HAIs – this was consistent with national methodology with unique typing of 2 cases. • All cases were added to the master list at the time of all cases to HPS for the water incident. Embedded docs- see folder Enterobacter – 3 of the five cases were not considered to be HAI although all considered in the reporting of the incident to HPS. To apply this definition at this time would be entirely consistent with established methodology (national prevalence study use this definition). Two patients had been typed at this time and both came back as 'unique' which indicated that this type of microorganism has never been isolated in the hospital before. All of these were considered in total see master cases above ref line 2258 and in the report to HPS were all cases have been included as a single issue. Embedded docs- see folder	It may be thought that Enterobacter was added to the alert list in 2018 but none of the 8 episodes of Enterobacter bacteraemia in 2019 had an alert created in ICNet (GC14, GC11 x2, GC67, GC68, GC72, GC76, GC80) The comment on the HIIAT score is indeed our retrospective judgement, and we feel it was scored too ow in the context. We have already made the point the NHS GGC took a narrow view of HAI in terms of eligibility for investigation We have commented on the limited value of a typing result reported as 'unique'
2334		Example 8.4 We would request that this example is reviewed. The IMT was stepped down with the full involvement of HPS and the Scottish Government HAI/AMR policy unit: the detailed reasons are provided in the minute with clear triggers established and agreed and set out below; - The SG HAI policy unit had requested directly all information	We do not think that the presence of representation from external organisations (which we cannot identify as those attending are not identified by role) eliminates NHS GGC from the consequences of any of the decisions under scrutiny. The minutes merely state (under date and time of next meeting) "The group agreed that there is no need for this IMT to continue unless any new cases occur that fit the case definition."

		by the end of 25th June for review. In addition, they were briefed directly by HPS after each IMT. They did not query the information nor the decision to step down the IMT. -The 2 cases referred which are referenced were not HAI cases and indeed one came from another NHS Board. Two further isolates of Enterobacter cloacae were found in July and August - these cases were not HAI and therefore were not a trigger and would not have resulted in a PAG/IMT. The July case was from another hospital and was previously positive in a stool specimen (endogenous infection) the second case was admitted on the day of a blood culture, clinically septic and rigouring. Last visit to the unit was to the day case area 7 days before. Triggers would have been: • One HAI bacteraemia • Two infections other than BSI in a 2-week period • Three colonisations in a 2 week period • General increase in environmental Gram negative organisms i.e. mixed organisms, on advice of ICD In response to the question, *why was the IMT stood down*?, we would draw attention to the IMT minutes of 21/6/18 at which HPS were in support. *"The group agreed that for the next 2 weeks if another case is reported then the IMT will be reconvened. If no cases after 2 weeks then the IPCT will resort back to their normal surveillance of 2 cases that fit the case definition*."	But 5 items on the action list were ongoing and one was deferred to a meeting of the water group. How would the IMT know what was happening going forward? The very suggestion that 2 more cases in this population were not considered "as they were not HAI" almost beggars belief given all else that was happening. This statement underlines again the rigidity of decision making at NHS GGC … sticking to triggers when the 4th bullet point in the list of triggers they provide gives required flexibility to proceed to investigate under exactly these circumstances Involvement of external agencies seems to be the go to line for NHS GGC to justify decisions taken, but whatever advice they received, they were in charge and

		The minute also notes that the ''*Scottish Government has requested all HIIORTs and PAGs regarding RHC including any green scoring HAIIT for 2018 to be sent to themselves by close of play on Monday 25th June*." This highlights the involvement of external agencies.	had ultimate responsibility.
2349	8.2.2.3 Adequacy of IMT meeting records	• Many of the issues set out in this section highlight the areas which the revised outbreak policy and SOP seek to address: there was a review by the Board following concerns highlighted by members of the IMT in September 2019 around inappropriate behaviour and lack of structure to the IMT. There are minutes of a meeting which took place on the 20/8/19 which may warrant discussion with the Review Team. • The revised outbreak policy and the revised SOP seeks to provide more robust measures to address this. Embedded docs- see folder • A full response and collation of timelines was sent to HPS in late 2019 of the whole incident in 2018 and 2019. Embedded doc- see folder	If NHS GGC thought that the minutes of a meeting on 20.8.19 were in any way germane to our review, they should have shared them with us. Good The significance of this comment to us is unclear
2386		It is incorrect that water was only tested once, and that an Enterobacter was isolated over this time period. Over the 10 month period 1.11.18 to 27.9.19 we tested 1,994 water samples. All water samples at this period would have ALL Gram negative organisms that grew identified to species level. Of those 1994 samples, 399 had bacterial/fungal growth of which	We have not been entirely correct here. Suggest change text to read "We have also ascertained from the data we received that there are no records to show any 'hard surface' (including drain) samples were positive for *Enterobacter*

		82 had Gram negatives identified: Embedded doc- see folder The conclusion in lines 2389 and 2390 requires review and is factually inaccurate.	spp. in 2019. Water samples positive for *Enterobacter* spp. in the same period were identified from an anaesthetic kitchen and basement water tank on 27.3.19 and from toilets in 3 patient rooms in Ward 6A on 24.6.19. These samples were obtained within 12 days of two patients with *Enterobacter* cloacae bacteraemia although there was no co-location with the rooms in which these patients had been nursed. This possible connection was not documented in the IMT minutes as having been discussed.”.
2391	8.2.2.4 Upward reporting from IMT meetings	The final IMT report for the water IMTs (April 2018) was sent to the Review 4.12.2020 Detailed email sent to Review 11.12.2020 discussing this issue. In view of the HPS review in place over 2018 a Hot Debrief at this point seemed superfluous as a national review was underway as agreed with HPS and the Scottish Government who were supporting the organisation throughout. Email evidence available. Embedded docs- see folder	I think the point still stands that it is GGC policy that upward reporting should take place after closure of an IMT, either in the form of a Hot Debrief or a Full IMT report, and we saw neither but we did see these from other areas of the organisation. We don't accept that just because HPS was involved, appropriate reporting didn't take place internally
2397		The AICC report to the Board Infection Control Committee. Comments in respect of organisational governance are not based on a sound understanding of the GGC structure and we would be happy to provide further context if this would be helpful.	The point we are making here is that the GGC policy also says that IMT members should be asked to sign of the report (for upward reporting). This is nothing to do with our understanding of the structure, merely to point out that they didn't do what their own policy said they should
2400-2415		Example 8.6 requires to be reviewed, the use of the tem ‘underplay’ is inaccurate and we believe a misrepresentation of	We have reviewed these concerns carefully. Some of the source documents were not available to us but from the explanation given, we are now able to see that

		the facts. **Background** • We believe that the example given refers to the HAIRT report presented to the public Board meeting on the 17/10/17. This is a meeting held with around 32 board members with both the press and the public in attendance. The paragraph was entitled ***'Women and Children's Directorate – Royal Hospital for Children; Ward 2A (haematology/oncology).*** • The conclusions expressed in those paragraphs suggesting underplay and lack of understanding, do not accurately reflect the factual position and are, in the Board's view, misrepresented and we consider that it should be reviewed and amended: a detailed timeline of the board committees as well as HPS advice is set out below: **Timeline:** • **26/07/17** Two cases of stenotrophomonas on RHC ward 2A in eight days. Problem Assessment Group (PAG) meeting held: Healthcare Infection Incident Assessment Tool (HIIAT) status Red, Healthcare Infection, Incident and Outbreak Reporting Template (HIIORT) completed and sent to Health Protection Scotland (HPS). • HIIORT updated 13 times between 26 July and 15 August 2017. • **15/8/17** Incident closed as reassessed as status Green.	other levels of reporting (up to BICC level) included the information that a child (GC03) had died following Stenotrophomonas bacteraemia. We also discussed this point at our meeting with GGC on 4.3.21 when great emphasis was placed on the concern not to allow the identification of a patient in a public meeting – hence the omission of the information about death. It is not clear to us why these two infections were specifically identified for reporting at Board level because this contrasts, for example, with the case of another child who died with Stenotrophomonas bacteraemia earlier in the same year (1.5.17, GC04) but whose case was not reported at the Board's next meeting on 27.6.17. Our position remains that, either it was either thought necessary by NHS GGC to report these infections to the Board, in which case the fact that one child had died is absolutely central to the report, or it wasn't. – in which case why did they report it? We are prepared to modify our commentary in the box setting out Example 8.6 as follows: "We do not understand why it was important for the Board to hear that there had been two infections, that they had been appropriately reported and that they were considered to be of different types but not to know that one of the children had died. We have since been told by NHS GGC that as the Board is a public meeting, there is a need to ensure awareness of infections but no requirement to discuss individual

		• **31/8/17** Patient sadly died. • **4/9/17** e-mail from Lead Infection Control Nurse to Dr Lisa Ritchie, HPS consultant nurse, informing her that the patient had died and asking if any further action was required. [full email trail at Reference 1] *'Hi Sandra,* *Thanks for letting us know that this patient has unfortunately passed away. As discussed on the phone, unless there was any anticipated concerns/issues with regards to the infectious agent or press interest then HPS would not take any further action on this information as this incident was closed three weeks ago having been reassessed HIIAT Green.'* • **4/9/17** Acute Infection Control Committee (AICC) meeting - IPC summary paper gives a detailed summary of 2 stenotrophomonas cases with dates, downgrading of HIIAT to GREEN after discussion with Health Protection Scotland, outcome as at 15.8.17. [Reference 2] • **9/10/17** Board Infection Control Committee (BICC) minutes record: • At Item 4 Matters arising*: 'In Ward 2A there were two cases of Stenotrophomonas maltophilia in July and one of the patients died. It was noted that this patient had very serious underlying health conditions which were set out in the death certificate. Pamela advised that Infection Control have been monitoring this*	patient details (for patient confidentiality and Data Protection reasons). However, the occurrence of another Stenotrophomonas bacteraemia earlier in the same year, following which the child also died, was not reported to the Board. This represents an inconsistency both in process and purpose.

		ward closely, and had undertaken focused work with ward and facilities staff on environmental cleanliness and clinical practice.' Discussion at this point on line care and the work of the Quality Improvement Group working in this area; Dr Armstrong requests Jen Rodgers to provide an update on ward 2A at the next meeting.' • At Item 6.5 Recent Outbreaks/Incidents: *'Two cases of Stenotrophomonas maltophilia in a ward at RHC. One patient died and this was recorded on Part 1c of the death certificate. Meetings were held and HPS were informed. The HIIAT for this was RED and then Green. Both isolates were different types and no further cases were reported. The incident was closed on 15th August.'* [Reference 2] • **17/10/17** Public Board Meeting (see above) [Reference 2] • **6/11/17** Acute Infection Control Committee**:** 2 stenotrophomonas cases in 2A discussed. Notes work in ward 2A to improve central line infection rates. [Reference 2] • **27/11/17** Board Infection Control Committee: Detailed update on line care improvements and environmental issues in RHC ward 2A given. [Reference 2] • **5/12/17** Care and Clinical Governance	

		Committee (CCGC) discusses a detailed 27 point infection control action plan which includes references to ward 2A actions on line infections. [References 7 and 8] **Subsequent meetings with discussion of this case or relevant issues arising from it:** • **June 2019**: Scottish Government debrief meeting on infection incidents with boards: NHSGGC raised the issue in the presentation of the conflict between patient identification and accusations in the media (slides 13-18). Other boards set out the same dilemmas. [Reference 3] • **26/11/19:** Full Board Seminar: Full discussion in a presentation to a Board seminar of the patient deaths receiving media scrutiny. Slides aide memoir to Deputy Medical Director (Acute) who presented cases.[Reference 4] • **13/02/20**: Meeting of IPC subgroup of Oversight Board. The full governance of this stenotrophomonas case was discussed at this meeting with a paper [Reference 2] and a presentation (slides 17-20) [Reference 5] given to the subgroup. The minutes [Reference 6] show other areas of enquiry but there were no comments then or subsequently that NHSGGC had underplayed or lacked understanding of the incident. (It was agreed that comments would be received within 1 week after the IPC	

		subgroup had had a chance to review the papers and nothing has been received to date). **Based on the timeline set out above, NHSGGC's position is summarised and is justified by the factual background:** - 1. The AICC as well as the BICC scrutinised this case and incident, after the case was closed on 15/8/17. The BICC (in October) asked for further actions in order to provide assurance – this was followed up at the November BICC. 2. HPS had no further concerns and this reflects the information available to them and to NHSGGC at the time. In 2017 it seemed that the infection was a complication of the patient's serious underlying illness and the possibility of contamination of the water supply was not raised until March 2018. 3. The HAIRT is presented at a public Board meeting where there is a need to ensure awareness of infections but no requirement to discuss individual patient details (which would be potentially unlawful for patient confidentiality and Data Protection reasons). This is in line with practice in other NHS boards in Scotland. 4. In 2017 there was a review of this case and there was a dilemma as to whether public interest outweighs patient and bereaved family confidentiality. In this case, the ward and speciality were clearly identified, it is a rare infection within a small cohort of patients, and the patient had very recently passed away after an	

		admission to the ward and Paediatric Intensive Care Unit (PICU): this is a very low level of aggregation which means that any public discussion of the case may have directly or indirectly identify the individual and family involved. The identification of specific individuals has occurred through social media in relation to a very small groups of patients since 2017. 5. As media interest has increased, this has become an even more difficult issue and indeed one on which NHSGGC sought advice at a debrief session held by the Scottish Government HAI/AMR policy team with other NHS Boards in June 2019 following an incident involving Cryptococcus infections. Many NHS Boards agreed that they also protected patient identity in such circumstances and felt that this was the correct course of action. In these circumstances we consider that lines 2400 to 2415 represents a conclusion that is without foundation based on the facts. The evidence reflects a contrary position that there was no underplay and the position was fully understood and sought to be addressed. This conclusion should be withdrawn or at least amended to reflect the accurate position. We would draw your attention to the following additional points that support that position: - 1. NHSGGC has a full governance trail demonstrating discussion and actions taken and followed up both at Acute and at Board level meetings. **This is not reflective of underplay or a lack of understanding.**	

		2. HPS at the time were not concerned and were content that no further action was required. **This does not suggest underplay by NHSGGC given the information available at the time.** **3.** Our practice is in line with all other NHS Boards in Scotland and national guidance and seems reasonable given the situation and advice at the time in 2017. **This does not suggest underplay by NHSGGC.** 4. This incident and case was fully explored by the IPC subgroup of the Oversight Board, as is within their terms of reference, and they were content with the governance process described at the time. **This does not suggest underplay or lack of awareness in the eyes of the IPC subgroup who considered all of the governance evidence.** **References** (available if required) 1. 2017-09-04 Email from Lisa Ritchie to Sandra Devine 2. Governance timeline outlining discussion of the 2017 stenotrophomonas cases at NHSGGC committees over 2017 [compiled for the Oversight Board IPC subgroup for their meeting of 13.2.2020]. 3. June 2019 presentation by NHSGGC Board Medical Director [see especially slides 13 onwards] 4. 2019-11-26 Board seminar presentation on infection	

		control and recent media scrutiny [see slides 13-16] 5. 2020-02-13 Presentation on NHSGGC infection control made to Oversight Board IPC subgroup meeting [see especially slides 17-20] 6. 2020-02-13 Minutes of Oversight Board IPC subgroup 7. 2017-12-05 CCGC minutes [see item 8] 8. 2017-12-05 '27 point action plan' paper	
2489-2515 2495 2498	8.3 Microbiology and IPC information systems 8. 3. 1 Telepath and bacterial typing	We would request a review of the statements made in this section. Whole genome sequencing (WGS) currently provides the most robust microbiological evidence and is already in use in investigating outbreaks. We would appreciate acknowledgement of how GGC used genome sequencing based on the advice of our local and national experts. GGC and NHS Lothian were recently nationally designated for WGS for COVID/other viruses. '25 SNPs difference' is from the international literature. We did ascribe limits of differences between strains, where such data exists. In the case of the steotrophomonas sequencing, we used the already described cut off of 25 SNPS that had been published by (Steinmann J. 2108. Analysis of phylogenetic variation so Stenotrophomonas maltophilia reveals human specific branches. Front Microbiol. 9.806 doi 10.2289/fmicb.2018.00806) We have data that when multi-picks are taken from a source isolation plate from an environmental water sample that when multiple colonies are compared the SNP difference between	The text in lines 2489- is framed to set out the uncertainties regarding the interpretation of WGS data, particularly when comparing isolates recovered over a protracted period and from different places/environments. There are published studies that reflect these uncertainties. We will amend the start of this paragraph as follows: WGS is the state of the art fingerprinting method for the comparison of microorganisms. Its strength lies in its ability to help determine how closely microorganisms are linked. However, the interpretation of WGS derived data in linking bacterial isolates has significant challenges given the way the genetic code evolves/mutates. Differences between microorganisms can be measured as SNPs … Note that I have suggested in the response to comments above on lines 1206-1220 some additional

2514 2512-3		colonies 4-25 SNPs. Within our sequencing data of stenotrophomonas, in most cases clinical cases of infection had between 4-600 SNPs difference. Our conclusion is that this is sufficient genetic distance to show non-identity. Over the period 2018 and 2019 5,057 water samples were taken in QEUH and RHC and tested for ALL gram negatives. From these 74 grew stenotrophomonas. We agree that the sampling was not all systematic, but it was extensive, prolonged, reactive to circumstances and was looking for ALL Gram negative organisms. As a result of the extensive testing done, and the laboratory processes that looked for all Gram negatives, and the use of TVCs to identify "statutory breeches", our view is that if an organism was not grown it was not present. Thus in the case of stenotrophomonas that 2-3% of all samples grew this organism, this represents the contamination rate. It is also noteworthy that a number of these stenotrophomonas were isolated in the pre-filter stage of the basement water tanks i.e. they have just come in from the Scottish Water mains and there is no evidence that these strains have been found in the hospital system. We believe that this data should be included in the report, the technique is proved and should be included in categories and hypothesis. From March 2018 all water samples were tested for ALL Gram negative organisms which were identified to species level over the period of the review. The cupriavidus work was done at pace to help the Review	text that also helps to address these comments.

		team, contrary to how it is portrayed with the report.	
2519	8.3.2	For accuracy it is important to note that all members of the IPCT have access to the ICNET system but this is only one way that communication occurs within the team. Each local team meets at least weekly, ICNs are in continual contact with the ICDs and we are happy to supply evidence of same. IPCT meet monthly to share information and learning across the board area. As an example throughout the recent pandemic the GGC team has met three times per week to update each other on issues encountered and solutions.	Noted
2545		Email from ICD to IC Data team confirming the inclusion of enterobacter (and others) onto the alert system for ICNET in 2018. Email held	There were 8 episodes of Enterobacter bacteraemia in 2019 9in 7 patients). None had alerts raised in ICNet. This indicates that an alert for Enterobacter cannot have been set in 2018 See also our similar evidence for Klebsiella (line 2258) I will add this to text in Example 8.7
2564-2570		We have significant concerns about the situation described in lines 2564 to 2570 and consider it to be judgemental, unbalanced with no effort sought to understand the facts. *….but we have also seen evidence that Infection Control management within NHS GGC actively sought to discourage this – a position that seems entirely inappropriate. Whilst it might be argued that this could be a workload issue, and that direct patient care was not adversely affected, this stance would have excluded the IPC Team from the management of some Gram-negative environmental infections at NHS GGC, which, at the very least, limited awareness of the problem. More importantly,*	We were informed verbally and have since seen an email sent by the IC Manager asking a senior member of the microbiology staff not to send data to IC Nurses direct. We do not know why but GGC have alluded to an interpersonal issue with a grievance raised by ICNs against an individual microbiologist. We have no details, but we understand that the grievance was activated in 2018 but the email we saw from the ICM was dated 2017. Whatever the reason, the answer is not to limit communication but to address the underlying issue. Preventing communications seems to us all the more unhelpful when the ICNet alert system was not being

		perhaps, it may also reflect a culture of denial about the nature, scale and importance of these infections within the organisation. We are of course unable to see this evidence however the Review team should be made aware that in 2018 several members of the IPCT senior nursing team met with the Royal College of Nursing with concerns about the behaviour of one microbiologist in QEUH. The RCN thereafter met with the GGC Board Nurse and Medical Director to advise of the intention of raising a grievance through the policy. Following discussion it was agreed to resolve through early resolution resulting in alternative contact arrangements between the microbiologist and the ICNs.	effectively updated We will change the text of lines 2558 – 2570 as follows: We have been told that requests from some microbiologists for the list of microorganisms on the ICNet alert list to be augmented were not heeded. We have also been told by NHS GGC that both *Klebsiella* spp. and *Enterobacter* spp. were added to the ICNet alert list in 2018. However, neither of the 2 *Klebsiella* spp. bacteraemias, and none of the 8 Enterobacter spp. bacteraemias that occurred in 2019, triggered an ICNet alert. This suggest that amendments had not been made as had been thought. We understand, however, that when cases are not identified by alerts in ICNet, there is still capacity within the system for IPCNs to manually create a case for any patient - if they are alerted to the identification of a microorganism of concern. We have been told that some microbiologists did make direct contact with IPCNs to alert them in this way and under certain circumstances, but we have also seen evidence that Infection Control management within NHS GGC sought to discourage this. This seems entirely inappropriate as it would have excluded the IPC nurses from the management of some Gram-negative environmental infections at NHS GGC, which, at the very least, would have limited wider awareness of the problem.
	8.4 Clinical records	Comments regarding clinical records require further consideration. It is not clear why such a critique of systems is included within the report. This situation would be replicated within most Board in NHS Scotland but is recognised within GGC as an area for continual focus for improvement. The below	Our critique of the clinical records is justified a) because it was not a straightforward task for us to obtain the data we needed and b) because the management of records to ensure they are clear and easy to follow is

		information may assist understanding.	ultimately an issue for patient safety
	8.4.1. The Clinical Portal 2620	• Generic continuation - No documentation is filed under Generic Continuation. Notes that are typed directly into Clinical Portal are either - IP Consultation, OP Consultation, Remote Consultation or MDT. These notes are filed under speciality in clinical portal. Notes that are scanned into Clinical Portal are filed by IP Medical Note, Nursing Assessment, AHP Assessment, Anaesthetic Record, OP Note, Drug Administration Chart, Consent. These are filed under the discharge speciality. There is a Generic Continuation Sheet as an eForm - <u>this is historic and is no longer used but still visible.</u> ○ Clinical Portal indexing NHSGGC operates a distributed scanning model for OP and IP / DC attendances / admissions which was implemented in a phased way from 2013 onwards. This process means that the patient's paper health record was locked down and all attendances from the implementation date forward are scanned into Clinical Portal. For inpatients each patient has a scanning folder created when they attend hospital which stays with them throughout their admission. The folder is divided into different indexing sections which ward staff will then file documentation appropriately within. The Filing within the scanning folder will then determine the filing within the clinical portal system when the record is scanned. For the majority of inpatients, the folder will be scanned in	This may be the intent, but it is not true and we have evidence to show that to be the case. We have offered (at our meeting with GGC on 4.3.21) to share our observations on the clinical records after the report has been published. The comments in this section are addressed in more detail in Appendix 2 to NHS GGC's response. We have provided comments on that document and will not reproduce here. We see no reason to change anything that we have wriiten about the medical records apart from one clarification to line 2644 (of the draft for consultation) to read: "Digital inpatient medical records may be filed in three separate areas within Clinical Notes …."

		totality on discharge for the whole episode of care. Our SOP determines that records should be scanned by discharge date to allow ease of reference. A QA process is in place to audit compliance within the scanning hubs. For long stay inpatients incremental scanning is used whereby at regular intervals records will be scanned to clinical portal rather than waiting on the patient being discharged. Some patients can be in our wards for over 1 year and therefore managing in a paper-based system on a ward for that length of time would be unmanageable, In addition it would mean where a patient is transferred to another area of the hospital for example ED for an accident or injury the patients notes would not be available electronically. The incremental scanning process will mean patient episodes will be scanned in phases and therefore not under discharge date. The scanning team will visit all wards twice per day to collect scanning folders of discharged patients and return these to the centralised scanning hub on site for preparation and scanning within 24 hours of pick up. Documentation is scanned under discharge date and then goes through a QA process. Thereafter paper copies are retained for 6 months and then destroyed. There can be occasions when records are returned and scanned but later turn out to be incomplete. In this scenario given the episode has been scanned already, the medical secretarial staff would be responsible for scanning the loose documentation relating to the episode of care, the guidance in this scenario is that this documentation should be scanned under episode date of discharge , however this would appear as a second episode for the same discharge date. It is possible that in this scenario	

		some staff have scanned this information under date scanned rather than discharge date which could in turn lead to notes appearing many months after discharge. Find attached (in appendix) the QRG and also the Incremental scanning process documents. Clearly the Board would like details of individual case records to address where this was identified.	
2682 2690	8.5 Patient location records	Process for bed closures – see attached QRG. Bed closures are also reflected in Microstrategy dashboards. If processes were not followed this will be reviewed. However the key issue is that no at risk patients were seen in 2b when it was being used for pre assessment. ICNet has a surgeries tab which contains all theatre activity, including theatre location, if this information is entered locally on the theatre information system (Opera). Users who had access to ICNet would be able to easily retrieve this level of details and this would also be contained in the Complete patient records report (pdf).	We have been reassured that no patients from Haem Onc were seen in 2b during its use for pre-assessment (and we have said so) the point we are making is not that we don't believe this but that the location coding was wrong – and this will not help trace links to possible environmental infections We are surprised that ICNet is required to identify theatre location – is this correct? We had no access to Opera and had rather assumed that theatre location would be identifiable in the main records. No change to text required
2776	8.7 Morbidity and Mortality Reports	17 Morbidity and Mortality Reviews were sent to the Review. Current narrative inaccurate.	We agree we made a mistake. We did indeed receive 17 M&M/PRAM reports and we will amend the text to correct this
2784/ 2784		This is inaccurate, the work was not in response to questions from the Scottish Government as clarified in email sent to M Stevens on 11/12/20 referring to an attachments and noting …*A*	Ok. Happy to accept this although letter does say t was to be sent to SG. We will amend the text from line 2781 to show as follows:

		further report, in the form of a letter, from Dr Chris Kidson. This was requested by Jamie Redfern – although the letter states this was for the Scottish Government – this was not the case but it was rather to formally answer specific questions internally.	
2800		To ensure accuracy we confirm that there is in fact a systematic approach to use of incident reporting - Datix are discussed at the CGM, learning points identified and highlighted key points disseminated via Schiehallion Newsletter. The summary reports are available but were not requested.	We can only comment on the information that we have received. We requested Morbidity and Mortality Reviews and Datix reports on all cases for the full period of the review. It would have been helpful to have been informed that additional summary reports were available.
2834 2842-8	8.8 Central Venous Line Care 8.8.2 Observed CVL Management	This section deals with CVL lines. The narrative quoting an informal discussion through email, is out of context and clinical discussion should have been held at the routine meetings with the Haem-oncology team. Many of these children have had multiple lines and placing of a further line challenging. It is for this reason that every effort was made to salvage lines. Locking line is an accepted practice. When used they are then by definition challenged. Any delay in removing lines is due to theatre/surgical availability. Challenging the lines is a practice where if a child had a pyrexia they would stop using the line, insert a cannula and use that,	We are not clear if this comment implies that the information provided was wrong, nor did we see this as an informal discussion although it was by email - we had asked what the policy about line challenge was as we understood that the QI group had been addressing this. We see no reason to change what we have written and what they seem to be missing here (and what worried us) is that in 43% of the line challenges we were able to identify, the child had symptoms of sepsis, and one child required PICU admission. This is an issue that needs to be addressed…..!

		then a few days later 'challenge' the line by taking more blood cultures and flushing, gradually using for fluids and medications. This practice is about line salvage so treatment can continue. It was discussed at the QI group (set up in May 2017) and we worked from there towards a change. Microbiology and other representatives within the group agreed to continue to use a line or remove a line depending on the clinical and microbiological status of the child". Clinical teams did not continue to try to salvage a line when the advice from microbiology was to remove it. Rather both teams started from a view point that line removal was the preferred option for children with Gram negative line infections. However individual patient details may make an attempt at line salvage preferable or inevitable. This was always discussed with colleagues from microbiology and their agreement to this strategy was obtained.	We accept this and did not intend to imply otherwise. We will change the text in line 2856 as follows: [redacted]
2889	8.9 Other aspects of clinical care 8.9.1. Antimicrobial prophylaxis	This section relates to antibiotic prophylaxis. It omits the meeting between clinicians and microbiology in which ciprofloxacin prophylaxis was discussed. It was noted that there was no evidence for prophylaxis in the setting (prevention of environmental gram negative infections) but was instigated as one intervention to halt the number of environmental gram negative infections. The report also omits the meeting of the prophylaxis groups which included representatives from the clinical team, ID, microbiology, pharmacy and nursing who reviewed the literature regarding prophylaxis and implemented a plan to discontinue cipro prophylaxis and instigate taurolock line locks for CVLs and ports. There is on-going audit of line associated complications.	We are not critical of the decision to use antibiotic prophylaxis but we were not given any documents about the prior discussions and have only seen the document written by Dr Murray when a decision was needed whether or not to discontinue the practice. We will modify text starting line 2895: We are not critical of the use of fluoroquinolone prophylaxis in this context and recognise from what we have since been told that the matter was carefully considered at the time. We note that the continuation of its use was reviewed in an SBAR written by Dr Andrew Murray, Medical Director, NHS Forth Valley and Co-chair, Scottish Managed Service Network for

			Children and Young People with Cancer in December 2019.
2912-17	8.9.2 The impact of the organisational response on the delivery of clinical care	We would be glad to work with MSN in doing a review.	MSN seem to have been absent throughout….?
2947		MSN were fully briefed over the incidents which are on their risk register	They may have been briefed but did they respond; where is the evidence for leadership around benchmarking, shared policies, contingency planning for inter unit transfer etc?
9. Evidence for Good Practice			No comments received
10. Summary of findings and recommendations for action			
3015 and 3018	10.1 How many children in the specified patient population have been affected, details of when, which organism etc?	See previous re 1 patient death – requires review.	We will correct the numbers of children who had died (line 3013 – change 21 to 22) and the details of cause of death
3032-9	10.2 Is it possible to associate these infections with the environment of	See earlier response re data availability and quality.	We do not intend to change this conclusion

	the RHC and the QEUH?		
3100		This section omits the regular review and discussion of Datix at the departmental clinical governance meeting which includes learning points and subsequent dissemination of information in the form of departmental education meetings, newsletters, safety brief etc. This should be reflected.	What they fail to recognise is that we have shown that incidents recorded in Datix are an under representation of the total AE and that there is concern that Datix incidents are under assessed. There is no point telling us they discuss the Datix findings if they are inaccurate. We will also update text from line 3106 to correct the number of deaths and to clarify wording around the causes of death, as follows: We found that the deaths of 2 of the 22 patients who had died by the time of the publication of this Report were, at least in part, the result of their infection. Both had other serious medical problems and it is our view that their survival would still have been uncertain. [redacted] We decided that the bacteraemia was contributory to the cause of death and this was reflected on the death certificate issued by NHS GGC. In both cases we had determined that the infections were both Probably related to the hospital environment and fell within our 'Most likely' to be related to the environment group.

3137-3143 3207	10.4 Recommendations Recommendation 1 Overall management of gram-negative environmental infection in paediatric haemato-oncology Recommendation 7 ICNet alerts	It should be noted that there is already in place a group that uses RCA methodology to investigate all environmental Gram negative infections. It has representation from Haematology and Oncology medical staff, senior nursing and facilities management, infection control and the general manager for paediatric services. An MDT group was established to provide oversight of this data. This is already in place and is a standing agenda item on the BICC reviewing updates to the NIPCM.	Ok, then that's a quick win for GGC!
3223	Recommendation 8. Infection incident and outbreak policy	RCA usage is recommended although the report earlier notes that these have been in place since October 2019 so may be an unnecessary recommendation.	OK, ditto but we don't need to withdraw our recommendation
3263	Recommendation 11 Patient records NHS GGC should clarify their strategy for further evolution towards fully	Before such a recommendation is made in the report, the national context may be useful, with GGC extremely well placed in this respect. The approach outlined below is in line with NHS Scotland Strategy and delivered via the NHS Scotland national Patient Management System contract. In the interim clinical portal and Trak care provide the integrated view of structured data held within specialty systems alongside scanned paper records. GGC has made significant progress in recent years to make available	OK but our recommendations stand

	digital records	clinical information regardless of physical location to support clinicians within the Board or region as recognised in the NHS Scotland 2019 national Digital Maturity Assessment. The case note review has flagged that while systems support individual care pathways, the ability to review and manipulate datasets at scale from systems does require additional focus and the Board would look to adopt the recommendations of the case note. This may help to share learning across NHS Scotland Boards as the majority of systems reviewed are standard across NHS Scotland (Trakcare , Portal , LIMS and ICNET) 5 other NHS Boards currently use the Telepath Laboratory Information System (GGC, Forth Valley, Dumfries & Galloway, Lothian and Grampian) and we are currently in the midst of a national procurement to replace this legacy platform and award an NHS Scotland wide contract in January 2022 subject to FBC sign off. OBC has been approved by GG&C and the other Boards. *Systems* ○ Electronic Health Records - TrakCare ○ Majority of ED, in-patient and out-patient documentation is currently handwritten and scanned into Clinical Portal. Active Clinical Notes (ACN) in TrakCare will enable the Board to incrementally move from paper to electronic. ○ Business Continuity and Legal Record functionality in TrakCare T2020 will enable to the Board to fully implement Active Clinical Notes and deliver a complete electronic health record. ○ Development has started on ACN in ED and the Nursing My Admission Record however there is a dependency on Business Continuity and Legal Record functionality in TrakCare T2020 to allow us to deploy to LIVE and implement across the Board.	

		○ Requires system upgrade to T2020 - Timescales for implementation – June 2021 ○ Digitisation of ACN - ED – August 2021; Inpatient (including My Admission Record) – September – December 2021; Outpatient - September – December 2021 .	
3270		It should be reflected that the Paediatric Haematology and Oncology service has a long standing robust methodology for the reporting and analysis of adverse events through the governance group. The group produces a report at the end of the meeting that discusses outcomes and learning points. These are disseminated across the whole clinical team and are put in the departmental newsletter. Again this is available however there was opportunity for discussion at the regular clinician meetings had it been known the review report would be commenting on the wider service.	If they had read our TOR they would have seen that we had a remit to look at the wider issues and, specifically, that the PTT would be used to identify AEs. They expressed concern about this on several occasions but never informed us of anything they already did which might have indicated they had this in hand, as they claim to have done.
3298	Recommendation 15 15. Other aspects of Clinical Care	Antibiotic prophylaxis / line prophylaxis is already being audited.	Noted

Appendices. We have provided comments in each of these appendices. There is some overlap with the main document

- Public Health Commentary
- Full data and systems analysis
- IMT Summary

NHS National Services Scotland

Notes for Boards:

Infection Prevention and Control (IPC) risks in the design of a Critical Care Unit (CCU), Level 2 and 3 care

ARHAI Scotland
Antimicrobial Resistance and Healthcare Associated Infection

Version history

Version	Date	Summary of changes
V1.0	23 May 2024	New publication.

Approvals

Version	Date Approved	Group / Individual
V1.0		

Contents

Introduction

There is limited technical standards and guidance currently available to aid decision making in respect of optimal design considerations when planning to undertake a new build, adapt, extend, or undertake refurbishment within a Critical Care Unit (CCU)

This document aims to support NHSScotland boards by providing them with a summarised set of questions and answers which will signpost them to any applicable technical guidance documents and summarise key considerations pertaining to:

- functionality
- layout
- support spaces
- maintenance access arrangements
- water systems (including drainage)
- ventilation systems

A list of all available guidance used within NHSScotland for the design, construction and maintenance of healthcare settings (inclusive of ICUs) is available. The main documents required to answer the specific design questions listed will be summarised at the end of each question and a full list provided in Appendix 1.

In addition to design considerations, project teams must engage with HAI-SCRIBE and NDAP/KSAR processes. Level 2 and Level 3 critical care units are high risk areas so particular care must be taken around protecting its water and ventilation systems during construction and there needs to be a robust commissioning plan from the outset. Clear project governance structures and involvement of IPC through each stage of the project are key to ensuring a safe environment for patients is delivered.

This document refers to both Level 2 and Level 3 critical care units.

Questions and answers

Question 1: What are the optimal functional and design considerations/requirements/guidance specifications for a Critical Care Unit within the UK?

Answer:

Any new build or refurbishment project design will be influenced by the varied clinical specialities the unit is intended to serve for example:

- adult
- paediatric
- elective
- emergency
- medical
- surgical
- neurological
- cardiothoracic
- burns and/or trauma orthopaedics.

The project design team should collaborate with the multidisciplinary team to design out or fully mitigate all infection risks to enable the safe delivery of care within any healthcare-built environment. Along with the project team, the critical care clinicians and the Infection Prevention and Control Team (IPCT) should consider the bespoke nature of each Level 2 or Level 3 unit and assess how it can be built or refurbished in accordance with relevant guidance within the available allocated space, and seek to enable a thermally comfortable working environment, which offers both optimal and practical clinical provision and workflows which both minimise and manage healthcare associated infection (HAI) risks.

A functional mixture of multi-bedded bays and single rooms will be required. The number of single rooms and or isolation suites would depend on the clinical

specialties locally and regionally that the Level 2 or Level 3 unit is intending to accommodate.

The ratios of single rooms and/or isolation suites would be relative to the forecasted number of source isolation and protective isolation facilities required as determined by the clinical brief for the facility. This may require the provision of positively pressured rooms, negatively pressured rooms and/or positive pressure ventilation lobby (PPVL) rooms required for infectious diseases, immunosuppressed individuals, and/or burns patients. The HBN 04-02 states “units that routinely admit neutropenic haematology patients may require up to 50% of their beds to be provided as isolation rooms with lobbies. No unit should, however, have less than 20% of their beds as isolation rooms.”

Planning and design considerations for the adequacy of bed spacing and single/ isolation room sizing/specifications and ancillary facilities are contained within a variety of Level 2 and Level 3 critical care and non-critical care specific technical guidance documents listed below.

The ventilation system and water system design and maintenance strategies for each should be approved within the boards local governance structure and be supported by the Ventilation Safety Group (VSG) and Water Safety Group (WSG). The project team should ensure that these groups are provided with technical and practical information such as business continuity or contingency arrangements for the Level 2 and Level 3-unit expansion or further compartmentation at short notice so as it can be incorporated into their decision making.

Resilience on the current provision of pre-existent services is optimistic and often largely impractical, and the project team should consider its adequacy for:

- central decontamination, laundry, and mortuary services
- domestic and maintenance provision and workflows (planned and preventative)
- safe and practical provision, removal and flow of stores, waste, and linen
- flow of staff, visitors, patients

- the unit's ability to apply the national infection prevention and control manual (NIPCM)

Relevant technical standards and guidance:

1. General design for healthcare buildings HBN 00-01 Oct 2014
2. Sanitary spaces HBN 00-02 Mar 2017
3. Critical care units Critical care units (HBN 04-02)
4. Adult in-patient facilities Adult in-patient facilities (SHPN 04-01)
5. Isolation facilities in acute settings In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)
6. Ventilation for healthcare Part A and B:
   - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
   - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)
7. Water systems Parts A-G Water safety (SHTM 04-01)

Question 2: What are the recommended requirements regarding provision of Clinical hand wash basins (CHWBs) and shower facilities for Level 2 or Level 3 care?

Answer:

The necessary provision of alternative methods as well as water provision via suitable outlets for hand decontamination, equipment decontamination, the provision of clinical care and assisted personal hygiene should be considered collectively by the design team.

This ratio of CHWBs required will be influenced by the bed numbers, and the variety of procedures which may be undertaken on the Level 2 or Level 3-unit. The

requirements to undertake hand hygiene in accordance with the WHO 5 moments for hand hygiene and any requirement to perform surgical hand antisepsis will influence the number, and location of accessible CHWBs, scrub troughs and hand rubs required. This should always be risk assessed locally and balanced by the project team whilst they consider a design enables the which enables the practical adoption of the NIPCM whilst preventing or mitigating for any splash or spray contamination risks which may lead directly or indirectly to water associated HAI.

Many Level 2 and Level 3 patients are unlikely to be ambulant enough to regularly use sinks, toilets, or showers therefore the ratio of outlets required should reflect the projected clinical demand.

Access to suitable showering facilities for staff should be included within accessible changing areas.

Design considerations and acceptable ergonomic arrangements for both sink and sanitary assemblies including CHWBs, and scrub troughs are contained within non-CCU specific technical guidance documents.

Relevant technical standards and guidance:

1. General design for healthcare buildings HBN 00-01 Oct 2014 (nhs.scot)
2. Sanitary spaces HBN 00-02 Mar 2017
3. Critical care units Critical care units (HBN 04-02)
4. Adult in-patient facilities Adult in-patient facilities (SHPN 04-01)
5. Isolation facilities in acute settings In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)
6. Water safety for healthcare premises Parts A-G: Water safety (SHTM 04-01)
7. Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018
8. National Infection Prevention and Control Manual. ARHAI Scotland. National Infection Prevention and Control Manual: Home

9. Scottish Healthcare Technical Memorandum 64: Sanitary Assemblies – Building Component Series 2009

Question 3: What air change rate should be provided to a Level 2 or Level 3 care area?

Answer:

All new build or refurbished Level 2 and Level 3 care areas must be designed to be provided with the air changes stipulated within the Scottish Health Technical Memoranda (SHTM), which will provide guidance and advice regarding ventilation for health care premises without unnecessary departure or derogation. Where departure or derogation is unavoidable as part of a refurbishment the project or design team are obliged to fully mitigate remaining infection risks to enable the safe delivery of care within the unit.

SHTM 03-01, interim v 2.0, 2022 stipulates this is a supply of 10 air changes per hour (Ach/hr) at 10 pascals (Pa) positive pressure within the main unit and an extract of 10 Ach/hr at -5 Pa for any isolation room/suite intended for infectious diseases.

Relevant technical standards and guidance:

1. General design for healthcare buildings HBN 00-01 Oct 2014
2. Critical care units Critical care units (HBN 04-02)
3. Adult in-patient facilities Adult in-patient facilities (SHPN 04-01)
4. Isolation facilities in acute settings In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)
5. Ventilation for healthcare Part A and B:
    - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
    - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 4: What pressure differentials should be applied to a Level 2 or Level 3 care area?

Answer:

All new build or refurbished Level 2 or Level 3 care units must be provided with the pressure differentials stipulated within the current SHTM.

SHTM 03-01 stipulates this is10 Pa positive pressure.

Relevant technical standards and guidance:

1. Critical care units Critical care units (HBN 04-02)
2. Adult in-patient facilities Adult in-patient facilities (SHPN 04-01)
3. Isolation facilities in acute settings In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)
4. Ventilation for healthcare Part A and B:
    - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
    - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 5: What monitoring of ward ventilation pressures cascades should be used in a Level 2 or Level 3 care area?

Answer:

As this is a critical ventilation system within a critical care area, pressure cascades should be continually and robustly monitored to detect failure along with other critical system parameters via a building management system (BMS) interface with an accessible control panel out with the clinical care space which is easily accessed by the maintenance team.

For areas where isolation rooms are required the design team may consider the use of differential pressure gauges for clinical staff to monitor the ventilation within the room. If used staff must be educated as to their function and how to interpret readings as well as procedures for alarms or out of specification readings.

Relevant technical standards and guidance:

1. Isolation facilities in acute settings In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)
2. Ventilation for healthcare Part A and B:
    - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
    - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 6: What level of ward ventilation filtration should be applied to Level 2 or Level 3 care areas?

Answer:

Filtration should be determined by a local risk assessment supported by the Ventilation Safety Group. The minimum grade of supply air is stipulated within the SHTM, which provides guidance and advice regarding ventilation for healthcare premises, in accordance with BS EN 16798.

SHTM 03-01, interim v 2.0, 2022 stipulates this is SUP2 for the main Level 2 or Level 3 care area supply and category 2 isolation room/source isolation (including rooms with extract only). Protective isolation rooms E12.

Relevant technical standards and guidance:

1. Ventilation for healthcare Part A and B:
    - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
    - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

2. Specialist Ventilation for Healthcare Society: Change in Air Filter Test and Classification standards: SVHSoc. 02-V1.2 Filter group revisions Nov 18.pdf

Question 7: Are High Efficiency Particulate Air (HEPA) filters advocated for use in Level 2 or Level 3 care areas?

Answer:

HEPA grade filtration requires additional capital expenditure and is subject to ongoing maintenance costs which exceed that of other filters. It is not currently specified as an essential requirement for the air supplied to a general Level 2 or Level 3 care area, however any neutropenic patients who may require critical care would require to be managed in a protective isolation room, provided with a HEPA filtered supply. Additionally, isolation rooms for infectious disease patients may require HEPA filtered extract.

Relevant technical standards and guidance:

1. Ventilation for healthcare Part A and B:
   - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
   - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 8: What is the recommended water and drainage system design for a Level 2 or Level 3 care area?

Answer:

Water and drainage system design should be determined by a local risk assessment supported by the Water Safety Group.

To prevent water associated HAI the design team should consider:

- hot and cold-water distribution system, and wastewater arrangements
- the suitability and selection of components (including outlets and taps), which do not promote the growth of pathogens within the water and drainage system
- the suitability of the proposed water outlet's locations within the CCU (see also Question 2)
- that maintenance and repairs are possible without a requirement to disrupt clinical care were deemed practicable.
- that the number of outlets reflects only the essential clinical requirements of the CCU
- that the drainage design suitably minimises backflow from sewer and pooling and/or reflux into the outlets present within the CCU
- any necessary mitigations to manage water associated infection risks within the CCU which cannot be designed out

Relevant technical standards and guidance:

1. Sanitary spaces HBN 00-02 Mar 2017
2. Water safety (SHTM 04-01 Parts A-G)
    - Water safety for healthcare – design, installation and testing (SHTM 04-01 Part A)
    - Water safety for healthcare - Operational management (SHTM 04-01 Part B)

- Water safety for healthcare - TVC Testing Protocol (SHTM 04-01 Part C)
- Water safety for healthcare- Disinfection of domestic water systems (SHTM 04-01 Part D) .
- Water safety for healthcare - Alternative materials and filtration (SHTM 04-01 Part E)
- Water safety for healthcare - Chloramination of water supplies (SHTM 04-01 Part F)
- Water safety for healthcare- Operational procedures and exemplar (SHTM 04-01 Part G)

3. Scottish Healthcare Technical Memorandum 64: Sanitary Assemblies – Building Component Series 2009.

Question 9: Do ventilation systems design or components exacerbate or contribute to an increased infection risk within Level 2 or Level 3 care areas?

Answer:

Yes. If the systems air handling unit or other components:

- has been poorly designed
- is not working as per intended design
- has not been fitted correctly
- is subject to contamination
- is unable to be fully maintained as per manufacturer's instructions and associated technical guidance.

The initial and ongoing oversight which can be provided by the boards Ventilation Safety Group is therefore of huge importance for this critical system and the safety of the patients within the CCU.

Building in resilience at the design phase may enable business and clinical continuity should the system fail.

Relevant technical standards and guidance:

1. Ventilation for healthcare Part A and B
    - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
    - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 10: What design considerations should be taken to reduce infection risks from a ventilation system within a Level 2 or Level 3 care area?

Answer:

There are many ventilation design considerations to reduce risk of HAI that apply for ICU areas. However, design is one component of the ventilation system to be considered in the overall ventilation strategy. The construction of commissioning of and operational maintenance of any ventilation system in accordance with the principles laid out in national guidance would reduce infection risks from any ventilation system.

All ventilation design proposals should be robustly reviewed by the project team and be presented at the board Ventilation Safety Group for approval and involved in the development of the ventilation strategy for the facility. Infection prevention and control team representatives should be involved as part of these discussions.

Relevant technical standards and guidance:

1. Critical care units Critical care units (HBN 04-02)
2. Isolation facilities in acute settings In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)
3. Ventilation for healthcare Part A and B:

- Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
- Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 11: What are the recommendations for installing point of use (POU) or inline filters as a control measure within a Level 2 or Level 3 care area?

Answer:

POU filters prevent microorganisms leaving the tap or outlet only and do not remove any microbial contamination which may be present within the water or outlet.

Unlike optimum temperature control, POU or inline filters are not considered a primary control measure for the maintenance of water supply or its quality and should not be fitted as standard.

POU filters may be used as a short term or temporary control measure within the CCU during any water associated infection incident or outbreak, to maintain the clinical functionality of the unit whilst the outlets or the hot and cold water system are being investigated.

The decision to introduce POU filters requires risk assessment as it may introduce other unintentional hazards which require to be fully considered by the IPCT and/or an IMT and/or the WSG prior to fitting and whilst they require to remain in situ.

Non-exhaustive list for risk assessment includes:

- ongoing WSG or IMT review
- outlet or POU filter compatibility
- manufacturer's instructions for installation or fitting, maintenance, lifespan and changing method and frequency

- altered ergonomics between outlet and drain and unintended consequences, for example water flow to drain being altered +/- altered splash contamination risk
- a cleaning and maintenance plan
- informing and keeping health care staff updated with the reasons for fitting a POU, any alterations to cleaning, provision of drinking water or the hand hygiene process
- informing staff what action to take if the POU becomes partially or fully dislodged from the outlet or becomes contaminated
- POU disposal in accordance with waste policy

Relevant technical standards and guidance:

1. Prevention and management of healthcare water-associated infection incidents/outbreaks. Health Protection Scotland 2019

Question 12: Are there any recommendations regarding inclusion of renal dialysis points within a Level 2 or Level 3 care area?

Answer:

Within Level 2 or Level 3 care areas outlets for haemodialysis must be connected to a new or existent reverse osmosis plant or an appropriate biocidal treatment system. This will be required to minimise impurities and maintain the water quality required to enable the safe provision of haemodialysis.

Relevant technical standards and guidance:

1. Critical care units Critical care units (HBN 04-02)
2. Water systems Parts A-G Water safety (SHTM 04-01)
3. Renal care in patients Renal Care - Main renal unit (HBN 07-02)

Question 13: What maintenance considerations are essential to prevent infection risk in water and drainage systems in a Level 2 or Level 3 care area?

Answer:

To prevent water associated HAI within the CCU the project team should consider the actions which will be required to assist maintenance of optimal temperature/ chemical controls, and those actions which prevent the stagnation of water, to reduce the risk of microbial growth and biofilm formation.

This includes incorporation of these new or refurbished water services into the boards water safety plan and the clinical team's awareness of safe water systems including:

- appropriate and ongoing operational use of all water outlets
- enactment of scheduled flushing regimes
- enactment of temporary flushing regimes for when any outlets are identified as little used
- the enablement of regular maintenance team access for planned preventative maintenance and disinfection schedules.
- the importance of active and scheduled temperature and or chemical monitoring/water testing
- the importance of immediate action where optimal control cannot be demonstrated or is not being preserved
- the importance of taking immediate action to report slow drainage or blockages

Relevant technical standards and guidance:

1. Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018

2. Prevention and management of healthcare water-associated infection incidents/outbreaks. Health Protection Scotland 2019
3. Pseudomonas aeruginosa routine water sampling in augmented care areas for NHSScotland. Health Protection Scotland 2018
4. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- Operational management (SHTM 04-01 Part B) 2014
5. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C) 2014

Question 14: What maintenance considerations are essential to prevent infection risk in ventilation systems in a Level 2 or Level 3 care areas?

Answer:

As not all Level 2 and Level 3 patients can be moved at short notice due to the clinical risks created by doing so, maintenance access and schedules should be enabled wherever practicable which cause zero to minimal clinical disruption.

As a critical ventilation system, annual inspection and verification is required for the Level 2 and Level 3 care area with oversight provided by the board VSG.

All AHU's may fail and have a manufacturer expected lifespan and for this reason isolations rooms should be served by a single AHU. Planned or predicted replacement of the AHU and an unexpected failure or loss of this critical system and the associated costs and clinical impact should feature within the units business continuity or contingency arrangements.

Relevant technical standards and guidance:

1. Ventilation for healthcare Part A and B:
    - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)

- Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

2. Ventilation Crib Card 2019-08-ventilation-crib-card-v1.pdf

Question 15: What are the commissioning and validation requirements for Level 2 or Level 3 care areas?

Answer:

Commissioning is an essential project step (undertaken by an appointed external independent contractor) which enables demonstratable assurances for the board and other stakeholders that the installed water and ventilation systems are installed as per design, safe to use and are fit for purpose.

Commissioning is required to take place prior to any operational use of the facility and to maximise safety in advance of or clinical occupation.

The IPCT and Estates and Facilities team (including maintenance personnel) are required to be engaged with the technical and operational elements of the commissioning and handover process.

Relevant technical standards and guidance:

1. Scottish Capital Investment Manual: NHSScotland Commissioning Process. Scottish Government 2017.
2. Key Stage Assurance Review (KSAR): Notes for Board Infection Prevention and Control Teams. National Services Scotland 2023.
3. Ventilation for healthcare Part A and B:
   - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
   - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

4. Water safety for healthcare premises Parts A-G Water safety (SHTM 04-01) Scotland (nhs.scot)

Question 16: Should chilled beams be used in CCU?

Answer:

Substantial risks can be introduced to the high-risk patient groups being cared for in CCU from chilled beams water pooling which would increase the risk of introduction or ingress for waterborne bacteria and fungus to the CCU and are therefore not desirable for a CCU.

The ventilation system design should include temperature controls without a requirement for any additional equipment installation.

Relevant technical standards and guidance:

1. Ventilation for healthcare Part A and B:
   - Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
   - Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)
2. Inkster T, Peters C, Soulsby H. Potential infection control risks associated with chilled beam technology: experience from a UK hospital

Appendix 1: Summary of relevant guidance

Health Building Note 00-01: General design for healthcare buildings

- HBN 00-01 Oct 2014

Health Building Note 00-02: Sanitary spaces

- HBN 00-02 Mar 2017

Health Building Note 04-02: Critical care units

- Critical care units (HBN 04-02)

Scottish Health Planning Note 04-01: Adult in-patient facilities

- Adult in-patient facilities (SHPN 04-01)

Scottish Health Planning Note 4 supplement 1: Isolation facilities in acute settings

- In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)

Scottish Health Technical Memorandum 02: Medical gas pipeline systems. Parts A and B:

- Medical Gas Pipeline Systems: Design installation validation and verification (SHTM 02-01 Part A)
- Medical Gas Pipeline Systems: Operational management (SHTM 02-01 Part B)

Scottish Health Technical Memorandum 03: Ventilation for healthcare. Parts A and B:

- Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
- Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Scottish Health Technical Memorandum 04: Water safety. Parts A-G:

- Water safety for healthcare – Design, installation and testing (SHTM 04-01 Part A)

- Water safety for healthcare- Operational management (SHTM 04-01 Part B)
- Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C)
- Water safety for healthcare- Disinfection of domestic water systems (SHTM 04-01 Part D) .
- Water safety for healthcare- Alternative materials and filtration (SHTM 04-01 Part E)
- Water safety for healthcare- Chloramination of water supplies (SHTM 04-01 Part F)
- Water safety for healthcare- Operational procedures and exemplar (SHTM 04-01 Part G)

Scottish Health Technical Memorandum 06: Electrical services Parts A and B:

- Electrical services supply and distribution: Design considerations (SHTM 06-01 Part A)
- Electrical services supply and distribution: Operational management (SHTM 06-01 Part B)

Electrical safety guidance for High Voltage Systems

- Electrical safety guidance for High Voltage systems (SHTM 06-03)

Scottish Health Technical Memorandum 08-03: Bedhead services

- Specialist Services - Bedhead Services (SHTM 08-03)

Scottish Health Technical Memorandum 08-05: Building Management Systems – Parts A-D

- Building Management Systems: Overview and Management (SHTM 08-05 Part A)
- Building Management Systems: Design Considerations (SHTM 08-05 Part B)
- Building Management Systems: Validation and Verification (SHTM 08-05 Part C)

- Building Management Systems: Operational Management (SHTM 08-05 Part D)

Scottish Health Technical Memorandum 54 – 69: Building component series

- Building component series -User manual (SHTM 54)
- Building component series -Windows (SHTM 55)
- Building component series - Partitions (SHTM 56)
- Building component series - Internal glazing (SHTM 57)
- Building component series - Internal doorsets (SHTM 58)
- Building component series - Ironmongery (SHTM 59)
- Building Component Series - Ceilings (SHTM 60)
- Building component series - Flooring - matrix example xls (SHTM 61 app 1a)
- Building component series - Demountable storage systems (SHTM 62)
- Building component series - Fitted storage systems (SHTM 63)
- Building Component Series – Sanitary assemblies (SHTM 64)
- Building component series - Cubicle curtain track (SHTM 66)
- Building component series - Laboratory storage systems (SHTM 67)
- Building component series - Protection (SHTM 69)

Scottish Health Technical Memorandum 81- 87:

- Fire safety - Precautions in new healthcare premises (SHTM 81 part 1)
- Fire safety - Fire engineering of healthcare premises (SHTM 81 part 2)
- Fire safety - Atria in healthcare premises (SHTM 81 part 3)
- Fire safety - alarm and detection systems (SHTM 82)
- Fire safety - General fire precautions in healthcare premises (SHTM 83)
- Fire safety - Precautions in existing healthcare premises (SHTM 85)
- Fire safety - Risk assessment (SHTM 86) Fire safety - Textiles and furniture (SHTM 87)

NHSScotland Waste Management Guidance

- NHSScotland Waste Management Guidance (SHTN 03-01)

NHS National Services Scotland

Notes for Boards:

Infection Prevention and Control (IPC) Risks in the Design of a Neonatal Unit (NNU)

May 2024

ARHAI Scotland
Antimicrobial Resistance and Healthcare Associated Infection

Version history

Version	Date	Summary of changes
V1.0	23 May 2024	New publication.

Approvals

Version	Date Approved	Group / Individual
V1.0		

Contents

Introduction

There is limited technical standards and guidance currently available to aid decision making in respect of optimal design considerations when planning to undertake a new build, adapt, extend, or undertake refurbishment within a Neonatal Unit.

This document aims to support NHSScotland boards by providing them with a summarised set of questions and answers which will signpost them to any applicable technical guidance documents and summarise key considerations pertaining to:

- functionality
- layout
- support spaces
- maintenance access arrangements
- water systems (including drainage)
- ventilation systems

In addition to design considerations, project teams must engage with HAI-SCRIBE and NDAP/KSAR processes. Neonatal units are high risk areas so particular care must be taken around protecting its water and ventilation systems during construction and there needs to be a robust commissioning plan from the outset. Clear project governance structures and involvement of IPC through each stage of the project are key to ensuring a safe environment for patients is delivered.

Questions and answers

Question 1: What are the optimal functional and design considerations/requirements/guidance specifications for a neonatal unit/facility/build within the UK?

Answer:

In this document, neonatal units refer to all three levels of care:

- special care
- high-dependency
- intensive care

Design should consider unit activity and local needs, relevant guidance, and footprint available. This requires multidisciplinary input from clinicians, IPC and the project team. A collaborative approach to identifying IPC risks and designing them out or planning mitigation is crucial to ensuring delivery of a safe neonatal unit.

HBN 09-03 provides an outline for design of a neonatal unit. This includes cot space sizes and consideration of bays vs single rooms with regard to function and staffing. A mixture of bays and single rooms would usually be required. Though not explicitly stated in HBN 09-03, it is expected single rooms are neutral pressure to the ward, for instance it would be exceptional for a unit to require for specialist ventilation isolation facilities. HBN 09-03 also contains advice around ancillary rooms and facilities and accommodation for parents.

Relevant technical standards and guidance:

1. Health Building Note: Neonatal Settings (HBN 09-03) 2013
2. Health Building Note: Maternity care facilities (HBN 09-02)
3. Neonatal Care in Scotland: A Quality Framework" Scottish Government March 2013

4. Bliss Baby Charter Standards 2020

The following are **not** intended for use in neonatal settings:

- Health Building Note: Critical care units (HBN 04-02)
- Health Building Note: Hospital accommodation for children and young people (HBN 23)

Question 2: What are the laundry facility requirements within a neonatal unit?

Answer:

HBN 09-03 suggests industrial laundry facilities should be provided within the neonatal unit to wash baby clothes, including a washer and dryer (1). A full options appraisal and risk assessment, with engagement from the IPCT, is needed prior to deciding on local management of laundry (2, 3). Options appraisal should include consideration of whether central laundry facilities would be appropriate. Risk assessment should also include how the equipment will be operated. Although HBN 09-03 implies parents should operate the laundry equipment, this approach may not be suitable for all units. Household washing machines are not suitable however there are no specific recommendations in national guidance for choice of laundry equipment in neonatal settings.

Relevant technical standards and guidance:

1. Health Building Note: Neonatal Settings (HBN 09-03) 2013
2. Health Technical Memoranda: Decontamination of Linen for Health and Social Care (HTM 01-04) Management and Provision 2016
3. National Guidance for Safe Management of Linen in NHSScotland Health and Care Environments For laundry services/distribution. Health Protection Scotland 2018

Question 3: What are the recommended requirements regarding provision of CHWB, toilet and shower facilities for NNU?

Answer:

The number of clinical handwash basins (CHWBs) needs to be determined by local risk assessment – see appendix 1 HPS 2018 (1). This should balance the risks water outlets pose to neonates with the need for sufficient and easily accessible CHWBs for the purpose of clinical staff decontaminating their hands.

HBN 09-03 (2) suggests a minimum ratio of one CHWB to three cots, conflicting with advice from HPS (1) which advocates a risk-based approach. The latter approach is preferred because evidence accrued over the past decade on Pseudomonas aeruginosa risk and splash risk from CHWBs may better inform decisions on CHWBs in neonatal units than a fixed ratio.

Scrub-up trough sinks are often installed in neonatal units (1). This is because a variety of procedures might be performed on the neonatal unit, which for some units includes surgical operations. As with CHWBs, a risk-based approach should be taken with placement of any scrub-up trough sinks. Alternatives should be considered for surgical asepsis, such as use of alcohol-based handrub which is supported as an acceptable method by the NIPCM (3).

SHTM 64 includes guidance on acceptable designs of CHWB, scrub-up trough sinks and ancillary parts such as taps (4).

Risk assessment should be undertaken prior to designing any water outlet into a neonatal unit and include justification, assessment and mitigation of risks.

Consideration should be given to splash risk and to design features which may reduce this risk. Sinks should be planned so that patients and care equipment are outside the splash zone.

IPCT should be involved in tap selection and selection of ancillary equipment, for example bins for waste disposal.

WC and/or shower provision may be required for staff and visitors or family (2).

Maintenance requirements should be considered for all outlets planned.

Relevant technical standards and guidance:

1. Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018
2. Health Building Note: Neonatal Settings (HBN 09-03) 2013
3. National Infection Prevention and Control Manual. ARHAI Scotland. National Infection Prevention and Control Manual: Home (scot.nhs.uk)
4. Scottish Healthcare Technical Memorandum 64: Sanitary Assemblies – Building Component Series 2009
5. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- Operational management (SHTM 04-01 Part B) 2014

Question 4: What air change rate should be provided to a NNU?

Answer:

- 10 air changes per hour – see Table 5, page 80 SHTM 03-01 part A (1).

Consideration should be given to air mixing.

HBN 09-03 does not comment on air change rate but contains useful advice on temperature control and grille placement in Section 13: Specific engineering considerations (2).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022
2. Health Building Note: Neonatal Settings (HBN 09-03) 2013

Question 5: What pressure differentials should be applied to a NNU?

Answer:

- +5 Pascals to corridor - see Table 5, page 80 SHTM 03-01 part A (1)

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 6: What monitoring of ward ventilation pressure cascades should be used in NNU?

Answer:

Neonatal units are considered “critical areas” so control systems to detect failures in ventilation control should be in place (1). These should be simple, robust, and reliable.

Room differential pressure gauges should be mounted directly adjacent to the entry door 1.5m above floor level so at eye line (7.24; p50 SHTM 03-01 Part A) (1). This may be a digital monometer or differential manometer, for example Magnehelic gauge, and should indicate the normal range.

The building management system (BMS) provides monitoring and control of the ventilation system. There should be a ventilation control panel fitted outside critical areas to enable maintenance by the authorised person (see 7.18; p49 SHTM 03-01 Part A) and there should be a visual indication for staff that the air handling unit is operating within parameters (see 9.229; p120 SHTM 03-01 Part A) (1).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 7: What level of ward ventilation filtration should be applied to NNU?

Answer:

- Supply filter grade SUP1.

Table 5 SHTM 03-01 (1) links to the SVHSoc02 document (2) which advises on appropriate second filter and need for gas filter depending on outdoor air quality (ODA). This will result in an F7-F9 second filter and either recommendation or requirement for a gas filter depending on ODA. This document explicitly states it is not concerned with infection prevention but rather “breathable” air and advises patients vulnerable to airborne infection may require HEPA filtration in addition to the second filter (2). The second filter is located within the air handling unit and any HEPA filter should be located within a metal terminal housing with airtight teals immediately prior to the grille – see 9.58 and 9.59 p98 SHTM 03-01 part A (1).

Consideration should be given to HEPA filtration in addition to the second filter – see question 7.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022
2. Specialist Ventilation for Healthcare Society: Change in Air Filter Test and Classification standards: SVHSoc. 02-V1.2 Filter group revisions Nov 18.pdf (andrewpoplett-enterprises.co.uk)

Question 8: Are HEPA filters advocated for use in NNU?

Answer:

Local risk assessment should determine whether HEPA filtration is required or not within the neonatal unit. This should be informed by unit activity and whether neonates cared for may be vulnerable to invasive mould infection.

Although SHTM 03-01 does not specify HEPA filtration is required, table 5 page 80 SHTM 03-01 Part A states that the ventilation system should protect neonates from fungal spores (1), for which HEPA filtration would be necessary.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 9: What is the recommended water and drainage system design for NNU?

Answer:

Design considerations should encompass:

- hot and cold water system components from supply to neonatal unit
- layout of services on the neonatal unit and access requirements for maintenance to components of the water system. Services include hot and cold water distribution, as well as wastewater drainage system
- location of water outlets, associated sanitary assemblies/equipment using water, and drain outlets

Design of safe water and drainage systems is complex, especially for areas with vulnerable patients such as the neonatal unit.

Multidisciplinary expertise should be drawn on with the aim of designing out infection risks and planning management of residual risk. It is crucial this is undertaken early in the project to inform the design brief. All parts of SHTM 04-01 should be considered, including parts B-G focussed on operational use.

Guidance exists for design of sanitary assemblies (2). See Question 2 for further considerations on water outlets.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 04-01 (SHTM 04-01)
    - Water safety for healthcare- Design installation and testing (SHTM 04-01 Part A)
    - Water safety for healthcare- Operational management (SHTM 04-01 Part B)
    - Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C)
    - Water safety for healthcare- Disinfection of domestic water systems (SHTM 04-01 Part D) .
    - Water safety for healthcare- Alternative materials and filtration (SHTM 04-01 Part E)
    - Water safety for healthcare- Chloramination of water supplies (SHTM 04-01 Part F)
    - Water safety for healthcare- Operational procedures and exemplar (SHTM 04-01 Part G)
2. Scottish Healthcare Technical Memorandum 64: Sanitary Assemblies – Building Component Series 2009

Question 10: How do ventilation systems design and components exacerbate or contribute to an increased infection risk and what design considerations should be taken to reduce those risks within NNU settings?

Answer:

Correct filters need to be selected including the consideration of HEPA filtration. Dilution requires more than adhering to air change rates; consideration should be given to air mixing with grille selection and grille placement which avoids short circuiting/Coanda effect. Consideration should be given to air movement within the unit and impacts of air pressures from adjacent areas. Natural ventilation should be avoided in neonatal units.

Planning operational monitoring and maintenance of the ventilation system from the outset is crucial and oversight should be provided by the Board Ventilation Safety Group. The neonatal unit is a “critical area” so there should be a plan for robust monitoring of air handling unit parameters and pressure cascades. There should be resilience built into the system from the design phase so there is a plan should the ventilation system fail – see 4.15 p27 SHTM 03-01 (1).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 11: Are there any recommendations for installing POU or inline filters as a control measure within NNU?

Answer:

Point of use filters (POUFs) or inline filters may be considered as a control measure during healthcare water-associated infection incident or outbreaks alongside other remedial actions (1). POUFs provide immediate protection where the source of pathogens is the outlet, which is desirable given the vulnerability of this patient population. They are also safe to use in a neonatal setting where some biocides may be hazardous.

Where POUFs are used, splash risk should be assessed and a plan must be made for their ongoing management. This should include cleaning regimens to avoid contaminating the filters, need for replacement at expiry/if removed/contaminated, and criteria for discontinuation. Long-term use of POUFs may be required in some circumstances and the Board Water Safety Group should participate in decision-making and the maintenance plan if this is the case.

Relevant technical standards and guidance:

1. Prevention and management of healthcare water-associated infection incidents/outbreaks. Health Protection Scotland 2019

Question 12: What maintenance considerations are essential to prevent infection risk in water and drainage systems in NNU?

Answer:

Appropriate operational use, maintenance, and preparedness for clinical incidents are crucial in keeping patients safe. Critical control points for this are stated in HPS guidance for minimising risk of Pseudomonas aeruginosa (1).

All water services installed should be incorporated into the Board Water Safety Plan and the Board Water Safety Group should have oversight of this (2).

As with the rest of the hospital, temperature control should be monitored and a risk assessment in place for Legionella control – guidance can be found in SHTM 04-01 part B (2).

Total viable count (TVC) testing should be undertaken quarterly and sampling locations determined by Board Water Safety Group with guidance from SHTM 04-01 part C (3). Additionally, water testing for Pseudomonas aeruginosa is advised at least every six months in neonatal units (4).

Relevant technical standards and guidance:

1. Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018
2. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- Operational management (SHTM 04-01 Part B) 2014
3. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C) 2014
4. Pseudomonas aeruginosa routine water sampling in augmented care areas for NHSScotland. Health Protection Scotland 2018

Question 13: What maintenance considerations are essential to prevent infection risk in ventilation systems in NNU?

Answer:

Ventilation systems in the neonatal unit are “critical systems”.

Inspection and annual verification requirements are advised in chapters 4 and 5 of SHTM 03-01 Part B (1).

All air handling units have an expected life span. It is important that trends are monitored to detect sudden changes in performance requiring urgent remediation and to inform planning for replacement.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Water safety for healthcare- Operational management (SHTM 04-01 Part B) 2022

Question 14: What are the commissioning requirements for a NNU?

Answer:

The commissioning process takes the installed environment to operational use; the processes for healthcare facilities in Scotland are described in the Scottish Capital Investment Manual (1). Commissioning is undertaken by an independent company, however local IPCT should be involved in tendering of the company and the commissioning strategy – see KSAR Notes for Boards section on Commissioning KSAR (2).

Engagement from IPCT on commissioning working groups is required throughout the project to ensure a safe handover for both technical and operational aspects (1, 2). Systems of key technical importance for IPCT are ventilation and water. An outline of the technical commissioning process for each can be found in SHTM 03-01 Part A

chapter 11 (3) and SHTM 04-01 Part A Chapter 16 (4) respectively. Operational aspects may include consideration of patient pathways and cleaning after handover. Specific to a neonatal unit, commissioning of any local laundry facilities will require IPCT input. General information on commissioning and validation specific to laundry can be found in HTM 01-04 (5) but its application would depend on the equipment procured – see Question 1.

Relevant technical standards and guidance:

1. Scottish Capital Investment Manual: NHSScotland Commissioning Process. Scottish Government 2017.
2. Key Stage Assurance Review (KSAR): Notes for Board Infection Prevention and Control Teams. National Services Scotland 2023.
3. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022
4. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- Design installation and testing (SHTM 04-01 Part A) 2014
5. Health Technical Memoranda: Decontamination of Linen for Health and Social Care (HTM 01-04) Management and Provision 2016

Question 15: Should chilled beams be used in a NNU?

Answer:

No. These can form condensation which drips into the room and the condensate may be contaminated with waterborne bacteria and fungi, presenting substantial risks in a neonatal unit (1).

Relevant technical standards and guidance:

1. Inkster T, Peters C, Soulsby H. Potential infection control risks associated with chilled beam technology: experience from a UK hospital

Appendix 1: Summary of relevant guidance

Health Building Note 09-03: Neonatal settings

- Health Building Note: Neonatal Settings (HBN 09-03) 2013

Health Building Note 09-02: Maternity care facilities

- Health Building Note: Maternity care facilities (HBN 09-02)

Neonatal care in Scotland: A Quality Framework

- Neonatal Care in Scotland: A Quality Framework" Scottish Government March 2013

Bliss Baby Charter Standards

- Bliss Baby Charter Standards 2020

Health Building Note 00-02: Sanitary spaces

- HBN 00-02 Mar 2017

Scottish Health Planning Note 4 supplement 1: Isolation facilities in acute settings

- In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)

Scottish Health Technical Memorandum 02: Parts A&B Medical gas pipeline systems

- Medical Gas Pipeline Systems: Design installation validation and verification (SHTM 02-01 Part A)
- Medical Gas Pipeline Systems: Operational management (SHTM 02-01 Part B)

Scottish Health Technical Memorandum 03: Parts A&B Ventilation for healthcare

- Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
- Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Scottish Healthcare Technical Memorandum 04-01 (SHTM 04-01)

- Water safety for healthcare- Design installation and testing (SHTM 04-01 Part A)
- Water safety for healthcare- Operational management (SHTM 04-01 Part B)
- Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C)
- Water safety for healthcare- Disinfection of domestic water systems (SHTM 04-01 Part D) .
- Water safety for healthcare- Alternative materials and filtration (SHTM 04-01 Part E)
- Water safety for healthcare- Chloramination of water supplies (SHTM 04-01 Part F)
- Water safety for healthcare- Operational procedures and exemplar (SHTM 04-01 Part G)

Scottish Health Technical Memorandum 06: Electrical services Parts A&B

- Electrical services supply and distribution: Design considerations (SHTM 06-01 Part A)
- Electrical safety guidance for High Voltage systems (SHTM 06-03)

Scottish Health Technical Memorandum 08-03: Bedhead services

- Specialist Services - Bedhead Services (SHTM 08-03)

Scottish Health Technical Memorandum 08-03: Building Management Systems – Parts A-D

- Building Management Systems: Overview and Management (SHTM 08-05 Part A)
- Building Management Systems: Design Considerations (SHTM 08-05 Part B)
- Building Management Systems: Validation and Verification (SHTM 08-05 Part C)

- Building Management Systems: Operational Management (SHTM 08-05 Part D)

Scottish Health Technical Memorandum 54 – 69: Building component series

- Building component series -User manual (SHTM 54)
- Building component series -Windows (SHTM 55)
- Building component series - Partitions (SHTM 56)
- Building component series - Internal glazing (SHTM 57)
- Building component series - Internal doorsets (SHTM 58)
- Building component series - Ironmongery (SHTM 59)
- Building Component Series - Ceilings (SHTM 60)
- Building component series - Flooring - matrix_example xls (SHTM 61 app 1a)
- Building component series - Demountable storage systems (SHTM 62)
- Building component series - Fitted storage systems (SHTM 63)
- Building Component Series – Sanitary assemblies (SHTM 64)
- Building component series - Cubicle curtain track (SHTM 66)
- Building component series - Laboratory storage systems (SHTM 67)
- Building component series - Protection (SHTM 69)

Scottish Health Technical Memorandum 81- 87:

- Fire safety - Precautions in new healthcare premises (SHTM 81 part 1)
- Fire safety - Fire engineering of healthcare premises (SHTM 81 part 2)
- Fire safety - Atria in healthcare premises (SHTM 81 part 3)
- Fire safety - alarm and detection systems (SHTM 82)
- Fire safety - General fire precautions in healthcare premises (SHTM 83)
- Fire safety - Precautions in existing healthcare premises (SHTM 85)

- Fire safety - Risk assessment (SHTM 86)
- Fire safety - Textiles and furniture (SHTM 87)

NHSScotland Waste Management Guidance

- NHSScotland Waste Management Guidance. Scottish Health Technical Note (SHTN-03-01)

Scottish Capital Investment Manual

- Scottish Capital Investment Manual: NHSScotland Commissioning Process. Scottish Government 2017

Key Stage assurance Review

- Key Stage Assurance Review (KSAR): Notes for Board Infection Prevention and Control Teams. National Services Scotland 2023

Health Technical Memorandum 01-04

- Health Technical Memoranda: Decontamination of Linen for Health and Social Care (HTM 01-04) Management and Provision 2016

National Guidance for the Safe Management of Linen

- National Guidance for Safe Management of Linen in NHSScotland Health and Care Environments For laundry services/distribution. Health Protection Scotland 2018

Guidance for NNU – levels 1,2, & 3

- Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018

Pseudomonas aeruginosa routine water sampling in augmented care areas

- Pseudomonas aeruginosa routine water sampling in augmented care areas for NHSScotland. Health Protection Scotland 2018

Prevention and management of healthcare water-associated infection/ incidents/outbreaks

- Prevention and management of healthcare water-associated infection incidents/outbreaks. Health Protection Scotland 2019

National Infection Prevention and Control Manual

- National Infection Prevention and Control Manual: Home (scot.nhs.uk)

Scottish Health Facilities Note Part A - C

- HAI-SCRIBE Manual information for project teams (SHFN 30 Part A)
- HAI-SCRIBE Implementation strategy and assessment process (SHFN 30 Part B)
- HAI-SCRIBE questionsets and checklists (SHFN 30 Part C)

NHS National Services Scotland

Notes for boards:

Infection Prevention and Control (IPC) risks in the design of haemato-oncology and bone marrow transplant (BMT) units

May 2024

ARHAI Scotland
Antimicrobial Resistance and Healthcare Associated Infection

Version history

Version	Date	Summary of changes
V1.0	23 May 2024	New publication.

Approvals

Version	Date Approved	Group / Individual
V1.0		

Contents

Introduction

There is limited technical standards and guidance currently available to aid decision making in respect of optimal design considerations when planning to undertake a new build, adapt, extend, or refurbishment within an inpatient haemato-oncology ward and/or bone marrow transplant (BMT) unit.

This document aims to support NHSScotland boards by providing them with a summarised set of questions and answers which will signpost them to any applicable technical guidance documents and summarise key considerations pertaining to:

- functionality
- layout
- support spaces
- maintenance access arrangements
- water systems (including drainage)
- ventilation systems

In addition to design considerations, HAI-SCRIBE and NDAP/KSAR processes support safe construction practices and commissioning. Haemato-oncology wards and BMT units provide accommodation to profoundly immunosuppressed patients so meticulous care must be taken around protecting its water and ventilation systems during construction works, and both during and beyond installation. There needs to be a robust commissioning plan from the outset. Clear project governance structures and involvement of IPC through each stage of the project are key to ensuring a safe environment for patients is delivered.

Questions and answers

Question 1: What are the optimal functional and design considerations/requirements/guidance specifications for a haemato-oncology ward/BMT unit within the UK?

Answer:

In this document, haemato-oncology wards and bone marrow transplant units refer only to inpatient settings.

Design should consider:

- service activity
- relevant guidance
- footprint available

Assessment of unit activity encompasses:

- case mix
- age range of patients
- treatments and procedures undertaken

Proximity to clinical areas outside the patient ward may be important, for example:

- intensive care
- medical imaging
- radiotherapy
- pharmacy
- operating theatres

Location of the haemato-oncology ward or BMT units should consider risks from adjacent clinical and non-clinical facilities. In particular, risks of water ingress from overhead water or drainage systems and garden areas should be considered. This

requires multidisciplinary input from clinicians, infection prevention and control (IPC), and the project team.

The number of single rooms and any specialised ventilation rooms required will be relative to the forecasted numbers of immunosuppressed patients who would require protective isolation, with the additional provision of source isolation rooms for transmissible infectious diseases.

Planning and design considerations for the adequacy of bed spacing and isolation room sizing and specifications and ancillary facilities are contained in technical guidance documents.

Relevant technical standards and guidance:

1. Healthcare Building Note: Cancer treatment facilities (HBN 02-01) 2013
2. Scottish Health Planning Note: Inpatient care (SHPN 04-01) 2010
3. Scottish Health Planning Note: Inpatient Accommodation SHPN 04 Supplement 1: Isolation Facilities in Acute Settings 2008
4. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 2: What air change rate should be provided to a haemato-oncology ward/BMT unit?

Answer:

For both BMT units and haemato-oncology wards:

- ≥10 air changes per hour achieved via supply air to the patient's room - see Table 3, page 79 SHTM 03-01 part A (1)

Consideration should be given to air mixing.

Each ensuite toilet should achieve:

- >10 air changes per hour via extraction.

Note: It is a matter of interpretation as to whether haemato-oncology ward/BMT unit refers to only patient rooms or is applicable within the wider unit footprint. The ventilation strategy for all ancillary rooms or spaces should be risk assessed locally based on the activities being undertaken in the ancillary room. Adjacencies, alongside the air flow patterns mitigate any infection risks to patients. In particular, preparation rooms and treatment rooms are areas where implementation of specified ventilation parameters and HEPA/EPA filtration should be considered.

Suitability of the overall ventilation system and its components require consideration. For example, thermal wheels may present a risk as it would recycle some extracted air into supply air, hence plate heat exchangers are preferable within these settings.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 3: What pressure differentials should be applied to a haemato-oncology ward/BMT unit?

Answer:

For both BMT units and haemato-oncology wards:

- +15 Pa from patient bedroom to corridor, with air cascading outwards via door undercut, transfer grilles or pressure stabilisers from the patient bedroom through to rooms of lower classification.

This is to be achieved through supply only in the patient room - see Table 3, page 79 SHTM 03-01 part A (1)

See note in Question 2 related to overall ventilation strategy.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 4: What monitoring of ward ventilation pressure cascades should be used in a haemato-oncology ward/BMT unit?

Answer:

“Airborne isolation facilities, both source and protective isolation” are listed as areas where the ventilation systems utilised are considered critical – see page 26 SHTM 03-01 Part A (1). These facilities include specialised ventilation rooms within BMT units and haemato-oncology wards. Control systems to detect system failures within the ventilation should be installed (1). These should be simple, robust, and reliable.

Room differential pressure gauges should be mounted directly adjacent to the entry door for each room with specialised ventilation 1.5m above floor level so at eye line (7.24; p50 SHTM 03-01 Part A) (1). These would typically be required where any pressure differential is expected to be maintained so their positioning would be guided by the overall ventilation strategy. This may be a digital monometer or differential manometer, for example Magnehelic gauge, which continually indicates the normal range.

The building management system (BMS) provides monitoring and control of the ventilation system. There should be a ventilation control panel fitted outside critical areas to enable maintenance by the authorised person (see 7.18; p49 SHTM 03-01 Part A) and there should be a visual indication provided for clinical staff which shows that the air handling unit is operating within expected parameters (see 9.229; p120 SHTM 03-01 Part A) (1).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 5: What level of filtration should be applied to a haemato-oncology ward/BMT unit?

Answer:

For both BMT units and haemato-oncology wards:

- Final filter EPA 12 - see Table 3, page 79 SHTM 03-01 part A (1). EPA/HEPA filters should be located within a metal terminal housing with airtight seals immediately prior to the grille – see 9.58 and 9.59 p98 SHTM 03-01 part A (1).

See note in Question 2 related to overall ventilation strategy.

Areas or rooms requiring EPA/HEPA filtration should be fully sealed. Windows should be non-openable style and any trickle vents sealed and non-openable. Consideration should be given to permeability testing for assurance of this being achieved following construction and as part of commissioning – see 12.17-19 page 142 SHTM 03-01 part A (1).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 6: Are HEPA filters required for use in a haemato-oncology ward/BMT unit?

Answer:

EPA 12 filters are sufficient for both - see Table 3, page 79 SHTM 03-01 part A (1).

These are defined by BS EN 1822 (note testing is now superseded by ISO 29463).

For practical purposes, there is little difference in level of protection provided by different grades of HEPA but higher grades will incur greater energy demand from the air handling unit (2).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022
2. Inkster T, Peters C, Dancer S. Safe design and maintenance of bone marrow transplant units: a narrative review. Clin Microbiol Infect 2022 https://doi.org/10.1016/j.cmi.2022.03.032

Question 7: Should chilled beams be used in a haemato-oncology ward/BMT unit?

Answer:

No. Chilled beams present a hazard of exposure to waterborne pathogens and maintenance requirements may be impractical to implement in these facilities.

Chilled beams can form condensation which can drip into the room and the condensate may be contaminated with waterborne bacteria and fungi (1). This presents substantial infection risks to immune compromised patients.

Chilled beams also require regular cleaning which may be impractical in terms of access requirements – see page 38 SHTM 03-01 Part A (2). These maintenance activities may generate further hazards to patients, for example dust generation, and have the potential for clinical service disruption.

In addition, rooms with EPA/HEPA supply should be fully sealed, including solid ceilings, usually precluding use of chilled beams.

Relevant technical standards and guidance:

1. Inkster T, Peters C, Soulsby H. Potential infection control risks associated with chilled beam technology: experience from a UK hospital
2. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 8: Are interlocking entrance doors recommended for a BMT unit?

Answer:

There are no current recommendations within UK guidance.

SHTM 03-01 Part A briefly outlines a typical ventilation strategy with supply only into patient rooms, cascading out via door undercut, transfer grille or pressure stabiliser through rooms of lower classification - see Table 3, page 79 SHTM 03-01 part A (1).

Interlocking entrance doors (for instance an anteroom with at the entrance to the unit) may provide additional protection against fungal spore ingress into the unit from adjoining corridors and spaces.

Decision to include or not depends on assessment of whether other control measures are sufficient to provide a safe BMT unit and assessment of operational risks of interlocking doors. Control measures to consider include:

- presence or absence of anterooms
- ventilation strategy adopted
- pressure of unit relative to the outside corridor

This may require multidisciplinary risk assessment.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022

Question 9: What is the recommended water and drainage system design for a haemato-oncology ward/BMT unit?

Answer:

Design considerations should encompass:

- hot and cold water system components from supply to ward
- layout of services on the ward and access requirements for maintenance to components of the water system. Services include hot and cold water distribution, as well as wastewater drainage system
- selection of the water outlets, associated sanitary assemblies and equipment using water, and drain outlet locations

Haemato-oncology wards and BMT units are considered high-risk areas for waterborne infection with Pseudomonas aeruginosa and other waterborne pathogens (1). This is due to the immunosuppressed patient population which confers greater likelihood of adverse events from exposure to waterborne pathogens, rather than the setting per se. CEL 03 (2012) (1) initially detailed requirements of the Health Board to identify high-risk units (stated to include haemato-oncology) and establish a water safety group. CEL 03 (2012) has now been replaced by CEL 08 (2013) (2), introducing further guidance and requirements.

SHPN 04-01 (3) states every single-bed room should have one clinical handwash basin (CHWB) and multi-bed rooms should have two CHWBs. SHPN 04-01 also advises an ensuite bathroom for each single-room with a toilet, shower and wash-hand basin (3). Further to this SHPN 4 Supplement 1 (4) on provision of isolation facilities advises a further CHWB in lobby rooms. SHPN 04 was last updated in 2010 (3), and since then Scottish Government have issued two letters of advice on water sources and potential infection risk to patients in high-risk units, stating substantial further evidence has been gained on potential risks to patients (1, 2). CEL 08 (2013) (2) introduced new HPS guidance for minimising risk of Pseudomonas aeruginosa in neonatal and intensive care units, updated in 2018 (5). This HPS guidance advises for neonatal and intensive care settings that risk assessment should determine

number of handwash basins rather than a particular ratio (5). At present, there is no similar guidance for haemato-oncology wards or BMT units.

Documents applicable to other settings may be considered in risk assessment of water outlets acknowledging their limitations. In addition to risks posed, consideration should be given to requirements of CHWBs for handwashing in line with NIPCM recommendations of where soap and water should be used vs hand rub (6).

SHTM 64 includes guidance on acceptable designs of CHWB and ancillary parts such as taps (7). Consideration should be given to splash risk and to design features which may reduce this risk. Sinks should be planned so that patients and care equipment are outside the splash zone. IPCT should be involved in tap selection and selection of ancillary equipment, for example bins for waste disposal.

Multidisciplinary expertise should be drawn on with the aim of designing out infection risks and planning management of residual risk. It is crucial this is undertaken early in the project to inform the design brief. All parts of SHTM 04-01 should be considered, including parts B-G focussed on operational use (8). Maintenance requirements should be considered for all outlets planned. Risks specific to patient population should also be considered, for example impact of hair shedding into drains due to cytotoxic chemotherapy.

Relevant technical standards and guidance:

1. CEL 03 (2012): Water sources and potential infection risk to patients in high risk units
2. CEL 08 (2013): Water sources and potential infection risk to patients in high risk units – revised guidance
3. Scottish Health Planning Note: Adult In-patient Facilities (SHPN 04-01) 2010
4. Scottish Health Planning Note: Inpatient Accommodation SHPN 04 Supplement 1: Isolation Facilities in Acute Settings 2008
5. Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018

6. National Infection Prevention and Control Manual: Home
7. Scottish Healthcare Technical Memorandum 64: Sanitary Assemblies – Building Component Series 2009
8. Scottish Healthcare Technical Memorandum 04-01 (SHTM 04-01)
    - Water safety for healthcare - Design installation and testing (SHTM 04-01 Part A)
    - Water safety for healthcare - Operational management (SHTM 04-01 Part B)
    - Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C)
    - Water safety for healthcare- Disinfection of domestic water systems (SHTM 04-01 Part D)
    - Water safety for healthcare- Alternative materials and filtration (SHTM 04-01 Part E)
    - Water safety for healthcare- Chloramination of water supplies (SHTM 04-01 Part F)
    - Water safety for healthcare- Operational procedures and exemplar (SHTM 04-01 Part G)

Question 10: What water system designs and components can exacerbate or contribute to an increased infection risk and what design considerations should be taken to reduce those risks within a haemato-oncology/BMT setting?

Answer:

SHTM 64 contains details on sanitaryware design (1).

Procurement of sanitaryware should follow options appraisal and multidisciplinary risk assessment by IPCT, estates management and clinicians.

In patient areas taps with thermostatic mixing valves (TMVs) are likely to be required due to scalding risk and there needs to be a plan for ongoing cleaning and maintenance of these. TMVs should ideally be located within the tap. If sensor taps are considered, the sensor should be placed in a visible area above or to the side of the outlet, so the user does not risk contaminating the outlet.

Consideration should be given to volume of water retained and the presence of any solenoid valves with synthetic rubber diaphragms which present a risk for biofilm growth. These risks may be weighed against possibility for automated flushing. Lever taps installed should be elbow operated.

Flow straighteners, rosettes, and aerators should not be fitted on outlets as these have been linked to outbreaks of Pseudomonas aeruginosa. Swan neck taps should not be installed. Consideration should be given to autoclavable taps.

Splash risk from basins presents a risk to patients so patients and patient care equipment should be outside the splash zone.

CHWBs should be rear-draining and consideration given to splash reducing designs.

Activity area of all outlets should be sufficient to fit a point of use filter (POUF) if required.

Flexible hoses should be kept to a minimum and risk assessed where required.

Showers hoses should be short enough for the showerhead to avoid the drain/floor. Similarly, it should not be possible to submerge a showerhead in a bath.

Bathrooms should be adequately sealed, have water-resistant cladding and sufficient extract ventilation for moisture control to decrease risk of mould proliferation.

Sufficient storage should be supplied so that patient hygiene products and cosmetics are not stored on sink tops.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 64: Sanitary Assemblies – Building Component Series 2009
2. Scottish Health Facilities Note Part A: HAI-SCRIBE Manual information for project teams (SHFN 30 Part A)
3. Scottish Healthcare Technical Memorandum 04-01: Scottish Healthcare Technical Memorandum 04-01 (SHTM 04-01) Part A 2014
4. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022
5. Safety Action Notice SAN SAN(SC)09/03 Flexible water supply hoses: risk of harmful micro-organisms.

Question 11: What are the recommendations for installing POU or inline filters as a control measure within a haemato-oncology ward/BMT unit?

Answer:

POUFs or inline filters may be considered as a control measure to protect against waterborne pathogens from supply water alongside other remedial actions (1).

POUFs provide immediate protection where the source of pathogens is the outlet, which is desirable given the vulnerability of this patient population.

Where POUFs are used, splash risk should be assessed and a plan made for their ongoing management. This should include cleaning regimens to avoid contaminating the filters, need for replacement at expiry/if removed/contaminated, and criteria for discontinuation.

Long-term use of POUFs may be required in some circumstances and the board Water Safety Group should participate in decision-making and the maintenance plan if this is the case.

In new and refurbished facilities, taps should be provided which can accommodate POUFs should the need arise – see 5.19 page 28 SHTM 04-01 Part A (2). Consideration should be given to sanitary ware during procurement that safe operation of an outlet would be possible with a POUF fitted.

Relevant technical standards and guidance:

1. Prevention and management of healthcare water-associated infection incidents/outbreaks. Health Protection Scotland 2019
2. Scottish Healthcare Technical Memorandum 04-01 (SHTM 04-01) Water safety for healthcare- Design installation and testing (SHTM 04-01 Part A)

Question 12: What maintenance considerations are essential to prevent infection risk in water and drainage systems in a haemato-oncology ward/BMT unit?

Answer:

All water services installed should be incorporated into the board Water Safety Plan and the board Water Safety Group should have oversight of this (1).

As with the rest of the hospital, temperature control should be regularly monitored and a risk assessment in place for Legionella control – guidance can be found in SHTM 04-01 part B (1). The board Water Safety Plan should include wider risk assessment of waterborne pathogens presenting a risk to vulnerable patients, including Pseudomonas aeruginosa and non-tuberculous mycobacteria (2, 3).

There should be a maintenance programme, including flushing, with defined responsibilities for each aspect.

Total viable count (TVC) testing should be undertaken quarterly and sampling locations determined by board Water Safety Group with guidance from SHTM 04-01

part C (4). Additionally, water testing for Pseudomonas aeruginosa is advised at least every six months but dependent on previous results (5).

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- Operational management (SHTM 04-01 Part B) 2014
2. British Standards BS 8680:2020: Water quality — Water safety plans —Code of practice
3. British Standards BS 8580:2019: Water quality – Risk assessments for Legionella control – Code of practice
4. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C) 2014
5. Pseudomonas aeruginosa routine water sampling in augmented care areas for NHSScotland. Health Protection Scotland 2018

Question 13: What maintenance considerations are essential to prevent infection risk in ventilation systems in a haemato-oncology ward/BMT unit?

Answer:

Ventilation systems for source isolation are “critical systems”.

Planning resilience into the ventilation system and contingency plans to ensure patient safety in the event of ventilation failure are crucial – see 4.14-4.16 page 26 SHTM 03-01 Part A (1).

Inspection and annual verification requirements are advised in chapters 4 and 5 of SHTM 03-01 Part B (2). Ventilation systems should be maintained in compliance with SHTM 03-01 Part B under oversight of the Board Ventilation Safety Group (2).

All air handling units have an expected life span. It is important that trends are monitored to detect sudden changes in performance requiring urgent remediation and to inform planning for replacement.

Relevant technical standards and guidance:

1. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022.
2. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Question 14: How should drinking water/ice be provided for BMT patients?

Answer:

Automated ice machines have been linked to outbreaks of waterborne pathogens and should not be used in this setting (1, 2). For immune compromised patients, ice may be prepared using sterile water in single use ice-making bags in a conventional freezer (2). Cooled boiled tap water is a reasonable alternate to sterile water for making ice.

There is variation in practice within the UK around drinking water provision for haemato-oncology patients, sometimes dependent on degree of immune suppression. Local risk assessment with key stakeholders should guide approach and may include wider considerations of bottled water, dietary provision and food preparation.

Relevant technical standards and guidance:

1. Safety Action Notice - Automatic Ice Making Machines: Risk of Infection (SAN(SC)06/46). Health Facilities Scotland 2006
2. Scottish Health Facilities Note Part A: HAI-SCRIBE Manual information for project teams (SHFN 30 Part A)

Question 15: What are the commissioning and validation requirements for a BMT unit?

Answer:

The commissioning process enables the installed environment to be brought into operational use; the processes for healthcare facilities in Scotland are described in the Scottish Capital Investment Manual (1). Commissioning is undertaken by an independent company, however local IPCT should be involved in tendering of the company and the commissioning strategy – see KSAR Notes for Boards section on Commissioning KSAR (2).

Engagement from IPCT on commissioning working groups is required throughout the project to ensure a safe handover for both technical and operational aspects (1, 2). Systems of key technical importance for IPCT are ventilation and water. An outline of the technical commissioning process for each can be found in SHTM 03-01 Part A chapter 11 (3) and SHTM 04-01 Part A Chapter 16 (4) respectively.

Areas with specialised ventilation should be considered for permeability testing and this may also be required during construction -see 12.17-12.19 page 142 SHTM 03-01 Part A (3). SHTM 03-01 Part A provides no recommendation on microbiological air sampling in these facilities, however consideration should be given to air sampling for filamentous fungi during commissioning. This may provide additional assurance of a safe ventilation system and provides a baseline in case further sampling is required in the future.

Microbiological testing in water should be undertaken during commissioning (5) including for TVCs, coliforms, E coli, Legionella, and Pseudomonas aeruginosa. The water sampling plan should provide assurance of a safe water system and a baseline for future testing results, with sufficient time before handover to react to any out-of-specification results. Operational aspects may include consideration of patient pathways and cleaning after handover.

Relevant technical standards and guidance:

1. Scottish Capital Investment Manual: NHSScotland Commissioning Process. Scottish Government 2017.
2. Key Stage Assurance Review (KSAR): Notes for Board Infection Prevention and Control Teams. National Services Scotland 2023.
3. Scottish Healthcare Technical Memorandum 03-01: Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A) 2022
4. Scottish Healthcare Technical Memorandum 04-01: Water safety for healthcare- Design installation and testing (SHTM 04-01 Part A) 2014
5. Scottish Healthcare Technical Memorandum 03-01: SHTM 04-01 Part G v1.0 Jul 2015 (nhs.scot) 2015

Appendix 1: Summary of relevant guidance

Health Building Note 02-01: Neonatal settings

- Healthcare Building Note: Cancer treatment facilities (HBN 02-01) 2013

Scottish Health Planning Note 04-01: Adult In-patient facilities

- Scottish Health Planning Note: Inpatient care (SHPN 04-01) 2010

Scottish Health Planning Note 04-01: Supplement 1: Isolation Facilities in Acute Settings

- Scottish Health Planning Note: Inpatient Accommodation SHPN 04 Supplement 1: Isolation Facilities in Acute Settings 2008

Health Building Note 00-02: Sanitary spaces

- HBN 00-02 Mar 2017

Scottish Health Planning Note 4 supplement 1: Isolation facilities in acute settings

- In-patient accommodation - supplement 1 - Isolation facilities in acute settings (SHPN 4 sup 1)

Scottish Health Technical Memorandum 02: Parts A and B: Medical gas pipeline systems

- Medical Gas Pipeline Systems: Design installation validation and verification (SHTM 02-01 Part A)
- Medical Gas Pipeline Systems: Operational management (SHTM 02-01 Part B)

Scottish Health Technical Memorandum 03: Parts A and B: Ventilation for healthcare

- Ventilation for Healthcare - Design and validation (SHTM 03-01 Part A)
- Ventilation for Healthcare - Operational and verification (SHTM 03-01 Part B)

Scottish Health Technical Memorandum 04: Water safety Parts A-G

- Water safety for healthcare - Design installation and testing (SHTM 04-01 Part A)
- Water safety for healthcare - Operational management (SHTM 04-01 Part B)
- Water safety for healthcare- TVC Testing Protocol (SHTM 04-01 Part C)
- Water safety for healthcare- Disinfection of domestic water systems (SHTM 04-01 Part D)
- Water safety for healthcare- Alternative materials and filtration (SHTM 04-01 Part E)
- Water safety for healthcare- Chloramination of water supplies (SHTM 04-01 Part F)
- Water safety for healthcare- Operational procedures and exemplar (SHTM 04-01 Part G)

Scottish Health Technical Memorandum 06: Electrical services. Parts A and B:

- Electrical services supply and distribution: Design considerations (SHTM 06-01 Part A)
- Electrical services supply and distribution: Operational considerations (SHTM 06-01 Part B)

Electrical safety guidance for high voltage systems

- Electrical safety guidance for High Voltage systems (SHTM 06-03)

Scottish Health Technical Memorandum 08-03: Bedhead services

- Specialist Services - Bedhead Services (SHTM 08-03)

Scottish Health Technical Memorandum 08-03: Building Management Systems – Parts A-D:

- Building Management Systems: Overview and Management (SHTM 08-05 Part A)
- Building Management Systems: Design Considerations (SHTM 08-05 Part B)
- Building Management Systems: Validation and Verification (SHTM 08-05 Part C)

- Building Management Systems: Operational Management (SHTM 08-05 Part D)

Scottish Health Technical Memorandum 54 – 69: Building component series

- Building component series -User manual (SHTM 54)
- Building component series -Windows (SHTM 55)
- Building component series - Partitions (SHTM 56)
- Building component series - Internal glazing (SHTM 57)
- Building component series - Internal doorsets (SHTM 58)
- Building component series - Ironmongery (SHTM 59)
- Building Component Series - Ceilings (SHTM 60)
- Building component series - Flooring - matrix_example xls (SHTM 61 app 1a)
- Building component series - Demountable storage systems (SHTM 62)
- Building component series - Fitted storage systems (SHTM 63)
- Building Component Series – Sanitary assemblies (SHTM 64)
- Building component series - Cubicle curtain track (SHTM 66)
- Building component series - Laboratory storage systems (SHTM 67)
- Building component series - Protection (SHTM 69)

Scottish Health Technical Memorandum 81- 87:

- Fire safety - Precautions in new healthcare premises (SHTM 81 part 1)
- Fire safety - Fire engineering of healthcare premises (SHTM 81 part 2)
- Fire safety - Atria in healthcare premises (SHTM 81 part 3)
- Fire safety - alarm and detection systems (SHTM 82)
- Fire safety - General fire precautions in healthcare premises (SHTM 83)
- Fire safety - Precautions in existing healthcare premises (SHTM 85)
- Fire safety - Risk assessment (SHTM 86)
- Fire safety - Textiles and furniture (SHTM 87)

NHSScotland Waste Management Guidance

- NHSScotland Waste Management Guidance (SHTN 03-01)

Scottish Capital Investment Manual

- Scottish Capital Investment Manual: NHSScotland Commissioning Process. Scottish Government 2017

Key Stage assurance Review

- Key Stage Assurance Review (KSAR): Notes for Board Infection Prevention and Control Teams. National Services Scotland 2023

Health Technical Memorandum 01-04

- Health Technical Memoranda: Decontamination of Linen for Health and Social Care (HTM 01-04) Management and Provision 2016

National Guidance for the Safe Management of Linen

- National Guidance for Safe Management of Linen in NHSScotland Health and Care Environments For laundry services/distribution. Health Protection Scotland 2018

Scottish Government Chief Executive Letters to health boards on water safety

- CEL 03 (2012): Water sources and potential infection risk to patients in high risk units
- CEL 08 (2013): Water sources and potential infection risk to patients in high risk units – revised guidance

Guidance to minimise risk of Pseudomonas aeruginosa in neonatal and intensive care

- Guidance for neonatal units (NNUs) (levels 1, 2, &3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. Health Protection Scotland 2018

Pseudomonas aeruginosa routine water sampling in augmented care areas

- Pseudomonas aeruginosa routine water sampling in augmented care areas for NHSScotland. Health Protection Scotland 2018

Prevention and management of healthcare water-associated infection/incidents/outbreaks

- Prevention and management of healthcare water-associated infection incidents/outbreaks. Health Protection Scotland 2019

National Infection Prevention and Control Manual

- National Infection Prevention and Control Manual: Home (scot.nhs.uk)

Scottish Health Facilities Note Part A - C

- HAI-SCRIBE Manual information for project teams (SHFN 30 Part A)
- HAI-SCRIBE Implementation strategy and assessment process (SHFN 30 Part B)
- HAI-SCRIBE question sets and checklists (SHFN 30 Part C)

A Paediatric Trigger Tool Review of Patients at the Royal Hospital for Children in NHS Greater Glasgow and Clyde

March 2021

Contents

Foreword

Scotland's healthcare system is one of the best in the world. Nationally, there is over a decade of experience in leading patient safety improvement underpinned by the Scottish Patient Safety Programme. In healthcare, original approaches to patient safety were essentially limited to risk management and review of adverse events. Measures of harm such as the Paediatric Global Trigger Tool (PTT) were developed to provide greater insight into paediatric patient safety and allow the development of interventions to address issues identified. Healthcare Improvement Scotland's leads the National Patient Safety Programme with particular interventions to improve paediatric patient safety.

Understanding adverse events are often difficult to discussed and put into context because it is a sensitive subject to address - and is often approached in an indirect manner by professionals and health services' users.

We recognise that the delivery of paediatric cancer care to haemato-oncology patients is highly complex and routinely involves a number of circumstances that may compromise the safety of children. This review used the validated UK (PTT) to examine the healthcare records of 83 children with positive blood cultures receiving care in the paediatric haemato-oncology treatment in Greater Glasgow and Clyde (GGC) from May 2015 to December 2019. The PTT used review used a structured retrospective case note tool that measures both triggers and adverse events in the service using paediatric-specific triggers.

The intention of using the PTT within the review of (GGC), Children's Hospital was not to determine preventable or non-preventable harm but to create opportunities to learn from the triggers and adverse events identified. Triggers are not themselves adverse events but help to identify them. The findings are comparable with other studies of this nature using trigger tools. That said, with any reflective process, there is always much to learn and improve. We have highlighted good practice and made recommendations for stakeholder consideration. This PTT review forms part of the overarching Case Record Review chaired by Professor Mike Stevens, Emeritus Professor of Paediatric Oncology, University of Bristol.

We thank a great number of individuals within the GGC system for their help and support to enable this review and hope the content is helpful to support their own internal quality improvement and patient safety endeavours.

Dr Patricia O'Connor
Honorary Professor
University of Stirling
Faculty of Health Science and Sport

Professor Peter Davey
School of Medicine
University of Dundee

Glossary

AD	Adverse event
CEWS	Children's Early Warning Scoring
GGC	Greater Glasgow and Clyde
ICU	Intensive Care Unit
M&M	Mortality and morbidity meetings
NCC MERP	National Coordinating Council for Medication Error Reporting and Prevention
PICU	Paediatric Intensive Care Unit
PRIMSA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PTT	Paediatric Trigger Tool
RCH	Royal Children's Hospital
RCPCH	Royal College of Paediatrics and Child Health
SCI	Significant Clinical Incident

1 Introduction

In November 2019, an oversight Board was established to address three specific issues within Queen Elizabeth University Hospital, Greater Glasgow and Clyde Health Board (GGC): infection prevention and control, associated governance and communications and engagement with the families affected. The chair of the oversight board is Chief Nursing Officer, Professor Fiona McQueen.

As part of the work of the Oversight Board, the Cabinet Secretary for Health and Sport set out, plans for a Case Note Review in a Parliamentary statement on 28 January 2020. A Case Note Review Team was established and tasked with examining the healthcare records of all haemato-oncology paediatric in-patients who had an identified gram-negative bacteraemia, in laboratory tests in the Royal Hospital for Children (RHC) and the QEUH, between May 2015 to December 2019.

1.1 Learning from adverse events

The review of the case notes was underpinned by Healthcare Improvement Scotland's document, '*Learning from adverse events through reporting and review – A National Framework for Scotland: July 2018*'. The aims of the national approach to learning from adverse events are to:

- Learn locally and nationally to make service improvements that enhance the safety of the care system for everyone
- Support adverse event management in a timely and effective manner
- Support a consistent national approach to the identification, reporting and review of adverse events, and allow best practice to be actively promoted across Scotland
- Present an approach that allows reflective review of events which can be adapted to different settings; and
- Provide national resources to develop the skills, culture and systems required to effectively learn from adverse events to improve health and care services across Scotland.

The national approach seeks to ensure that no matter where an adverse event occurs in Scotland:

- The affected person receives the same high-quality response
- Organisations are open, honest and supportive towards the affected person, apologising for any harm that occurred
- All staff involved are supported in a consistent manner
- Events are reviewed in a consistent way; and
- Learning is shared and implemented across the organisation and more widely to improve the quality of services.

This report presents the findings of the Paediatric Trigger Tool Review from the 83 patients and 117 episodes of infection identified. Individual case details cases are anonymised.

2 Background

Improving patient safety has had policy support internationally for over twenty years.[1-3] Methods for measuring and characterising patient safety issues have also attracted attention as governments, researchers and healthcare teams seek to make progress in reducing hospital acquired conditions. No single method can identify all harm associated with patient care. Approaches include record reviews,[4 5] incident reporting, patient experience data, routine safety metrics[6] and a wide range of observational and ethnographic studies. Efforts to advance patient safety have been hampered by the lack of high-quality measures of identifying and understanding the conditions that contribute to adverse events (AEs).

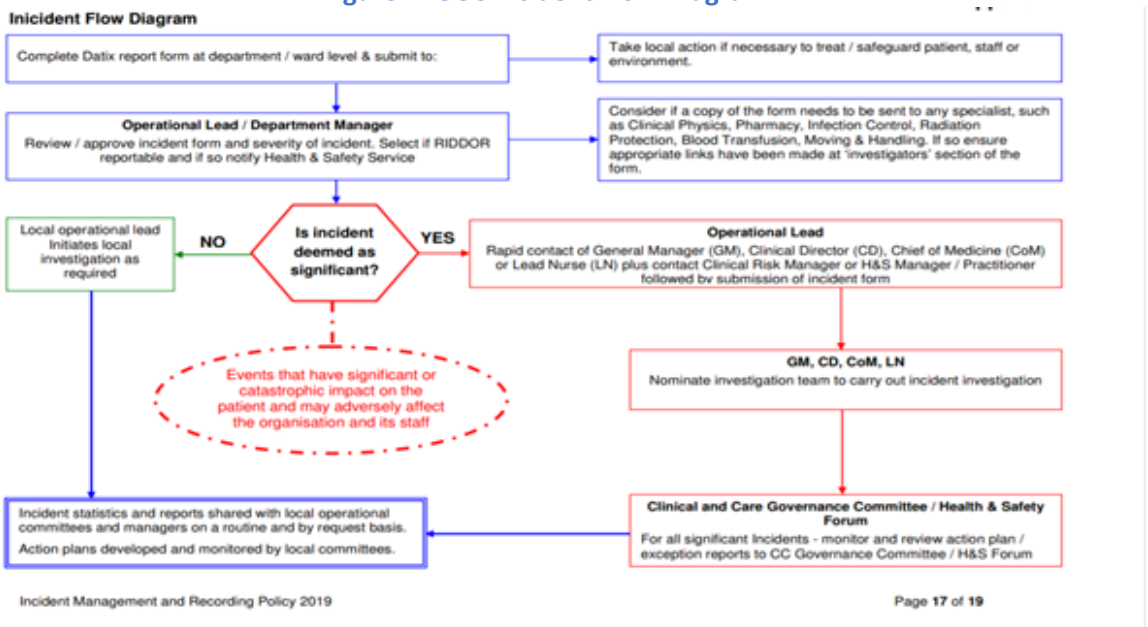
The most well-known strategy to identify and measure patient safety in hospitals is the use of occurrence ("incident") reports, submitted by healthcare staff and only identifies between 2%–9% of all adverse events in the inpatient setting.[1 5 7 8] Although these data are relatively easy and inexpensive to obtain, evidence suggests that occurrence reports are not widely used to drive improvement.[2 3] This under-utilisation results from the fact that occurrence reports are voluntary, time intensive, far more likely to be completed by nurses than doctors[9] and frequently perceived by staff to result in punitive action.[3] While identifying important clues to process flaws, occurrence reports generally identify near misses and sentinel events but rarely reflect the spectrum of adverse events in the episode of care.[10 11]

The concurrent use of complementary methods in real-time and retrospectively for AE detection is required. Healthcare harm (synonymous with the terms patient harm and AE) is defined as unintended physical injury resulting from or contributed to by healthcare care that requires additional monitoring, treatment or hospitalisation or that results in death.

2.1 Managing adverse events in GGC

GGC currently have an Incident Management Policy (2019) which details the organisational system to record and address adverse events and near misses. The Policy sets out for all staff, how to report, record and investigate clinical and non-clinical incidents, including near misses and potential incidents as detailed in the incident flow diagram Figure 1 below. It covers all incidents, whether they involve patients, relatives, visitors, staff, contractors, volunteers or the general public. The main route for reporting any adverse events within Greater Glasgow and Clyde is through DATIX (a web-based incident reporting and risk management software for healthcare and social care organisations). A risk assessment is undertaken to inform initial notification and escalation as detailed in the incident flow diagram within the policy. (GGC Incident Management Policy 2019) A risk matrix is used to determine the incident's grade based on the impact and likelihood of recurrence.

Figure 1: GGC Incident Flow Diagram



When an incident is scored a 4 or 5 there must be an investigation, which investigates causation (Figure 1). One approach to this is Root Cause Analysis. These incidents will be discussed with the Clinical Director or General Manager. If the severity is moderate, there should at least be a local investigation, led by the line manager, using if appropriate, a root cause analysis type approach. We

note that the policy was updated in 2020 to underpin national guidance from Healthcare Improvement Scotland (2019).[25]

2.2 Trigger Tools

Previous studies have identified harm using a trigger tool to detect specific "triggers," defined as medical record–based hints,[3 7] presented in a patient's medical record that may be associated with harm. Internationally, large studies, using a range of paediatric trigger tools have highlighted:

- harm 2 to 3 times higher than incident reporting.[12]
- the trigger tool performed reliably, and widespread implementation could substantially improve patient safety surveillance (16 academic hospitals, 3968 records, USA)[13]
- only 9.2 % of harm detected by the tool was reported in the adverse event system (6 centres, 600 records USA)[13]
- one in seven children experience harm during admission to hospital in the UK. Most of this harm is temporary, but a significant minority is serious (25 centres,3992 records, UK).[4]
- Chronically ill children had higher AE rates than patients without chronic Conditions (16 centres, 3790 records).[14]
- Children with complex medical conditions had increased vulnerability to adverse events due to the complexity of care (14 centres, 3669 records, Canada).[15]
-

Trigger tools can be customised to diverse settings and if used consistently, can accurately measure harm over time.[3] Using trigger tools can support the detection of potential patient safety issues[16] as trigger tools can identify harm two to 3 times higher than self-reported adverse events.[4]

2.2.1 The Paediatric Trigger Tool

The original global trigger tool[3] was adapted in the UK for use in paediatric services. In 2008, the National Health Service (NHS) Institute for Innovation and Improvement undertook to develop and test a UK Paediatric Trigger Tool (PTT) that could be applied to all levels of paediatric hospital care.[17] The PTT offers a structured retrospective case note review process to measure both triggers and adverse events within a service using paediatric-specific triggers. It provides paediatric teams with an unbiased measure of the incidence of hospital acquired conditions in their patients (i.e., harm caused by healthcare).[1] The tool offers a more efficient approach to the traditional healthcare record review. The literature highlights a range of triggers are found in services for 3-6% of discharges and[7 9-11] and around 22-37%[16 18] of cases have adverse events identified. The most frequent type of (AE) identified is hospital related infection. Triggers are not themselves AEs but help to identify them. When a trigger occurs, a more extensive review of the healthcare record is required to confirm whether an AE did or did not, in fact, occur.

2.2.3 The UK Paediatric Trigger Tool

In 2014, the UK PTT was developed with the support of clinicians in nine hospitals across the UK (including Scotland) in order to detect adverse events in paediatric care provided in district general hospitals, acute teaching hospitals and specialist paediatric centres[4] based on the Canadian Paediatric Trigger Tool.[19] For this case note review the UK Paediatric Trigger tool with three modifications for application in children receiving treatment for cancer (Section 4.1).

2.3 The Core Project Team

A core project team (CPT) chaired by Professor Marion Bain was established to review the work of the expert panel including the PTT review. Through Professor Marion Bain (Director of Infection Prevention and Control NHS GGC and Senior Medical Consultant, NHS National Services Scotland

(now Deputy Chief Medical Officer) progress and final report is directly to Professor Fiona McQueen as Chair of the Oversight Board. The CPT meetings provided governance oversight for the Case Note Review. These meetings received an update on the progress of our work and provided an opportunity to discuss risks and issues arising from the Review process itself. These meetings also acted as the conduit to provide updates and escalate risks and issues to the Scottish Government Oversight Board.
The PPT team were responsible for:

- undertaking the data collection, storage and submission of case note review material to the Expert Panel;
- resolving data/sampling issues with Professor Bain, the Support Team and the Expert Panel; and
- supporting the analysis and reporting of the Case Note Review through the Expert Panel.

All handling of patient data was covered by the relevant data-sharing agreements and protocols agreed between GGC and the Scottish Government.

2.4 Aim of the Paediatric Trigger Tool Review

The PTT review process uses a rapid structured case note review to help measure the rate of harm in an organisation or service. It provides paediatric teams with an unbiased measure of the incidence of healthcare associated harm. Most importantly, it allows clinical teams to prioritise safety improvement activity and track improvements overtime.
The intention of using the PTT within the review of Greater Glasgow and Clyde (GGC), Children's Hospital was not to determine preventable or non-preventable harm but to create opportunities to learn from the triggers and adverse events identified. The PTT forms part of the overarching case review process. The information from the PTT underpinned the epidemiological review and provided additional contextual data and information for each case. The PTT review examined the processes of healthcare provided to identify triggers in haemato-oncology patients who received hospital care between May 2015 and the December 2019 with:

- at least one positive blood culture of a Gram-negative organism associated with the environment

OR

- at least one positive culture of an atypical Mycobacterium (Acid Fast Environmental bacteria

The objectives of the PTT review were to contribute to the overall aim of the case note review by:

- Identify all triggers and adverse events in the cohort of patients included in the epidemiological review
- Describe the type and severity of adverse events occurring in hospitalised children in the review group
- Consider the findings of the review in line with current literature

3 Methodology

The list of cases for inclusion was validated by the Health Protection Scotland epidemiological review protocol. In total, 83 children were included with 117 episodes of infection. One patient was excluded as the care they received during the infection was out-with the GGC health system. Following the data sharing agreement protocol granted by GGC on 6th March 2020 the review team accessed the medical records through the electronic Clinical Portal.

We examined each of the 83 healthcare records using a structured process (to search for 'triggers' as determined by the PTT check list (Appendix 1). The presence of a trigger ***is not harm***. A 'trigger' is a predefined event that alerts the reviewer to the *possibility* of patient harm. Once a trigger is identified, the reviewer uses clinical expertise to examine the healthcare records in more detail to understand the circumstances and context around the event. If harm is suspected, a second reviewer (a physician) is consulted to confirm and validate all AE. In this review all cases were validated by two reviewers.

3.1 Adaptation of the UKPTT

As the PTT was to be applied to a specific cohort of patients with an adverse event already identified (positive blood culture), it was important that the context of cancer care in Scotland was understood. As a result, a critical review of the UK PTT was undertaken by Professor Hamish Wallace, Consultant Paediatric Oncologist at the Royal Hospital for Sick Children, Edinburgh and previously National Clinical Director of the Managed Service Network for Children and Young People with Cancer in Scotland; and Professor George Youngson CBE, Emeritus Professor of Paediatric Surgery, Aberdeen University, a UK leader in patient safety practice. Each of the triggers and definitions within the UK PTT tool was considered as applied to the GGC clinical paediatric haemato-oncology services. Following review, 3 additional triggers were recommended for inclusion. The additions were: PG12 Pain Score >7; PM9 Missed Doses and PM10 Antifungal treatment. The presence of neutropenia was also identified as an important trigger for children with cancer and infection. Therefore, it was agreed that in the section for other triggers, code PO1, neutropenia would be recorded if present and the level confirmed from haematology reports for all results with a level <1.0 ml. The PTT tool check list used in this review is presented in Appendix1. Additional narrative was added to the definitions (Appendix 2) to support contextual understanding during the PTT analysis as detailed in highlighted italics text.

The outcome of the PTT critical review and rationale for the inclusion of these additional triggers was discussed and the agreed by the Core Project Team in March 2020 as detailed below.

PG12 Pain

Pain management is one of the most important components in patient care.[20]
Pain is commonly under-recognised, under-treated and treatment may be delayed.[21] This is especially true in children.[22] The GGC system has dedicated records for the recording of pain scores. As mucositis, or inflammation of the mucous membranes (linings of the mouth and gut), is a common side-effect of cytotoxic chemotherapy. Mucositis can be so severe, a morphine infusion (PCA) may be required in order to control the pain. From the GGC pain protocol a score of >4 is considered uncontrolled pain and therefore recorded as a trigger.

PM9 Missed Doses

Missed doses particularly of cancer therapies for >7 days should be recorded as a trigger.

PM10 Antifungal treatment

Children and adolescents receiving intensive myelosuppressive chemotherapy and some paediatric hematopoietic stem-cell transplantation (HSCT) recipients are at high risk for invasive fungal disease caused by yeasts and moulds. In these patients, infections with *Candida* and *Aspergillus* species are most common. Therefore, the routine prescription of antifungals was added as an additional trigger.

3.2 Case Note Review Team

In January 2020 following discussion with the core project team the PTT review team were identified as:

- Paediatric Nurse*: Mr Peter Campbell, Associate Director of Nursing, NHS Lothian.

- Paediatrician*: Dr Linda Clerihew, Consultant Paediatrician, NHS Tayside,
- Haemato Oncologist*: Professor Hamish Wallace University of Edinburgh
- Infectious Diseases Consultant*: Professor Peter Davey
- ICP Nurse*: Ms Lesley Shepherd
- Review Co-ordinator: Dr Patricia O'Connor*, Honorary Professor Faculty of Health Sciences and Sport, University of Stirling
- Family Representative Liaison Member: Professor Craig White Scottish Government

3.3 Impact of Covid-19

The initial plan was for all 6 clinical reviewers* to train together on-site at GGC for 2 days in March 2020 to become familiar with the GGC clinical records structure and test use of the PTT tool with support from the medical records team. The rationale for training together is recommended in the literature to ensure interrater reliability.[19] Due to the emerging Covid-19 pandemic the Scottish Government announced on March 23rd, 2020 a stay-at-home order and clinical services began preparing to respond to increasing demand for hospital care. As a result, many of the members of the PTT team were recalled for clinical practice priorities before training and the case note reviews could take place. To ensure the PTT review could go ahead remotely, the Head of Service for Information Management at GGC arranged technical medical records support, IT devices and remote access for the Epidemiology and the PTT team. The UK PTT recommends two reviewers, a nurse and a medical doctor. Following discussion with Core Project team, in March 2020, it was agreed to continue the PTT review with the team members available: Dr. Patricia O'Connor and Professor Peter Davey. Both individuals have over 15 years' experience in using and implementing patient safety improvement methods, including the use of trigger tools. Following the Data Sharing Agreement Protocol granted by GGC on 6th March 2020 the review team were permitted access to the medical records within the electronic Clinical Portal.

3.4 The Clinical Portal

The GGC Clinical Portal is the web-based application that presents, in one convenient location, clinical patient data from a variety of NHS clinical systems. The Clinical Portal is widely accessed by a range of medical, nursing, AHP and administration staff, as well as by GPs and other Health Professionals, across NHS Scotland. The Clinical Portal has largely replaced manual (paper) case records at most NHS Scotland locations including GGC. During the PTT review we accessed each case record with a particular focus on:

- Admission and discharge records
- Medical in-patient notes
- Nursing care records
- Laboratory results from tests undertaken
- Intervention records
- Medications administered
- Correspondence between clinicians

The GGC Clinical Portal stores copies of the record components listed above in both written scanned records and electronic records. These records include the details of all the care given including:

- Records of medical care including reviews plans and decisions
- Nursing Care Records of direct care and decisions
- Medication records, prescriptions, medicines administered and changes to medicines therapies
- Laboratory results undertaken including results
- Procedure and intervention records
- Admissions, transfers and discharges

- Procedure and intervention records
- Admissions, transfers and discharges correspondence
-

3.4.1 Telepath

In addition to the Clinical Portal, we accessed the Microbiology section of Telepath, a generic Laboratory Information Management System that includes Patient Note Pad for recording text entries about patient management. This information was used to review microbiology advice about antibiotic treatment and line management. Access to Telepath required additional approval for non-laboratory staff, which was not obtained until October 2020.

3.5 Testing the PTT

The senior medical records manager at GGC reviewed the 43 triggers within the PTT check list to help and advise the review team of the location points of each item within the Clinical Portal patient record system. Supported by the records manager and using the location guidance, we tested the tool on 5 patient records. The initial testing identified that changes to the record review process were required to extract all the information required. Patient's records are scanned into the clinical portal after the patient is discharged. Many of the children were in hospital for weeks and months. Therefore, the date range search in the clinical portal, around the infection episode, had to be extended to at least 30 days before and up to 1 year after the infection to ensure all clinical record and associated correspondence were included. Testing 5 cases also offered the opportunity to reconcile the reviews of both PTT team members. Relevant clinical care narrative recorded within each healthcare record was directly extracted to support the triggers identified and adverse event grading.

3.6 Data Collection

We used a systematic structured process to access the clinical healthcare record and complete the adapted UK PTT (Appendix 1&2). All inpatient episodes of care of at least 24 hours in QEUH/RHC were included (n=117). Each reviewer examined the case record and used the PTT to record the presence of any of the 43 triggers and where applicable the adverse event severity score. Where adverse events were identified an Adverse Score E to I (Table 1) was applied to each.

Table 1: Adverse Event Scores E to I (original source the NCCC-MERP Index)[23]

Adverse Event Score	
E	Temporary harm to the patient that required an intervention
F	Temporary harm to the patient that required initial or prolonged hospitalisation
G	Permanent patient harm
H	Intervention required to save life
I	Patient Died

A second reviewer (the physician) confirmed and validated all the AE identified and recorded the details within the PTT checklist and accompanying additional narrative notes.

The literature recommends consistency in the reviewing process therefore inter-rater reliability was an important part of the case note review process. All PTT reports were reviewed by both members of the team. The review commenced in March 2020 and completed in February 2021.

The PTT Trigger Tool is divided into 6 components that relate to the sections of the clinical record where the triggers are likely to be found: General, Surgery, ITU, Medication and Laboratory (Appendix 1). Similar AEs may be identified with triggers in more than one section. For example,

Healthcare Associated Infections could be identified with Laboratory (positive blood culture), Medication (antifungal prescribed) or Surgery (surgical site infection) components. We defined nine categories of AEs in the UK PTT, adapted from categories defined for the Canadian Paediatric Trigger Tool[19] and the Global Trigger Tool [24]:

1. Biochemistry: intervention for increased creatinine; high/low potassium, sodium, sugar
2. Care complications: intervention for tissue damage, thrombosis, adverse drug reaction, central line infection or pain
3. Deteriorating patient: delayed response to Early Warning Score; intervention for cardiac/respiratory arrest, hypoxia or hypovolaemia
4. Haematology: intervention for anticoagulation, anaemia, thrombocytopenia or neutropenia
5. Infection: intervention for infection causing admission or occurring >48h after admission, bacterial or fungal
6. PICU: unplanned transfer to PICU
7. Medication: intervention with naloxone, chlorpheniramine, glucagon; unplanned anti-emetic; interruption of planned treatment
8. Surgery: returned to theatre for unplanned procedure
9. Transfer to/from hospital: readmission, unplanned admission, delayed discharge.

3.7 Analysis plan

Descriptive statistics were used to understand the trigger frequency and the number of AEs identified. Key measures were:

- The rate of events per admission
- Frequency and type of triggers identified
- The frequency and severity of the adverse events
- The Positive Predictive Value (PPV) of triggers (number of episodes with an AE identified by a trigger/ total number of episodes with that trigger)

3.8 Patient inclusion criteria

Health Protection Scotland (HPS) has undertaken an analysis of a variety of options to define the sample. The Expert Panel agreed the following cohort definition

- patients with blood cultures of a Gram-negative environmental pathogen (including enteric pathogens associated with the environment); or
- patients with a M. chelonae (Acid Fast Environmental) infection; and
- one child with severe infection with a Gram-negative infection environmental microorganism, although without proven bacteraemia

All families were informed, in a letter from NHS GGC on 4.03.20, of the inclusion criteria agreed by the Panel. All except one confirmed that they wanted their child to be included in the Review.

3.9 Case note review

A systematic structured process was used to review the healthcare record including the specific component parts: Correspondence, admission referral and discharge summaries, Clinical Records including Nursing, Medical and allied health professional Records, Laboratory and procedural reports, medicines, and treatment specific information. The process searched for ‘triggers’ within each episode of care as determined by the PTT check list. (Appendix 1). A ‘trigger’ is a predefined event that alerts the reviewer to the possibility of patient harm. The core project team agreed the list of definitions for each trigger in accordance with the UK PTT with the 3 additions detailed above. Once a trigger was identified, the reviewer used clinical expertise to examine the records in more detail to understand the circumstances around the event and record additional narrative contextual

details. A second reviewer (a physician) reviewed, confirmed and validated all of the AE identified and recorded the specific details within the PTT form and accompanying additional narrative notes.

3.10 Literature review

Evidence from the literature about detection of AEs in paediatric inpatient with trigger tools was identified through searches in PubMed and Medline. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)was used with results presented in Appendix 3. Additional records were identified from published reviews and by searching bibliographies of full text articles. The terms used in the search were:

> *(paediatric **OR** paediatric **OR** children) **AND (**Hospital **OR** NICU **OR** hospitalised **OR** hospitalized) **AND** ("Paediatric trigger tool" **OR "**paediatric trigger tool**" OR** "global trigger tool**") AND** ("adverse event" **OR** "harm"**)***

Included studies reported adverse event rates detected with a trigger tool in children <18 years old and treated in hospital for at least 24 hours.

Studies were excluded if they reported the development or validation of a trigger tool, were confined to adverse drug events or adverse events associated with medical devices, were reviews with no original data, were studies of children in specialist units other than oncology (e.g. psychiatry) or were not published in English or were a study protocol.

For comparison of data from NHS GGC with other hospitals we classified hospitals as tertiary care if they provided specialist services and received referrals from primary care and from secondary care hospitals. We classified NHS GGC as a tertiary care hospital. Hospitals were classified as secondary care if they only received referrals from primary care.

Published studies used trigger tools in random samples from all admissions. For comparison of event rates in NHS GGC with the published evidence we have only included adverse events from NHS GGC that were not directly related to the infections that were the reason for inclusion in the NHS GGC cohort.

3.11 Datix and Mortality and Morbidity Review reports

Clinical Risk at NHS GGC were asked to provide copies of all Datix reports for patients in the review cohort from 1st January 2015 to 31st December 2019. In addition, NHS GGC were asked to provide all Morbidity and Mortality Review reports for all patients in the review cohort.

3.12 Categorisation of adverse events for comparison between PTT and Datix

The Paediatric Trigger Tool uses the NCC MERP index, whereas Datix uses the NHS Scotland risk matrix to classify adverse events. We have therefore converted these classes into the three Categories advised by the national framework for Scotland. We have also applied these categories to data from published papers that use the NCC MERP index.

The national framework in Scotland for learning from adverse events through reporting and review[25] recommends that the following categories should be used to group adverse events:

• Category I – events that may have contributed to or resulted in permanent harm, for example unexpected death, intervention required to sustain life, severe financial loss (£>1m), ongoing national adverse publicity (likely to be graded as major or extreme impact on NH Scotland risk assessment matrix, or Category G, H or I on National Coordinating Council for Medical Error Reporting and Prevention (NCC MERP) index).

• Category II – events that may have contributed to or resulted in temporary harm, for example initial or prolonged treatment, intervention or monitoring required, temporary loss of service, significant financial loss, adverse local publicity (likely to be graded as minor or moderate impact on NHSScotland risk assessment matrix, or Category E or F on NCC MERP index).
• Category III – events that had the potential to cause harm, but no harm occurred, for example near miss events (by either chance or intervention) or low impact events where an error occurred, but no harm resulted (likely to be graded as minor or negligible on NH Scotland risk matrix or Category A, B, C or D on NCC MERP index).

4 Results

4.1 PTT

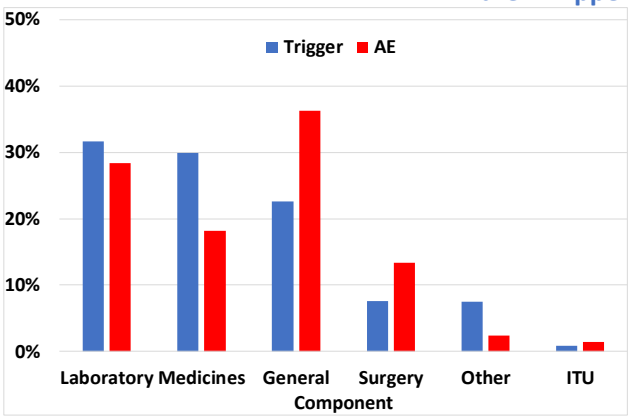
The PTT tool uses the NCC MERP index adverse event coding in ascending order of severity from E to I in component groups of General Care, Surgical Care, Laboratory (test results), transfer to ITU, Medicines and Other as detailed in Table 1. From the 117 episodes included there was the potential to record a total of 5031 triggers. In total, we identified 966 triggers and 501 AEs.. The summary breakdown results are presented in Table 2 below.

Table 2: Total number of adverse events by severity code

Total number of adverse events by severity code					
Adverse event code	E	F	G	H	I
Total number	53	424	18	4	2

The Laboratory component of the PTT accounted for 32% of the 966 triggers but the General component accounted for 36% of the AEs (Figure 2).

Figure 2: Frequency of 966 triggers and 501 AEs by UK PTT Component. Full results for all triggers are in Appendix 4.



Component	Trigger		AE	
Laboratory	306	32%	142	28%
Medication	289	30%	91	18%
General	218	23%	182	36%
Surgery	73	8%	67	13%
Other	72	7%	12	2%
ITU	8	1%	7	1%
Total	966		501	

Although the General component did not have as many triggers as the Laboratory or Medication components it accounted for 36% of the AEs because the most three most frequent triggers had a PPV of 76-98% (Table 2). The 115 bacteraemias were all classified as AE's but these General component triggers identified consequences of infection that may have contributed to or resulted in harm. In contrast, in both the Laboratory and Medication components two of the most frequent triggers identified events that were part of the planned management for these children. We identified prescription of antifungals in 98 episodes, but this was at prophylactic doses in 94. We only identified escalation to treatment doses in 4 episodes. In the Medication component Missed Doses had a high PPV because it identified 48 delays in cancer treatment. We classified all delays of >24h as Category II AEs. On the NCC MERP Index we scored delays of 1- 7 day as E AEs and delays of

8 or more days as F AEs. The most frequent triggers in the Surgery component all had high PPV in this cohort of patients (Table 3).

Table 3: Three most frequent triggers in the General, Laboratory Medication and Surgery components with their Positive Predictive Value (PPV)

Trigger	Description	Trigger	%	AE	%	PPV
General component						
PG4	Un planned Admission	73	33%	63	35%	86%
PG8	Complication of procedure or treatment	43	20%	42	23%	98%
PG3	Readmission within 30 days	42	19%	32	18%	76%
	Total	218		182		
Laboratory component						
PL14	Positive Blood Culture	115	38%	115	81%	100%
PL2	Transfusion	74	24%	3	2%	4%
PL15	Thrombocytopenia (<100)	62	20%	1	1%	2%
	Total	306		142		
Medication component						
PM10	Antifungal prescribed	98	34%	4	4%	4%
PM6	Anti-emetic given	70	24%	1	1%	1%
PM9	Missed Doses	56	19%	48	53%	86%
	Total	289		91		
Surgery component						
PS1	Returned to Theatre	48	66%	47	70%	98%
PS2	Change in planned procedure	22	30%	17	25%	77%
PS3	Surgical Site Infection	2	3%	2	3%	100%
	Total	73		67		

In the Other component neutropenia accounted for 71 of 72 triggers, with 12 AEs (PPV 17%). The remaining trigger was a skin biopsy, which was not classified as an AE.

The ITU Component only has one trigger. This identified 8 admissions to ITU of which 7 were unplanned and classified as severity G or I AEs.

4.1.1 Central line management

The Patient Note Pad notes in Telepath frequently state that microbiology advice is based on evidence from the IDSA (Infectious Diseases Society of America) guidelines on management of intravascular catheter related infection.[26] Overall recommendations for Gram-negative bacteraemia in patients with long term catheters are:

- If the line is removed, treat with 7-14 days antibiotics
- For line salvage, use systemic and antibiotic lock therapy for 10-14 days.

The line was removed in 78 (67%) of episodes. When line salvage was attempted the line was rested in 51 (45%) episodes and subsequently challenged in 21 (18%) episodes. Signs and symptoms of sepsis occurred after 9 (43%) of those line challenges and, in one case, resulted in a patient who experienced rigors, became cyanosed, tachycardic and had limited response to bolus fluid infusion, being admitted to PICU.

NHS GGC provided us with information regarding central line challenges: “Challenging the lines was a rather historic practice, if a child had a pyrexia they would stop using the line, insert a cannula and

use that, then a few days later 'challenge' the line by taking more blood cultures and flushing, gradually using for fluids and medications. This practice was discussed at the QI group (set up in May 2017) and we worked from there towards a change. Microbiology and other representatives within the group agreed to continue to use a line or remove a line depending on the clinical and microbiological status of the child".

However, the frequency of line challenges did not appear to reduce with time and was identified in 5 (14%) of 36 episodes occurring up to May 2017 versus 16 (20%) of 79 episodes from June 2017 onwards. The latest line challenge we noted in our review was for a bacteraemia diagnosed in March 2019.

Patient Note Pad notes do not document any microbiology concerns about plans to challenge the line where this is explicitly mentioned.

4.2 Adverse Events

4.2.1 Categorisation of adverse events detected with the UK PTT

The PTT review included 83 patients with 115 episodes of bacteraemia, all of which were defined as an AE (Table 3). The PTT review separately identified 389 additional AEs, making a total of 501 AEs. Of these 24 (5%) were Category I and occurred in 17 (14%) episodes. There were 362 Category II AE in addition to the 115 bacteraemias, of which 78 (21%) related to removal of the central line and 48 (13%) to delays in cancer treatment.

All unplanned admissions to PICU were classified as Category I AE and occurred in 16 episodes, accounting for 67% of all Category I AE. Moreover, 7 of the remaining 8 Category I events occurred in 2 of the same 16 episodes. The only Category I event to be recorded in an infection episode with no PICU admission occurred in a patient who was resuscitated for sepsis on the ward but whose condition stabilised sufficiently to avoid PICU admission.

Overall, of the 501 AEs detected by the PTT, only one fifth (91 (18%)) were unrelated to management of the infections. Six of these were Category I: 4 of the admissions to PICU, one pulmonary embolus and one case of pressure ulcers.

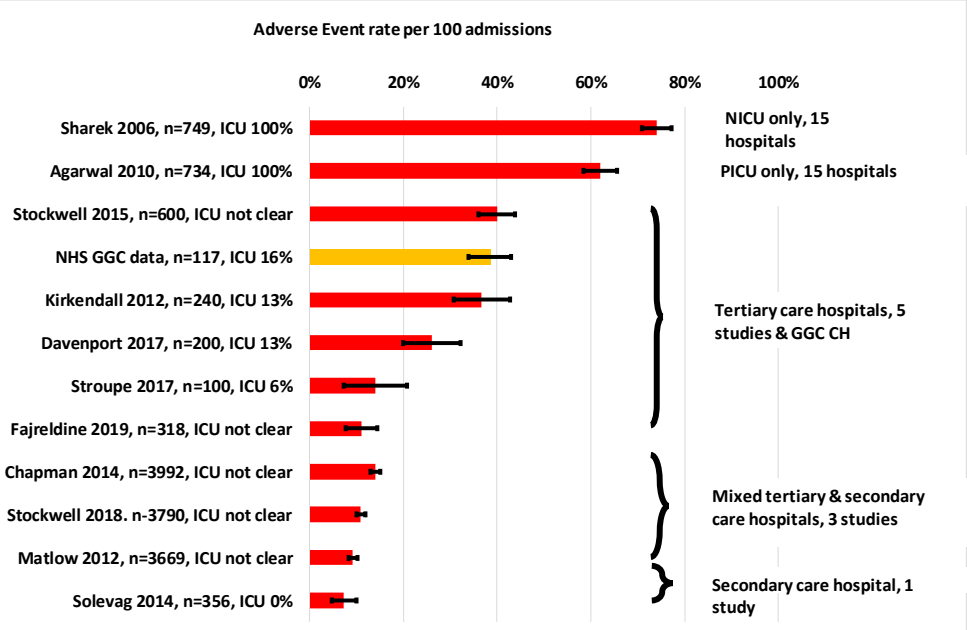
4.2.2 Adverse Event in NHS GGC compared with evidence from the literature

4.2.2.1 Adverse Event rate

The search identified 11 studies with 15,153 paediatric inpatients from 104 hospitals in four countries: Argentina,[27 28] Canada,[15] Norway,[29] the UK[4] and the USA.[5 12 14 24 30 31] The details of included studies are in Appendix 5.

The mean AE rate reported in the paediatric inpatient studies ranged from 7% to 74%. Two studies reported that risk of AE was greater in tertiary care *versus* secondary care hospitals (RR 6.20, 95% CI 5.05-7.61)[14 15] and two studies reported that risk was increased in children who spent one or more days in NICU or PICU (RR 2.79, 95% CI 1.03-4.79).[24 27] These two risk factors explained much of the variation across all 11 studies. The highest AE rates were in the two studies that only included patients from ICUs. In comparison with studies that included secondary care hospitals, studies that only included tertiary care hospitals had higher AE rates. Finally, within studies from tertiary care hospitals higher proportion of ICU patients was associated with higher AE rates (Figure 3).
The rate of AE unrelated to infection in NHS GGC was 39%, which is comparable with rates reported in random samples of admissions from other Tertiary Care Hospitals with similar PICU admission rates (Figure 3).

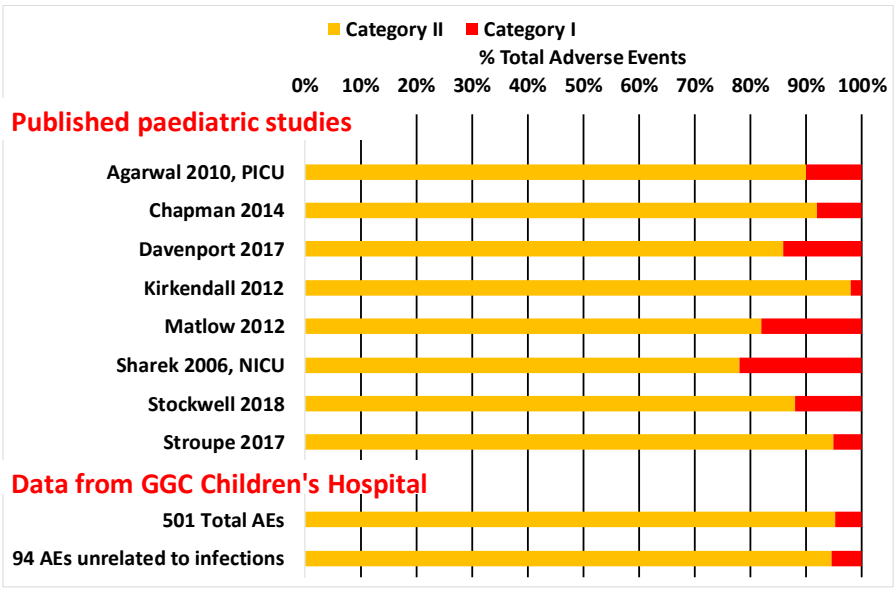
Figure 3: Adverse events per 100 admissions in 11 studies of paediatric inpatients and at NHS GGC. Bars show 95% CI of event rates.



4.2.2.2 Adverse Event severity

Eight paediatric studies used the NCC-MERP classification of harm to assign severity to AEs, which is the classification used in the UK Paediatric Trigger Tool. The proportion of Category I events was 5% for NHS GGC, which was lower than in six of the eight published studies. The proportion was also 5% for the 94 NHS GGC AEs that were unrelated to infections (Figure 4).

Figure 4: Severity of adverse events in eight studies compared with NHS GGC



4.2.2.3 Adverse Event categories

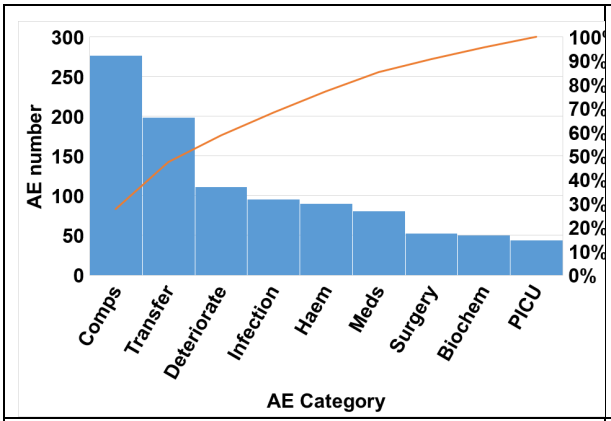
We have grouped AEs into categories for ease of analysis (Table 4).

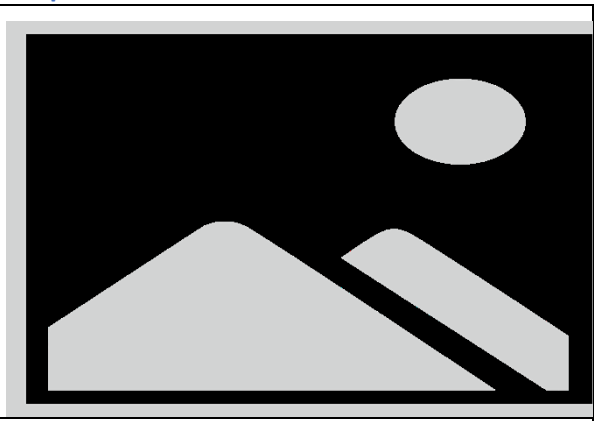
Table 4 Adverse Event Categories.

Biochem	Biochemistry	Intervention for increased creatinine; high/low potassium, sodium, sugar
Comps	Care complications	Intervention for tissue damage, thrombosis, adverse drug reaction, central line infection or pain
Deter	Deteriorating patient	Delayed response to Early Warning Score; intervention for cardiac/respiratory arrest, hypoxia or hypovolaemia
Haem	Haematology	Intervention for anticoagulation, anaemia, thrombocytopenia or neutropenia
Infection	Infection	Intervention for infection causing admission or occurring >48h after admission, bacterial or fungal
PICU	PICU	Unplanned transfer to PICU
Meds	Medication	Intervention with naloxone, chlorpheniramine, glucagon; unplanned anti-emetic; interruption of planned treatment
Surgery	Surgery	Returned to theatre for unplanned procedure
Transfer	Transfer to/from hospital	Readmission, unplanned admission, delayed discharge

Two of the included studies used the UK Paediatric Trigger Tool[4 29] but one of these was from a single Secondary Care Hospital with no unplanned paediatric admissions.[29] We have compared the AE categories at NHS GGC with the results of a multi-hospital UK study (Figure 5)

Figure 5 Pareto charts plotting the pattern of AE at NHS GGC compared with those in a large study at other UK hospitals.





Chapman 2014. Data from 1001 AE from 25 UK hospitals (9(36%) were tertiary care	NHS GGC. Data from all 501 AE identified from the PTT

The NHS GGC data are dominated by AE classified as Infection and Transfer, which is much as would be expected from the nature of the group selected. In the UK study only 36% of the participating hospitals were Tertiary Care, which may account for the finding that only 68 (4%) of 1668 unplanned admissions were coded as AEs, presumably because the remainder were admissions that were unrelated to previous hospitalisation or treatment of long-term conditions. In contrast 63 (86%) of 73 unplanned admissions at NHS GGC were coded as adverse events. It is reassuring, however, that although nearly 1/3 of 'Deteriorating patient' AE in the Chapman study were caused by failure to do or to respond to Early Warning Scores, this was not identified as causing AE in any of the NHS GGC episodes. In contrast, 74% of these AEs in the NHS GGC data were in patients who were given fluid resuscitation on the ward in response to symptoms of their bacteraemia – in itself, this is indicative of the serious nature of such infections.

4.2.3 Adverse events reported in NHS GGC compared with those detected with the PTT

4.2.3.1 Datix reports on cases in the review

In total 174 incidents were recorded in Datix in 65 (78%) of the 83 patients from 2015-2019 with a median of 2 (range 1 to 6) Datix incidents per patient. In 23 of these patients a total of 31 Datix reports were made during an admission that included one or more episodes of infection that met the criteria for inclusion in the review. The other 143 Datix reports were made during admissions that occurred either before (n=84) or after (n=59) the admissions with infection episodes.
Of the total 501 AEs detected with PTT six (1%) were reported on Datix, which included two (9%) of the 22 Category I AEs. One of these patients had severe sepsis and died in PICU, which was classified as Category I (Extreme) on Datix. The second had PICU admission for toxic megacolon due to *C difficile*, but this was classified as Moderate (Category II) on Datix.

There were six adverse events that were common to both systems. These included two incidents that were categorised as infection control on Datix: septic shock associated with gram negative bacteraemia and the case of severe *C difficile*. The other four incidents that were common to both systems were pressure ulcers, infusion of contaminated bone marrow cells and two pain control incidents.

The 23 patients with Datix reports had a total of 36 incidents. However, 9 (29.0%) of these were recorded as Negligible risk (i.e. Category III) incidents that were not associated with harm, whereas the PTT review only included Category I and II incidents. However, one of the Datix incidents that was graded as Negligible risk on the NHS Scotland Risk matrix was one of the two deaths associated with infection. The reason for reporting this death was that it occurred within seven days of stem cell transplant. The report says: "*To comply with HTA (Human Tissue Authority) regulations, any death within 7 days post receiving stem cells must be reported and this DATIX is part of the documentation."* It may be unlikely that the stem cell transplant contributed to death, but the incident was an unexpected death so we believe that it should have been reported as Category I.
In addition to the Extreme incident (Category I - death in PICU), there was only one other incident reported in Datix as Major in any of these patients throughout the period of the Review - and this was unrelated to an infection episode.

Of the total of 174 Datix incidents, 124 (71%) were classified as Minor or Negligible.
Only 5 of the total 174 incidents were coded as relating to infection control for the entire period of the Review, and only 2 of these were documented as such during an infection episode. However, some Datix reports that were classified as 'Other' clearly described an infection control incident (e.g. bacterial contamination of donor transfusion cells) and should have been coded as such.

4.2.3.2 Morbidity and Mortality Reports on cases in the review

We received 15 reports of Morbidity and Mortality (M&M) reviews from patients in the cohort, all from amongst the 21 patients who had died by the time of publication of this report. Two of these reviews were about deaths that occurred during an infection episode and two were deaths within 28 days after discharge following an infection episode.

In one of these four patients an additional review was undertaken at the request of NHS GGC Management over two years after the child died, in response to questions raised by Scottish Government. The death certificate indicated that bacteraemia had contributed to death; the death had been reported on Datix as an Extreme incident, but there was no recognition of this either from the reviewer or in the request from management.

The other three M&M reviews of deaths that related in time to infection episodes were all initiated by clinical staff. None of these reviews included a discussion of the GNE infection but they do identify other significant discussion points, including death within 30 days of chemotherapy and the very large resource implications of transferring a ventilated patient from PICU to another hospital for other treatment. However, these issues were not reported on Datix and the M&M reports do not include action plans.

The M&M reports we have seen were limited to patients who died. Much of the content of the remining M&M reports related to the chronology of the patient's underlying disease and treatment, and to aspects of end-of-life care. We could find no evidence that GNE infection was discussed.

4.3 Clinical records

In general, the review team found the medical and nursing care for each patient was stored in the Clinical Portal application, recorded routinely and reliably on a day-to-day basis. The challenge within many of the patient records was locating the specific information required as there are wide variations in practice in the way that parts of the clinical record are finally scanned, filed and stored electronically within the Clinical Portal.
The following points are a summary of our findings:

4.3.1 Storage and location of medical records

Daily recordings of In-patient medical care were found in 4 different areas in the Clinical portal:

1. Written and scanned into a sub section tab of Clinical Notes detailed as "In-patient Medical Notes"
2. Embedded in the "Nursing Assessment" tabs on generic continuation sheets continuous with other records including nursing records and allied health professional records and not necessarily recorded as a medical record of care
3. Digital records filed under Clinical Notes in two different sub-folders. Both of these sub-folders contained a mixture of inpatient and outpatient notes, often in the same document.
   3.1. Generic Continuation
   3.2. Patient Notes

4.3.2 Storage and location of nursing records

Nursing care is reliable recorded and stored in the nursing assessment tabs. These records are exemplary with dated, signed entries of the elements of care recorded.
Standardised elements of care for example CEWS and CVC/PVC bundle care was reliably recorded for all patients in the review within the dedicated record segments for these recordings

4.3.3 Medication records

Medications were recorded within a wide range of documents/places in the medical and nursing records in narrative form when administered or considered for change as instructed by medical staff

- Within the medication records
- Within the medical in-patient records (in the four locations detailed above)
- Scanned in the Nursing Assessment records
- Within "Patient Notes" tab under Clinical Notes

4.3.4 Laboratory results

All laboratory results are reliably entered into the associated tabs recording the test carried out:

- Biochemistry
- Haematology
- Genetics
- Immunology

- Microbiology
- Virology
- Other

4.3.5 Procedures and interventions transfer information

We found where a procedure was undertaken such as; the insertion or removal of a central line the information was usually recorded in dedicated records for “Interventions” under the sub tabs of “Anaesthetics” and “Operation Notes”. In some cases, the records for the same procedure were not dated correctly or signed. We found details of the procedures/interventions were also recorded within the medical and nursing records.

4.3.6 Admission, transfer and discharge information

Not all patients had an immediate discharge or final discharge letter prepared and stored.
The team found admission and transfer information embedded in four different locations within the nursing records, in the medical records and in the “Generic Continuation” and “Patient Notes” digital records.

Transfers of care within the hospital system were difficult to identify as Medical PICU admission and discharge summaries were often scanned and embedded within nursing notes within the Nursing Assessment section of the Clinical Portal

4.3.7 Overview of scanned record storage

Locating all the part of the healthcare record required for this review was a challenge. That said, knowledge and frequent use of the system enabled us to navigate the anomalies. Some records stored as 1 document are scanned in sections of up to 900 pages long with a variety of different records within them. For example, daily recording sheets of medical, nursing and medication records were found. A journal article was also scanned into the patient healthcare record. We found that some patient records were scanned in many months or years after discharge. Scanned records for each episode did not necessarily have the correct care episode date. Scanned pages within the records particularly patients with extended in-patient stays and or multiple episodes of care were the most problematic. We found that some of these cases had pages of the records scanned in reverse order and had multiple admission episodes within the same scanned document, which were not necessarily in time, date order. There were examples of pages scanned in upside down.

4.3.8 Inpatient medical records

4.3.8.1 Scanned handwritten notes

For the 117 infection episodes included we found complet written notes for 76 (65%), incomplete notes for 22 (18%) and no written notes for 19 (16%). Only 60% of the written notes were filed under the date of discharge. Written notes for 39 episodes were filed up to 14 months after the date of discharge.

One example of good practice had several episodes of infection. This example had 906 pages of notes covering 418 days of admission, which were complete, in order and with no irrelevant information. In contrast, another example of medical notes for the bacteraemia admission contained 139 pages with many undated and the remainder not filed in chronological order. For this patient the notes commenced one week after the bacteraemia and the final 38 pages of this record were blank treatment checklists and protocols. The inpatient Medical Record for this patient contained very few details regarding the clinical management of the bacteraemia. However, written Medical

Notes with critical information about bacteraemia management including discussions with carers were found in the clinical nursing notes sections of the Nursing Assessment records.

4.3.8.2 Digital medical inpatient notes

The Clinical Portal has a section to record digital typed inpatient medical records. These records may be filed in 3 separate areas:

- Generic Continuation
- Patient Notes
- Pharma Care Plan

When filed under 'Generic Continuation' some records were not linked to specific admissions and contained diverse inpatient and outpatient records from a range of clinical disciplines and specialties. When Generic Continuation records were labelled Paediatrics, we found those to contain digital inpatient medical notes. These were detailed and fully electronic, which enabled word searching. The Generic Continuation Paediatrics notes may cover several admissions, the median length of records for patients in the review was 12 months and the maximum 35 months.
Patient Notes were labelled by discipline (e.g. Haematology) or AHP (e.g. Dietetics).

Most Patient Notes were outpatient contacts recording a clinic appointment, home visit or telephone call. However, there were some notes about in-patient care. We found, in this location, the clinical information was less detailed than in a Generic Continuation record. A few of the cases reviewed had in-patient notes for most of the episode in Patient Notes but these might be filed in more than one specialty area. For example, we found inpatient notes for the same episode filed in 3 different Patient Notes locations in Clinical Oncology, Haematology and Paediatrics.

The Pharma Care Plan notes are stored routinely and reliably within a standardised care plan but they exclusively record medicines information, we found no inpatient medical notes in these care plans. For the 117 included infection episodes we found complete digital notes within 38 (32%) records and incomplete digital notes for 6 (5%) of episodes. We did not find any digital notes for the remaining 73 episodes.

The presence of digital notes did not appear to be related to the year of infection:

2015, 0 of 3 episodes;
2016, 13 (59%) of 22 episodes;
2017, 8 (22%) of 36 episodes;
2018, 14 (44%) of 32 episodes;
2019, 9 (35%) of 26 episodes.

4.3.8.3 Completeness of inpatient medical records

Overall, we found complete inpatient medical records for 111 (95%) of all episodes (Table 5). However, only 46 (39%) of all episodes had complete medical records filed by the date of discharge for the episode. Finding medical records for all remaining episodes required searching through all subsequent Inpatient Medical Notes, Generic Continuation and Patient Notes.

Table 5: Completeness of written and digital notes

Medical Records	Written notes	Digital notes	N	% Episodes
Complete	Complete	None found	68	58%
	Complete	Incomplete	5	4%
	Complete	Complete	3	3%

	Incomplete	Complete	20	17%
	None found	Complete	15	13%
		Total complete	1	95%
Incomplete or none found	Incomplete	None found	2	2%
	None found	Incomplete	1	1%
	None found	None found	3	3%
		Total episodes	117	

Both written and digital notes were found for 28 (23%) of 117 episodes (Table 5). There were only three episodes with written and digital notes for each day of the episode. However, these were not duplicate records and there were important entries in only one record. For example, one patient had discussion with mother recorded in the digital record but not written notes. However, ward round by neurosurgeon on the same day was in the written notes but not digital notes.

Two examples demonstrate the challenges that we faced in finding complete medical records.

1. One 18-day admission had the Inpatient Medical Note correctly filed under the date of discharge but only contained records for two of the 18 days. We did find digital records for every other day of this admission, but they were filed within different areas of the Clinical Oncology, Haematology and Paediatrics Patient Notes.
2. One patient had records within a 24-hour period filed in three different locations in the clinical portal system:
   - Ward round discussion and decisions were in the scanned Inpatient Medical Notes,
   - A medical review to examine the extension of a rash was recorded in digital Haematology Patient Notes but with no management plan.
   - A medical review for pyrexia was detailed as “NOTES in red medical folder” In digital Paediatrics Patient Notes. Full documentation of the medical review for the same pyrexia and the plan for management of the extension of the rash were in the scanned Inpatient Medical Notes,

We found no written or digital medical notes for three patients but there was sufficient information within the Nursing records to assess the infection management decisions.

5 Evidence of good practice

5.1 Recording and Responding to Clinical Deterioration

Reliably recording each child’s clinical condition improves the detection and response to clinical deterioration and is an essential element of patient safety to improving patient outcomes. Recording vital signs is a fundamental component of clinical care. Recognising that a child is becoming more unwell requires effective monitoring and management of their vital signs. Action and early recognition of the signs of deterioration requires timely review and appropriate intervention. One of the first steps of the PTT review examined each nursing record for completeness of recording all of the components of the children’s early warning scoring chart (CEWS). All records (n=83) were 100% were complete. As a consequence, within the clinical records we examined there was evidence of rapid action by the nurses to escalate clinical concerns and swift response and interventions by medical staff with detailed clinical communication by the multidisciplinary teams.

5.2 Multidisciplinary Clinical Communications

The practice of paediatric haematology-oncology is complex and involves a wide range of staff on a daily basis. In GGC, the children with cancer are treated by highly specialised teams. Teamwork is key. The multi-disciplinary records examined show frequent and detailed discussion and decision

making between all team members including referral and care planning for all patients. Within individual records there were clear examples of written instruction and communications between junior staff and requests for senior reviews for patients. These extracts of the detailed discussions within the healthcare records suggest that there is an effective teamwork communication system within clinical teams with patient safety at the centre of those connections. These examples in our opinion show candid open communications between the clinical front line teams members from the most junior to the most senior.

5.3 Family centred compassionate care

In some, but not all records communication with the parents and families is comprehensive. There are examples of letters to parents where the content is highly personalised demonstrating real compassion and empathy with deep understanding of the child as an individual. On a daily basis the nursing care recorded examples of the child's plan of care developed with input from the child and family. From the healthcare records reviewed family centred care is evident with health staff and professionals supporting parents in their caring role. There is a focus on working together, negotiation and information sharing with children, young people and their families to plan deliver and evaluate care. Parents/family opinions are taken into account. They are viewed as experts on their child. Many examples in the nursing records stated their contribution to their child's care. The records show children and young people were encouraged to be active partners in decisions about their health and care, and, where possible, were able to exercise choice.

5.4 Professional Duty of Candour

NHS Greater Glasgow and Clyde maintain a policy of "being open" when patients are affected by serious adverse events. Communicating effectively with patients and/or their families is an essential part of the process when dealing with a Clinical Incident. Some but not all records had discussions with parents regarding the infection detailed within the notes.

6 Conclusions

6.1 PTT results

All of the children in the cohort had serious infections with Gram Negative and Environmental bacteria. Most of the AEs detected with the PTT were related to the impact of these infections on hospitalisation (unplanned admissions, readmissions) and on the management (CVL removal, cancer treatment delays). Only one fifth of the AEs were unrelated to the management of infections.
The practice of challenging central lines was supposed to have stopped in May 2017. However, we identified line challenges up to March 2019. Signs and symptoms of sepsis occurred after 9 (43%) of those line challenges and, in one case, resulted in a patient being admitted to PICU.
All but one of the 17 Category I AEs occurred during 16 episodes that included an unplanned PICU admission and there were only three additional planned PICU admissions in the cohort. Admission to PICU is identifiable from routine data and is potentially a very efficient trigger for identification of Category I AEs.

There is a substantial evidence base about use of trigger tools to detect AEs in children in hospitals. However, all published studies use either randomised or consecutive samples of children, so they are not directly comparable to the GGC cohort. The overall rate of AEs and the proportion of Category I events unrelated to infection in the GGC cohort were comparable to studies in other Tertiary Care hospitals. Moreover, recording and responding to signs of clinical deterioration was excellent at NHS GGC (Section 5.1), whereas a large UK study reported that nearly 1/3 of 'Deteriorating patient' AE caused by failure to do or to respond to Early Warning Scores.[4]

6.2 Adverse events reported in NHS GGC

We found that Datix reporting significantly underestimated the AE experienced by this group of patients and that, when reported, some incidents were incorrectly classified and under scored in terms of their severity.

The M&M reports we have seen were limited to patients who died, but the Scottish Mortality and Morbidity Programme clearly states that they should include review of care complications in addition to patient deaths.[25] Moreover, the Programme is intended to provide a systematic approach to improve patient care and provide professional learning. Some of the M&M reviews clearly identified important issues. If these were cross referenced to, or entered as reports on Datix, this would create an opportunity to engage more widely with action plans and improvement.

6.3 Medical records

Complete inpatient medical records were found for 95% of all episodes. However, only 39% of all episodes had complete medical records filed by the date of discharge for the episode.
A minority (37%) episodes had digital inpatient medical notes. These were filed in five different locations under Clinical Notes. Some patients had digital notes for a single episode filed in four different locations.

Both written and digital notes were found for 28 (24%) of 117 episodes. These were not duplicate records and sometimes included separate, important information about the same day of the episode.

There was no trend to show the increasing use of digital records over time suggesting that there was no planned evolution to full digital record keeping over the period of the review.
Finding medical records for 61% episodes required searching through written records for up to 14 months and digital records for up to 35 months after the date of discharge for the episode.

7 Recommendations and learning for improvement

7.1 Adverse Events

Only one of the Category I events identified via the PTT was reported as risk level 4/5 on Datix; and there was only one other risk level 4/5 incident reported on the entire patient cohort from 2015-2019. The NHS GGC Incident Management Policy is clear that these events should be reported on Datix and “will be considered potential Significant Clinical Incidents and subject to screening using the appropriate tool to support decision making as to whether the incident should be confirmed as an SCI.” Our data suggest that this was not done.

Of the 17 episodes with one or more Category I events, 14 included a PICU admission. The only exception was a patient who was resuscitated for sepsis on the ward but did not require PICU admission. Therefore, 94% of the patients with Category I events could have been identified from routine data (PICU admission within 28 days of their bacteraemia). This illustrates a way to use routine data to identify patients for review. Other opportunities to use routine data to identify Category I events might include, for example, deaths within 7 days of stem cell transplant or within 30 days of chemotherapy.

Our analysis suggests that Category II events will occur in 20-40% of children in tertiary care, but we are not clear how incidents are selected for reporting, review and audit within NHS GGC. An advantage of looking for adverse events in random samples of patients is that it provides a systematic approach to the identification and classification of events in an unselected setting. In

addition, reviewing a random sample of patients rather than starting with an incident provides a better opportunity to identify and feedback on good practice. We recognise, however, that many of the episodes we have reviewed are of very long duration, and so consideration could be given to focusing such reviews on a limited period within an admission (for example, within 28 days of admission or 28 days of a bacteraemia).

Some of the M&M reviews were presented by Specialist Trainees. Audit and quality improvement are Outcome 8 in the RCPCH Paediatric Training Curriculum, and this is one of nine areas for assessment of applicants for Specialist Training, with clearly described indicators of involvement in audit/QI and learning from this.[33 34] We could not identify a systematic approach to how the use of incident reporting or M&M review was used either to improve patient care or to provide professional learning.[33 34]

These recommendations have been informed by a recent Fatal Accident Enquiry into a sepsis related death in NHS GGC. The enquiry noted that NHS GGC have replaced their Significant Clinical Incident Policy with a Policy for the Management of Severe Adverse Events, which is "*is clearly an improvement of the previous arrangements under which the SCIIR was produced*".[32] The new policy is on the NHS GGC Intranet, the SAE Process Guide is in Appendix 6 of this report.

Use routine data to identify Category I events and implement the new NHS GGC Significant Adverse Event Process Guide (Appendix 6). In particular communicate with family within 3 days of identification of the AE, engage with and support the staff involved and share findings with staff and relatives.

Integrate Morbidity and Mortality Reviews with reporting and investigation of Category I events on Datix and share learning across the organisation.
Consider reviewing random samples of patients for detection of adverse events and identification of targets for improvement. The trigger tool approach is an opportunity for involving doctors in training in interprofessional teams, which is a key characteristic of successful Quality Improvement Education for Health Professionals.[35 36]

7.2 Clinical record keeping and storage

The case review team recommend, within their current governance arrangements, the systems for GGC clinical records filing and storage are reviewed to consider the following:

- There may be opportunity to rationalise the four different processes to ensure in patient medical care is systematically recorded and stored within the medical record tabs.
- Greater emphasis on reliably and timeously recording digital records may support a more complete medical record
- All patients should have a discharge or transfer summary reliable stored for all admissions
- Chronological records are essential. Not all scanned entries examined within this review were in date order. Records with episodes of care were often scanned into the Clinical Portal many months and up to years after the care episode was completed. A review of the current scanning processes may present opportunities for more efficient and effective record storage.
- Large, scanned documents with 100's of pages were difficult to navigate. Scanned episodes could have a limited number of pages to make searching and location easier
- Nursing records could also be scanned in subsections for records for vital signs, medications patient, and safety information e.g. CVC bundle.

7.3 The Scottish Patient Safety (SPSP)Programme paediatric care

In 2018, the SPSP Paediatric programme established a focus on reducing unplanned admissions to Paediatric Intensive Care Units (PICU), Ventilator Associated Pneumonia (VAP) and central venous catheter related blood stream infections. The measurement framework can be found at https://ihub.scot/media/5448/20180508-paediatric-core-measurement-plan-2018-final.pdf https://ihub.scot/media/1407/20180508-paediatric-supplementary-measurement-plan-2018-final.pdf

Measures of particular importance to this review are those related to unplanned admissions to PICU and central line bundle compliance and line infection reduction. While we did not examine the monthly data as part of this review, the national measures for improvement available at Healthcare Improvement Scotland give GGC an excellent framework for improving paediatric patient safety within their services.

8 Acknowledgements

The review team would like to thank all of the staff who made the production of this report possible at Scottish Government, GGC, the expert panel members and support team, Health Protection Scotland and in particular the GGC records team for continuing to provide support to source the information required.

References

1. Classen DC, Resar R, Griffin F, et al. 'Global trigger tool' shows that adverse events in hospitals may be ten times greater than previously measured. *Health Aff (Millwood)* 2011;30(4):581-9. doi: 10.1377/hlthaff.2011.0190 [published Online First: 2011/04/08]
2. Layde PM, Cortes LM, Teret SP, et al. Patient safety efforts should focus on medical injuries. *JAMA* 2002;287(15):1993-7. doi: 10.1001/jama.287.15.1993 [published Online First: 2002/04/19]
3. Resar RK, Rozich JD, Classen D. Methodology and rationale for the measurement of harm with trigger tools. *Quality and Safety in Healthcare* 2003;12 Suppl 2:ii39-45. [published Online First: 2003/12/04]
4. Chapman SM, Fitzsimons J, Davey N, et al. Prevalence and severity of patient harm in a sample of UK-hospitalised children detected by the Paediatric Trigger Tool. *BMJ Open* 2014;4(7):e005066. doi: 10.1136/bmjopen-2014-005066 [published Online First: 2014/07/06]
5. Sharek PJ, Horbar JD, Mason W, et al. Adverse events in the neonatal intensive care unit: development, testing, and findings of an NICU-focused trigger tool to identify harm in North American NICUs. *Pediatrics* 2006;118(4):1332-40. doi: 10.1542/peds.2006-0565 [published Online First: 2006/10/04]
6. Woods D, Thomas E, Holl J, et al. Adverse events and preventable adverse events in children. *Pediatrics* 2005;115(1):155-60. doi: 10.1542/peds.2004-0410 [published Online First: 2005/01/05]
7. Griffen FA, Resar RK. IHI global trigger tool for measuring adverse events. IHI Innovation Series White Paper. 2nd ed: Institute for Healthcare Improvement 2009.
8. Takata GS, Mason W, Taketomo C, et al. Development, testing, and findings of a pediatric-focused trigger tool to identify medication-related harm in US children's hospitals. *Pediatrics* 2008;121(4):e927-35. doi: 10.1542/peds.2007-1779 [published Online First: 2008/04/03]
9. Wild D, Bradley EH. The gap between nurses and residents in a community hospital's error-reporting system. *Jt Comm J Qual Patient Saf* 2005;31(1):13-20. doi: 10.1016/s1553-7250(05)31003-8 [published Online First: 2005/02/05]
10. Classen DC, Lloyd RL, Provost L, et al. Development and Evaluation of the Institute for Healthcare Improvement Global Trigger Tool. *Journal of Patient Safety* 2008;4(3):169-77.
11. Suresh G, Horbar JD, Plsek P, et al. Voluntary anonymous reporting of medical errors for neonatal intensive care. *Pediatrics* 2004;113(6):1609-18. doi: 10.1542/peds.113.6.1609 [published Online First: 2004/06/03]
12. Kirkendall ES, Kloppenborg E, Papp J, et al. Measuring adverse events and levels of harm in pediatric inpatients with the Global Trigger Tool. *Pediatrics* 2012;130(5):e1206-e14. doi: 10.1542/peds.2012-0179
13. Landrigan CP, Stockwell D, Toomey SL, et al. Performance of the Global Assessment of Pediatric Patient Safety (GAPPS) Tool. *Pediatrics* 2016;137(6) doi: 10.1542/peds.2015-4076 [published Online First: 2016/05/26]
14. Stockwell DC, Landrigan CP, Toomey SL, et al. Adverse Events in Hospitalized Pediatric Patients. *Pediatrics* 2018;142(2):e20173360. doi: 10.1542/peds.2017-3360
15. Matlow AG, Baker GR, Flintoft V, et al. Adverse events among children in Canadian hospitals: the Canadian Paediatric Adverse Events Study. *Cmaj* 2012;184(13):E709-18. doi: 10.1503/cmaj.112153 [published Online First: 2012/08/01]
16. Slonim AD, LaFleur BJ, Ahmed W, et al. Hospital-reported medical errors in children. *Pediatrics* 2003;111(3):617-21. doi: 10.1542/peds.111.3.617 [published Online First: 2003/03/04]
17. Improvement NIfIa. The Paediatric Trigger Tool.
18. Miller MR, Elixhauser A, Zhan C. Patient safety events during pediatric hospitalizations. *Pediatrics* 2003;111(6 Pt 1):1358-66. doi: 10.1542/peds.111.6.1358 [published Online First: 2003/06/05]

19. Matlow AG, Cronin CMG, Flintoft V, et al. Description of the development and validation of the Canadian Paediatric Trigger Tool. *BMJ quality & safety* 2011;20(5):416-23. doi: 10.1136/bmjqs.2010.041152 [published Online First: 2011/01/17]
20. RCEM Royal College or Emergency Medicine. Management of Pain in Children, 2017.
21. Todd KH, Sloan EP, Chen C, et al. Survey of pain etiology, management practices and patient satisfaction in two urban emergency departments. *Cjem* 2002;4(4):252-6. doi: 10.1017/s1481803500007478 [published Online First: 2007/07/05]
22. Petrack EM, Christopher NC, Kriwinsky J. Pain management in the emergency department: patterns of analgesic utilization. *Pediatrics* 1997;99(5):711-4. doi: 10.1542/peds.99.5.711 [published Online First: 1997/05/01]
23. NCC MERP National Coordinating Council for Medication Error Reporting and Prevention. NCC MERP Index for Categorizing Medication Errors [Available from: https://www.nccmerp.org/sites/default/files/indexColor2001-06-12.pdf.
24. Stroupe LM, Patra KP, Dai Z, et al. Measuring Harm in Hospitalized Children via a Trigger Tool. *J Pediatr Nurs* 2017 doi: 10.1016/j.pedn.2017.09.010 [published Online First: 2017/10/04]
25. Healthcare Improvement Scotland. Learning from adverse events through reporting and review. A national framework for Scotland: December 2019 2019 [Available from: http://www.healthcareimprovementscotland.org/our_work/governance_and_assurance/management_of_adverse_events/national_framework.aspx.
26. Mermel LA, Allon M, Bouza E, et al. Clinical Practice Guidelines for the Diagnosis and Management of Intravascular Catheter-Related Infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2009;49(1):1-45. doi: 10.1086/599376
27. Davenport MC, Domínguez PA, Ferreira JP, et al. Measuring adverse events in pediatric inpatients with the Global Trigger Tool. *Archivos argentinos de pediatria* 2017;115(4):357-63. doi: 10.5546/aap.2017.eng.357 [published Online First: 2017/07/25]
28. Fajreldines A, Schnitzler E, Torres S, et al. Measurement of the incidence of care-associated adverse events at the Department of Pediatrics of a teaching hospital. *Archivos argentinos de pediatria* 2019;117(2):e106-e09. doi: 10.5546/aap.2019.eng.e106 [published Online First: 2019/03/15]
29. Solevåg AL, Nakstad B. Utility of a Paediatric Trigger Tool in a Norwegian department of paediatric and adolescent medicine. *BMJ Open* 2014;4(5):e005011. doi: 10.1136/bmjopen-2014-005011 [published Online First: 2014/05/21]
30. Agarwal S, Classen D, Larsen G, et al. Prevalence of adverse events in pediatric intensive care units in the United States*. *Pediatric Critical Care Medicine* 2010;11(5):568-78. doi: 10.1097/PCC.0b013e3181d8e405
31. Stockwell DC, Bisarya H, Classen DC, et al. A trigger tool to detect harm in pediatric inpatient settings. *Pediatrics* 2015;135(6):1036-42. doi: 10.1542/peds.2014-2152 [published Online First: 2015/05/20]
32. SHERIFFDOM OF NORTH STRATHCLYDE AT GREENOCK. DETERMINATION BY SHERIFF PRINCIPAL DUNCAN L MURRAY WS UNDER THE INQUIRIES INTO FATAL ACCIDENTS AND SUDDEN DEATHS ETC (SCOTLAND) ACT 2016 into the death of WILLIAM HARRISON 2021 [Available from: https://www.scotcourts.gov.uk/docs/default-source/cos-general-docs/pdf-docs-for-opinions/2021fai008.pdf?sfvrsn=0.
33. Royal College of Paediatrics and Child Health. Paediatric ST1 Recruitment 2020-2021 Application Scoring Framework & Guidance [Available from: https://www.rcpch.ac.uk/sites/default/files/2020-11/ST1%20Application%20Form%20Scoring%20Framework%20v.3b%20JAC%20291020_0.pdf.
34. Royal College of Paediatrics and Child Health. Paediatric ST4 Recruitment 2020 – R2R Self-assessment Framework & Guidance [Available from:

https://www.rcpch.ac.uk/sites/default/files/2020-07/st4_recruitment_2020_round_2_readvert_self-assessment_framework_0.pdf.

35. Jones AC, Shipman SA, Ogrinc G. Key characteristics of successful quality improvement curricula in physician education: a realist review. *BMJ Quality & Safety* 2015;24(1):77-88. doi: 10.1136/bmjqs-2014-002846
36. Starr SR, Kautz JM, Sorita A, et al. Quality Improvement Education for Health Professionals:A Systematic Review. *American Journal of Medical Quality* 2016;31(3):209-16. doi: 10.1177/1062860614566445
37. Health Improvement Scotland Scottish Patient Safty Programme Paediatric Care https://ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/spsp-programmes-of-work/maternity-and-children-quality-improvement-collaborative-mcqic/paediatric-care/

Appendix 1: Paediatric Trigger Tool GGC 2020

Trigger		Trigger		Ad EVT		Severity					Comment
		N	Y	N	Y	E	F	G	H	I	
PG1	EWS or Baseline Obs missing or incomplete										
PG2	Tissue Damage or pressure ulcer										
PG3	Readmission within 30 days										
PG4	Un planned Admission										
PG5	Cranial Damage										
PG6	Respiratory/Cardiac Arrest/Crash call										
PG7	Diagnostic Imaging for embolus /thrombus+/- confirmation										
PG8	Complication of procedure or treatment										
PG9	Transfer to a higher level of care (PICU)										
PG10	Hypoxia 02 sat <85%										
PG11	Cancelled elective procedure/delayed discharge										
PG12	Pain score < 7										
PS1	Returned to Theatre										
PS2	Change in planned procedure										
PS3	Surgical Site Infection										
PS4	Removal/Injury repair of organ										
ITU1	Readmission to ICU/HDU/PICU										
PM1	Vit K given										
PM2	Naloxone given										
PM3	Flumazenil Given										
PM4	Glucagon or Glucose ≥10% given										
PM5	Chlorphenamine Given										
PM6	Anti-emetic given										
PM7	IV Bolus ≥10ml/kg colloid or crystalloid given										
PM8	Abrupt medication stop										
PM9	Missed Doses										
PM10	Anti fungal prescribed										
PL1	High INR(>5)or APTT>100 sec										
PL2	Transfusion										
PL3	Abrupt drop in HB or Hct (>25%)										
PL4	Rising Urea or creatinine (>2x baseline)										
PL5	Na+ <130 or>150										
PL6	K+ <3.0 or > 6.0										
PL7	Hypoglycemia (<3mmol/l)										
PL8	Hyperglycaemia (>12mmol/l)										
PL9	Drug level out of range										
PL10	MRSA bacteraemia										
PL11	C.difficile										
PL12	Vanc resistant enterococcus										
PL13	Hospital Acquired Pneumonia										
PL14	Positive Blood Culture										
PL15	Thrombocytopenia (<100)										
PO1	Other Specify in Notes Include Neutropenia										
	Total										

Adverse Event Score Measure of Harm		
E Temporary harm to the patient that required an intervention	F Temporary harm to the patient that required initial or prolonged hospitalisation	
G Permanent patient harm	H Intervention required to save life	I Patient Died

Appendix 2 UK Paediatric Trigger Tool (PTT) Definitions

*Text in **italics** was added to the UKPTT by the expert reviewers as guidance for the local context and cohort sample.*

This document lists all the triggers used in the five parts of the UK PTT as applied to the GGC case note review: general care, surgical care, medicines, intensive care admission and laboratory results. A brief explanation of the triggers is included and why each may indicate an adverse event and what to look out for during the reviews. Additional text in italics was added by the expert reviewers including contextual considerations for the purposes of the GGC case note review in Haemato-oncology patients.

General Care Component

PG1 Early warning score recording and response

If an early warning scoring risk or standard baseline observation assessment system is in use, then the lack of a score or incomplete observations, or a score or observation requiring a response, may be a precursor to an adverse event. *GGC tool is CEWS. The GGC tool chart recommends medical notification with a score of ≥ 3.*

PG2 Tissue damage or pressure ulcer

Tissue damage or pressure ulcer may be difficult to define. All children who are admitted to hospital and who have difficulty in turning will need to be assessed for pressure ulcers on admission and throughout their stay. Look for assessments and, in particular, look in nursing notes for comments on reddening of the skin and early development of tissue damage. Also look for tissue damage as a result of IV therapy.

PG3 Readmission within 30 days

An adverse event may not manifest itself until after the patient has been discharged from the hospital, especially if the length of stay is minimal. As the chart is reviewed, look to see if this admission was within 30 days of a previous hospitalisation. Or, did the current admission result in another future hospitalisation? Examples of adverse events may include surgical site infection, recurrent infections, relapses and ongoing seizures. This is easier to detect if all the patient's records are pulled along with the case note currently being reviewed. *For this cohort of patients' the focus of the review is all unplanned admissions. Refer to **PG4***

PG4 Unplanned admission

Any unscheduled admission for a known or previously diagnosed condition could be an indication of an adverse event. The fact that it was unscheduled may be as a result of sub-optimum treatment which would be considered as an adverse event. Consider the reason for the admission and whether it was related to an adverse event or not. *For example: Febrile neutropenia in this group of patients. Record Neutropenia in PO1 with level <1.0mL.*

PG5 Abnormal cranial imaging

Any abnormal cranial imaging (including, but not limited to, cranial imaging with evidence of significant ischemia or grade 3-4 haemorrhage) may be the result of fluctuations in blood pressure, cardio-respiratory arrest, or electrolyte imbalances. The adverse event will be intra-ventricular haemorrhage. Congenital anomalies should not be considered as adverse events.

PG6 Respiratory or cardiac arrest / crash calls

All respiratory or cardiac arrests need to be carefully reviewed as they may represent the end event of a flawed care process. Not all crash calls are adverse events. However, cardiac or pulmonary arrest occurring intra-operatively, or in the post-anaesthesia care unit, should always be considered an adverse event. If these occur in the first 24 hours post-operatively, they are also very likely to be an adverse event. A sudden cardiac arrhythmia, with a resulting crash call, may well be associated with no adverse event. But failing to rescue a patient, due to lack of recognition of physiological change in signs and symptoms, would definitely be an adverse event.

PG7 Diagnostic imaging for embolus / thrombus +/- confirmation

Development of a DVT or pulmonary embolism (PE) during a hospital stay should be considered as an adverse event. Even if all appropriate preventive measures appear to have been taken, from a patient's perspective this is a harmful event. If the hospitalisation occurs due to a DVT or emboli, look for drug-related or other cause (at previous admission or outside of the hospital).

PG8 Complication of procedure or treatment

Evaluate the reason for the procedure. The procedure itself may be required due to an adverse event. Look for complications from any procedures. Procedure notes do not always note the complications, especially if the complication occurs hours or days after the procedure note has been documented. *Note this trigger includes: extravasation, **central line complications**, accidental removal/damage blocked, infected, and reinserted, pulled out, ruptured. **Change of line management techniques***

PG9 Transfer to higher level of care (including specialist unit/PICU/HDU)

Transfers include those that occur within hospital, to another hospital, or to your hospital from another. Transfer to an intensive care unit or high dependency unit or step up to 'specialising' on the same ward, is a trigger that indicates an adverse event may have occurred. Admissions to intensive care or HDU, or the decision to give specific intensive nursing input on the same ward, may have occurred when a patient's clinical condition deteriorated, perhaps secondary to an adverse event.

When reviewing this trigger, look for the reasons for the transfer and the change in condition. For example, in the case of admission to intensive care following respiratory arrest and intubation, if the respiratory arrest was a natural progression of an exacerbation of chronic disease, it would not be an adverse event. But if it was caused by a post-operative event (e.g. a pulmonary embolus, or over-sedation) it would be an adverse event.

PG10 Hypoxia O2 sat <85%

Hypoxia that is not in keeping with the condition of the child (e.g. in congenital heart disease or chronic lung disease) could be an indication of an adverse event such as a cardiac or respiratory arrest.

PG11 Cancelled elective procedure / delayed discharge

Cancellation of an elective procedure might indicate that the patient has experienced an adverse event that compromised their procedure. Alternatively, the patient may experience and adverse event as a result of waiting longer than planned for the procedure.

Delayed discharge for non-clinical reasons can result in an adverse event. This includes discharges to home or to another clinical area (e.g. a delay of six hours from the time of being classified as clinically fit for discharge home, due to waiting for medications to be released from pharmacy). Reviewers should agree what is reasonable for their organisation.

PG12 Pain Score

Particular attention should be paid to the pain score recorded on the CEWS chart if included under PG1 and if a score of >4 the details should be recorded separately under this new trigger PG12. Additional narrative record extracts in the comments column where there are issues with pain control documented in the healthcare record. The GGC system has dedicated records for the recording of pain scores. As mucositis, or inflammation of the mucous membranes (linings of the mouth and gut), is a common side-effect of cytotoxic chemotherapy. Mucositis can be so severe, a morphine infusion (PCA) may be required in order to control the pain. A score of <4 or continued intervention for pain management should be considered as a trigger.

Surgical Care Component

PS1 Return to theatre

A return to surgery is a trigger and means you should check whether an adverse event occurred during the previous surgery. An example of an adverse event is a patient who had internal bleeding following the first surgery and required a second surgery to stop the bleeding. Where patients have a second surgery that is exploratory, but does not reveal anything (looking for bleeding, or a suspected retained surgical instrument) this would still be considered an adverse event.

Sometimes a return to theatre after a previous surgical procedure is planned and is therefore not an adverse event. For example, a procedure that must be completed in stages, or a procedure that is completely unrelated to the first procedure, and the result of another diagnosis - such as pacemaker insertion after a bowel resection. It is important to distinguish whether the additional procedure was planned.

PS2 Change in planned procedure

An unexpected change in surgical procedure can be the result of unexpected findings after the procedure has started; a change in clinical condition during the procedure; or an adverse event occurring during the procedure. When the procedure on the post-operative note is different from the procedure planned in the pre-operative note, or documented in the surgical consent, a reviewer should look for details as to why the change occurred.

An unexpected change in procedure, due to equipment failure or missing equipment, is an adverse event if the patient experienced additional pain, time in the hospital or other harm as a result of the different procedure. *Context is important cancer care is complex*.

PS3 Surgical site infection or hospital acquired urinary tract infection

Surgical site infections are the second most common type of adverse events in adult hospitalised patients, increasing the length of stay and morbidity. (Few studies are available on children.) Look for any nosocomial infections, surgical

site infections, or urinary tract infections. Any infection occurring in hospital is an adverse event. The infection may occur after discharge, so look at visits to the emergency department, community nursing, or outpatient visits.

PS4 Removal / injury/ repair of organ
Review theatre notes and post-operative notes for evidence that the procedure included repair, injury or removal of any organ. Except in cases of trauma, where organ injury or a suspicion of organ injury is the reason for surgery, this may indicate an operative event damaging the organ.

Intensive Care Component

ITU1 Readmission to Intensive Care or High Dependency Care PICU
Any readmission to the PICU indicates a high probability of an adverse event occurring on the ward or outside the hospital. Look for a relationship with an adverse event. Examples might be pulmonary oedema, secondary to excess fluid administration, or an aspiration. PICU admissions have separate healthcare records within GGC.

Medication Component

PM1 Vitamin K (except for routine dose in neonates**)** *May not applicable to this cohort of patients.*
If vitamin K was administered as a response to a prolonged INR, review the chart for evidence of bleeding. The laboratory reports should indicate a lowered haematocrit or presence of faecal occult blood (blood in stools). Check the progress notes for evidence of excessive bruising, gastrointestinal (GI) bleed, haemorrhagic stroke, large haematomas, or other bleeding episodes.

PM2 Naloxone
Naloxone is a powerful opiate antagonist. Determine why the drug was used. If it has been used because of opiate overdose or overuse, an adverse event has occurred.

PM3 Flumazenil (Romazicon)
Flumazenil reverses benzodiazepine drugs. Determine why the drug was used. If hypotension or marked, prolonged sedation occurred following benzodiazepine administration, an adverse event has occurred.

PM4 Glucagon or glucose ≥ 10%
The administration of glucagon or glucose ≥ 10% (oral or intravenous), may indicate that the patient has received too much or too little insulin or oral hypoglycaemic. They may also have experienced symptoms as a result of this. Both the symptoms and the administration of additional medication are adverse events.

PM5 Chlorphenamine or antihistamine
Although frequently used for allergic reactions to drugs, these drugs can also be prescribed as a sleep aid, a pre-op/pre-procedure medication, or for seasonal allergies. If the drug has been administered, review the chart to determine if it was ordered for symptoms of an allergic reaction to a drug administered, either during the hospitalisation or before admission

PM6 Anti-emetics the local GGC protocol needs to be applied
Administration of anti-emetics may not be recorded as a trigger in this group of patients as many receive these medicines routinely. Professional judgment may be required to determine if an adverse event has occurred. Nausea and vomiting can be the result of drug toxicity or overdose, particularly in patients with impaired renal function. Some drugs, such as theophylline, frequently cause nausea and vomiting when levels are out of the therapeutic range. Anti-emetics are also commonly administered to patients post-operatively, or those receiving chemotherapy or PCA. Where these have not been administered in advance of nausea and vomiting, you may wish to consider this as an adverse event. In some instances, clinicians judge that potential side effects from prophylactic use of anti-emetics may outweigh the potential benefits and may not consider any resulting nausea or vomiting in these circumstances to be an adverse event.

PM7 IV Bolus ≥ 10ml/kg colloid or crystalloid given
Administration of the colloid or crystalloid is an indication of possible collapse/shock and is an indication of a possible adverse event. It may be detected separately under PG6.

PM8 Abrupt medication stop

While some medication courses, such as antibiotics, are for a limited duration, the cessation of several medications at once, or cessation of a long-term medication (eg an antihypertensive) is a trigger requiring further investigation. It may indicate an adverse drug reaction, drug interaction, or sudden change in the patient's condition.

PM9 Missed Doses *Missed doses of medication particularly of cancer therapies for >7 days should be considered as a trigger.*

PM10 Antifungal treatment

Cancer patients receiving chemotherapy, or a bone marrow transplant are at risk of fungal infections. These can be life-threatening, especially when they spread throughout the body. Those patients with low white cell counts (neutropenia) are particularly at risk. Antifungal drugs are often given as a routine preventive measure, or when people who are at risk have a fever. Children and adolescents receiving intensive myelosuppressive chemotherapy and some paediatric hematopoietic stem-cell transplantation (HSCT) recipients are at high risk for invasive fungal disease caused by yeasts and moulds. In these patients, infections with Candida and Aspergillus species are most common.[21]Therefore, the routine prescription of antifungals was added as an additional trigger

Lab Test Component *(Use the local laboratory upper limit for children)*

Haematology

PL15 Thrombocytopenia (platelets <100)

Abnormal coagulation or platelet counts (due to sepsis or ITP) that requires treatment with clotting products or platelet transfusions, may not be an adverse event as it is part of a pathological process. But if it is left untreated and the child suffers a bleed as a consequence, you should record an adverse event.

PL1 High INR >5 or a PTT >100

Look for evidence of bleeding to determine if an adverse event has occurred. An elevated INR in itself is not an adverse event.

PL2 Transfusion

Procedures can require intra-operative transfusion of blood products for replacement of estimated blood lost, but this has become less common with 'bloodless surgery'. Any transfusion of packed red blood cells (RBCs), or whole blood, should be investigated for causation, including excessive bleeding, unintentional trauma of a blood vessel, etc. Transfusion of many units within the first 24 hours of surgery, including intra-operatively and post-operatively, will commonly be related to a peri-operative adverse event. Exceptions would be where excessive blood loss occurred pre-operatively. Fresh frozen plasma and platelets can reflect system problems that include failure to plan changes in anticoagulants prior to surgery, and the need to reverse quickly in order to carry out the surgery.

PL3 Abrupt drop in Hb or Hct (>25%)

Any drop of 25% or greater in Hb grams or Hematocrit (Hct) requires an explanation. All bleeding-associated events might commonly be identified by this trigger. Smaller 'drops' can obviously also be associated with adverse events, but the question as to whether harm has occurred needs to be answered subjectively. Anticoagulant use is frequently found to be associated with this particular trigger.

Biochemistry

PL4 Rising urea or creatinine (>2x baseline)

Review laboratory records for rising levels of either BUN or serum creatinine. If a change of two times greater than baseline levels is found, review medication administration records for medications known to cause renal toxicity. Review medical progress notes and the history, seeking physical and other causes of renal failure, such as pre-existing renal disease or diabetes that could have put the patient at greater risk of renal failure. If multiple factors are identified, subjective judgment may be needed to determine whether renal failure was an adverse event.

PL5/PL6 Electrolyte abnormalities (Na+ <130 or >150, K+ <3.0 or >6.0)

Electrolyte imbalance can either precede or be associated with adverse events. Not all patients with electrolyte abnormalities will be symptomatic. Review the case notes for evidence of symptoms.

PL7 Hypoglycaemia (<3mmol/l)

Not all patients will be symptomatic; if the patient is not symptomatic there is probably no adverse event. Review for associated use of insulin, or oral hypoglycaemic with evidence of symptoms and commonly followed by administration of glucose (oral or intravenous). Signs and descriptions of symptoms such as lethargy, shakiness, etc. will be described by nurses in the notes.

PL8 Hyperglycaemia (>12mmol/l)

Glucose greater than 12mmol/l requiring treatment in the non-diabetic could be the result of IV fluid/TPN error, nosocomial infection, steroid overdose, osmotic dieresis or sepsis - all of which are adverse events.

PL9 Drug level out of range *Likely to be gentamicin*

Where a drug level has been taken and the result is a sub-therapeutic level or a toxic level, this may imply harm to the patient. For example, a sub-therapeutic level of an anticonvulsant may result in the patient having seizures and may be due to poor management of, or compliance with, treatment. A toxic level of an antibiotic, such as gentamicin, may result in renal failure or deafness. A toxic level of paracetamol may result in acute liver damage and death. These may a drug interaction that alters the metabolism of a drug; the prescription of an incorrect dose; or lack of recognition of impending organ failure which would have required a lower dosage of drug to be prescribed. If a patient has recently started a drug which takes a while to achieve steady state, then sub-therapeutic levels may be an expected part of monitoring and would not necessarily imply harm. This should be at the discretion of the reviewer.

Microbiology

PL10 MRSA bacteraemia

Review for any positive MRSA bacteraemia.

PL11 C. difficile

If a patient is on, or has been on, multiple antibiotics, this adverse event can be observed. A positive C. difficile result is an adverse event.

PL12 Vanc resistant enterococcus (VRE)

Review for any hospital acquired infections, central line infection, surgical site infection, or urinary tract infections. Any infection occurring in hospital is an adverse event. Exceptions might be the urinary tract infection from outside the hospital, or infection being treated but not contracted in hospital.

PL13 Hospital acquired pneumonia

Look for x-ray or lab reports that suggest pneumonia. Any pneumonia diagnosed in the hospital needs to be looked at carefully. Any infection starting in hospital needs to be considered nosocomial and an adverse event, unless clearly contracted from outside the hospital. Re-admissions could also represent pneumonia from a previous hospitalisation, particularly if antibiotic resistant.

PL14 Positive blood culture

A positive blood culture at any time during hospitalisation must be investigated as an indicator of an adverse event. A surgical site infection, sepsis, infected lines, or any other hospital acquired infection is an adverse event. *All patients in 1st cohort will have this trigger recorded by definition of the sample.*

Other Component

PO1 Other Event

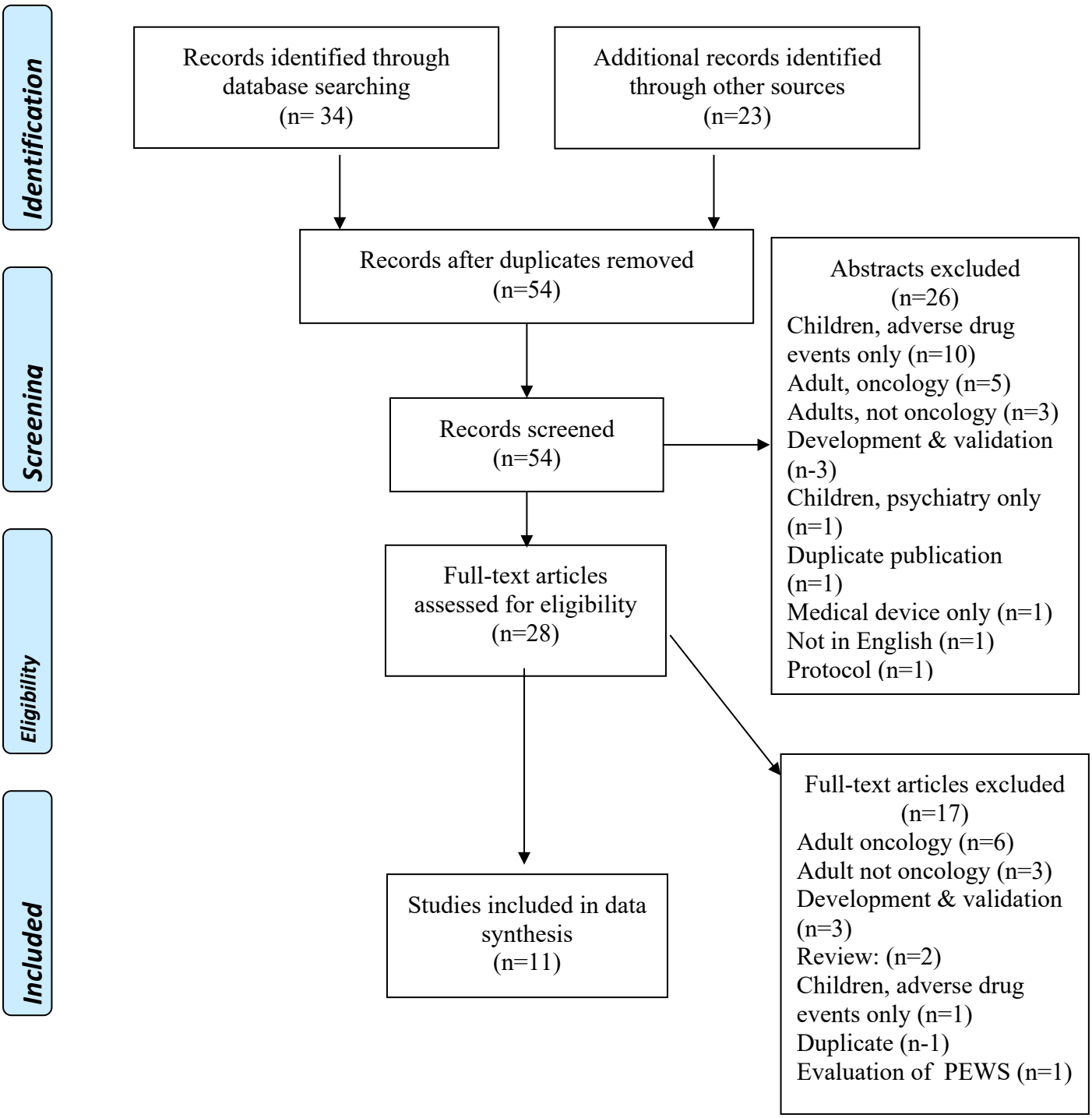
Any other events that may not be listed by the trigger tool but may be considered
Examples include:

- *Neutropenia <1.0mL*
- *Off-site radio therapy*
- *Patient susceptibility -Bone marrow and non-bone marrow transplant patients*
- *Is place of care trigger if not in planned area/ward or side room*
- *Entry into trial and Non-compliance with protocol selected*

**Text in italics was added to the UKPTT by the expert reviewers as guidance for the local context and cohort sample*

Appendix 3: PRISMA Flow Diagram for identification of studies of adverse events in paediatric inpatients detected with a trigger tool

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
www.prisma-statement.org.



Appendix 4: Trigger and Adverse Events Frequency and Severity GGC Results of the UKPTT

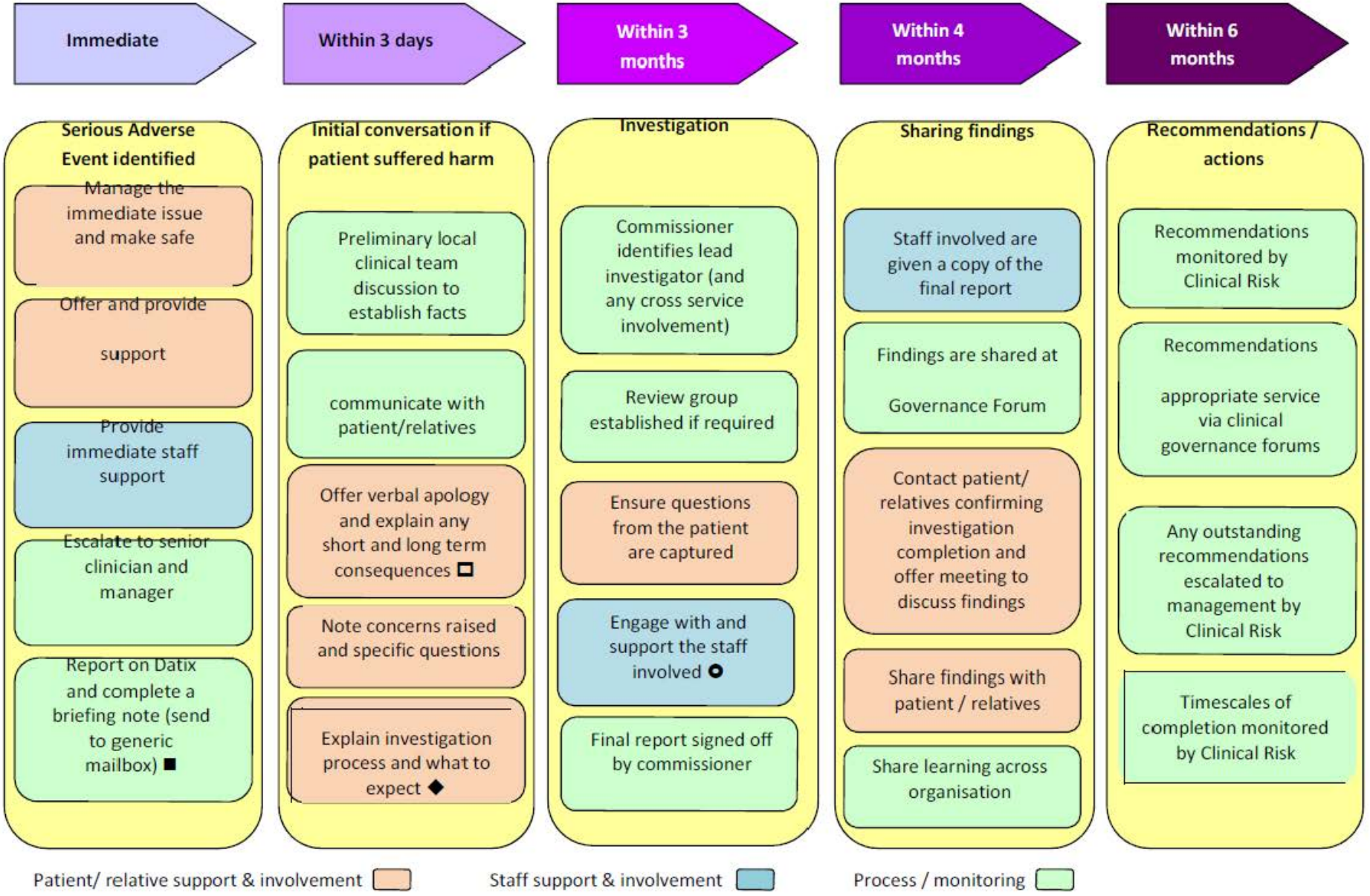
Code	Description	Trigger	AE	E	F	G	H	I
PG1	EWS or Baseline Obs missing or incomplete	0	0	0	0	0	0	0
PG2	Tissue Damage or pressure ulcer	8	6	0	5	1	0	0
PG3	Readmission within 30 days	42	32	3	29	0	0	0
PG4	Un planned Admission	73	63	1	62	0	0	0
PG5	Cranial Damage	3	0	0	0	0	0	0
PG6	Respiratory/Cardiac Arrest/Crash call	3	3	0	2	0	1	0
PG7	Diagnostic Imaging for embolus /thrombus+/- confirmation	3	3	0	2	1	0	0
PG8	Complication of procedure or treatment	43	42	2	39	1	0	0
PG9	Transfer to a higher level of care (PICU)	16	11	0	1	8	2	0
PG10	Hypoxia 02 sat <85%	9	7	0	6	1	0	0
PG11	Cancelled elective procedure/delay/discharge	12	9	0	9	0	0	0
PG12	Pain score < 7	6	6	0	6	0	0	0
PS1	Returned to Theatre	48	47	1	45	1	0	0
PS2	Change in planned procedure	22	17	3	13	1	0	0
PS3	Surgical Site Infection	2	2	1	1	0	0	0
PS4	Removal/Injury repair of organ	1	1	0	0	0	1	0
ITU1	Readmission to ICU/HDU/PICU	8	7	0	1	4	0	2
PM1	Vit K given not applicable	6	0	0	0	0	0	0
PM2	Naloxone given	0	0	0	0	0	0	0
PM3	Flumazenil Given	0	0	0	0	0	0	0
PM4	Glucagon or Glucose ≥10% given	1	1	1	0	0	0	0
PM5	Chlorphenamine Given	12	2	0	2	0	0	0
PM6	Anti-emetic given	70	1	1	0	0	0	0
PM7	IV Bolus ≥10ml/kg colloid or crystalloid given	39	29	4	24	1	0	0
PM8	Abrupt medication stop	7	6	0	6	0	0	0
PM9	Missed Doses	56	48	19	29	0	0	0
PM10	Anti-fungal prescribed	98	4	0	4	0	0	0
PL1	High INR(>5)or APTT>100 sec	1	0	0	0	0	0	0
PL2	Transfusion	74	3	1	2	0	0	0
PL3	Abrupt drop in HB or Hct (>25%)	4	1	0	1	0	0	0
PL4	Rising Urea or creatinine (>2x baseline)	5	1	0	1	0	0	0
PL5	Na+ <130 or>150	8	3	1	2	0	0	0
PL6	K+ <3.0 or > 6.0	25	9	4	5	0	0	0
PL7	Hypoglycaemia (<3mmol/l)	3	3	2	1	0	0	0
PL8	Hyperglycaemia (>12mmol/l)	3	2	0	2	0	0	0
PL9	Drug level out of range	2	1	0	1	0	0	0
PL10	MRSA bacteraemia	0	0	0	0	0	0	0
PL11	C.difficile	1	0	0	0	0	0	0
PL12	Vanc resistant enterococcus	3	3	1	2	0	0	0
PL13	Hospital Acquired Pneumonia	0	0	0	0	0	0	0
PL14	Positive Blood Culture	115	115	2	113	0	0	0
PL15	Thrombocytopenia (<100)	62	1	1	0	0	0	0
PO1	Include Neutropenia <1mL	71	12	5	7	0	0	0
	Other Specify in Notes	1	0	0	0	0	0	0
	TOTAL	966	501	53	424	18	4	2

Appendix 5 Table of included studies for the PTT literature review

Paper	Country	Hospitals	Service	Patients	Trigger Tool	AE rate measure
Agarwal 2010[30]	USA	15 Tertiary	PICU only	734	PICU Trigger Tool	AE per 100 admissions; AE per 1000 patient days
Chapman 2014[4]	UK	25 Tertiary & Secondary	Medical, Surgical & PICU	3992	UKPTT, UK Paediatric Trigger Tool	AE per 100 admissions only
Davenport 2017[27]	Argentina	1 Tertiary	Medical, Surgical & PICU	200	GTT, Global Trigger Tool	AE per 100 admissions only
Fajreldines 2019[28]	Argentina	1 Tertiary	Medical, Surgical & PICU	318	GTT, Global Trigger Tool	AE per 100 admissions; AE per 1000 patient days
Kirkendall 2012[12]	USA	1 Tertiary	Medical, Surgical & PICU	240	GTT, Global Trigger Tool	AE per 100 admissions; AE per 1000 patient days
Motlow 2012[15]	Canada	22, 8 Tertiary. 14 Secondary	Medical, Surgical & PICU	3669	CTT, Canadian Trigger Tool	AE per 100 admissions only
Sharek 2006[5]	USA	15 Tertiary	NICU only	749	NICU Trigger Tool	AE per 100 admissions only
Solevag 2014[29]	Norway	1 Secondary	Medical, Surgical & PICU	761	UKPTT, UK Paediatric Trigger Tool	AE per 100 admissions; AE per 1000 patient days
Stockwell 2015[31]	USA	6 Tertiary	Medical, Surgical & PICU	600	GAPPS, Global Assessment of Paediatric Safety	AE per 100 admissions only
Stockwell 2018[14]	USA	16 Tertiary & Secondary	Medical, Surgical & PICU	3790	GAPPS, Global Assessment of Paediatric Safety	AE per 100 admissions only
Stroupe 2017[24]	USA	1 Tertiary	Medical & Surgical only, no PICU	100	GAPPS, Global Assessment of Paediatric Safety	AE per 100 admissions; AE per 1000 patient days

Appendix 6 NHS GGC policy on the management of serious Adverse Events, August 2020

Appendix A - SAE Process Guide



SCOTTISH HOSPITALS INQUIRY

POSITIONING PAPER 2 ON BEHALF OF NHS GREATER GLASGOW AND CLYDE

Executive summary

1. The September-November 2021 hearings of the Scottish Hospitals Inquiry focused on evidence of experiences and perceptions of patients and families over the period of their treatment at Queen Elizabeth University Hospital at Glasgow, predominantly within the Royal Hospital for Children. A significant feature of the testimony of patients and families centred around their experience of suffering infection over the course of their treatment and their understanding that their infections may have been caused or contributed to by the built environment of the hospital itself.

2. Included in the remit of the Inquiry is to "determine how issues relating to adequacy of ventilation, water contamination and other matters adversely impacting on patient safety and care occurred" and "if these issues could have been prevented." In particular, the Inquiry Team has sought the position of NHS GGC on the question of whether the built environment at the QEUH was in an "unsafe state," and, if so, whether any link between infections and the built environment can be said to exist.

3. It is the position of NHS GGC that the built environment of the QEUH did not, on a proper reading of the available evidence, expose patients to any increased risk to their health, safety or wellbeing. Further, with the exception of two discrete cases of paediatric infection, there is no evidence before the Inquiry to properly suggest a link between infections suffered and anything arising from the built environment. In particular, there is no evidence to demonstrate any increased rate of infections within the QEUH from micro-organisms related to the built environment.

Questions posed by Counsel to the Inquiry

4. It is our understanding that the Inquiry considers that there are 3 questions in relation to infections that require to be considered:

    (a) "Was the built environment in an unsafe state in that it presented the opportunity for pathogens to come into contact with patients?"

    (b) "If the built environment was in an unsafe state is there a link between infections suffered and the unsafe state of the built environment?"

    (c) "If the built environment was in an unsafe state has it now been addressed?"

5. In addition, the Inquiry wishes to understand NHS GGC's position on whether there is a causal connection between the infections and the hospital built environment. In

particular, "whether it is the Board's position that unless one can categorically confirm connection e.g. [redacted], then there is no basis to conclude that there may nevertheless be likely/very likely to have been a connection."

6. In order to properly address these points, there are relevant factors that must be borne in mind, which will also change the nature of the question that requires to be answered. However, before doing so there are key concepts on how infections occur that must be understood.

Background

7. An infection is the presence of live and multiplying micro-organisms, evident clinically, in a part of the body where the micro-organisms should not be present (or present in those numbers). For an infection to occur, that micro-organism must have come from somewhere (a source), had a path to get to that person (transmission route) and a way to get into the body (opportunity/susceptibility). The development of any infection is therefore multifactorial.

Source

8. The micro-organism can either come from the same person (endogenous) or from somewhere else (exogenous) such as the environment, food and other people. It should be noted that the human body has more bacteria than human cells (40 trillion bacteria cf. 37 trillion human cells)[1] and so an individual's own body represents the largest source of micro-organisms to which they are exposed.

Transmission

9. If it is an exogenous infection (i.e. one caused by a micro-organism that is not part of the person's own flora) then there must have been a route by which it reached the person. The most common route is by direct contact with the source (another person, food, soil etc.), but depending on the type of micro-organism it may be spread through another medium from the source such as by air (e.g. *Aspergillus fumigatus*), droplets (e.g. *Coronavirus*), or water (e.g. *Escherichia coli*).

10. It should be noted that transmission may not be directly from the originating source of the micro-organisms to the point of infection, but can be through several steps including becoming part of the community of micro-organisms that have colonised the body (commensal flora) for a period before the opportunity to cause an infection arises.

[1] Presentation by Prof. A Leanord to Inquiry team on 29 June 2022.

Opportunity/Susceptibility

11. The human body has a number of mechanisms to prevent infection. Firstly, there are barriers such as the skin, mucous membranes and stomach acid, all of which prevent potentially infective micro-organisms from entering the body. Secondly, the body's immune system attacks and kills micro-organisms that do enter the body preventing an infection developing. Any defect in these mechanisms, such as a wound, creates susceptibility and will provide an opportunity for an infection to develop.

12. This is particularly the case in a hospital setting as patients are more susceptible to infection than the general public for several reasons. They have invasive devices, which are necessary for their treatment, that breach their natural barriers (e.g. a venous cannula for the administration of intravenous fluids). Also as they are unwell, hospital patients are less able to mount an effective immune response in general and even less so for patients who are immunosuppressed. In these circumstances, it is by no means unusual for a hospital patient to acquire an infection. In particular, paediatric haemato-oncology patients, who are immunocompromised, are unfortunately particularly vulnerable to infection.

13. A point to note is that, whilst the commensal flora act as a barrier to exogenous infections, they can cause an endogenous infection as a result of this susceptibility/opportunity (opportunistic infection).

Healthcare associated infections

14. People are not sterile. Buildings are not sterile environments. Healthcare buildings such as hospitals, although subject to significantly higher cleaning standards than other premises (e.g. office or domestic premises) are not sterile. Hospitals have a large volume of people (staff, patients and visitors). Hospital surfaces, which are subject to cleaning regimes, are not sterile. Hospital water and air, which are filtered, are not sterile.

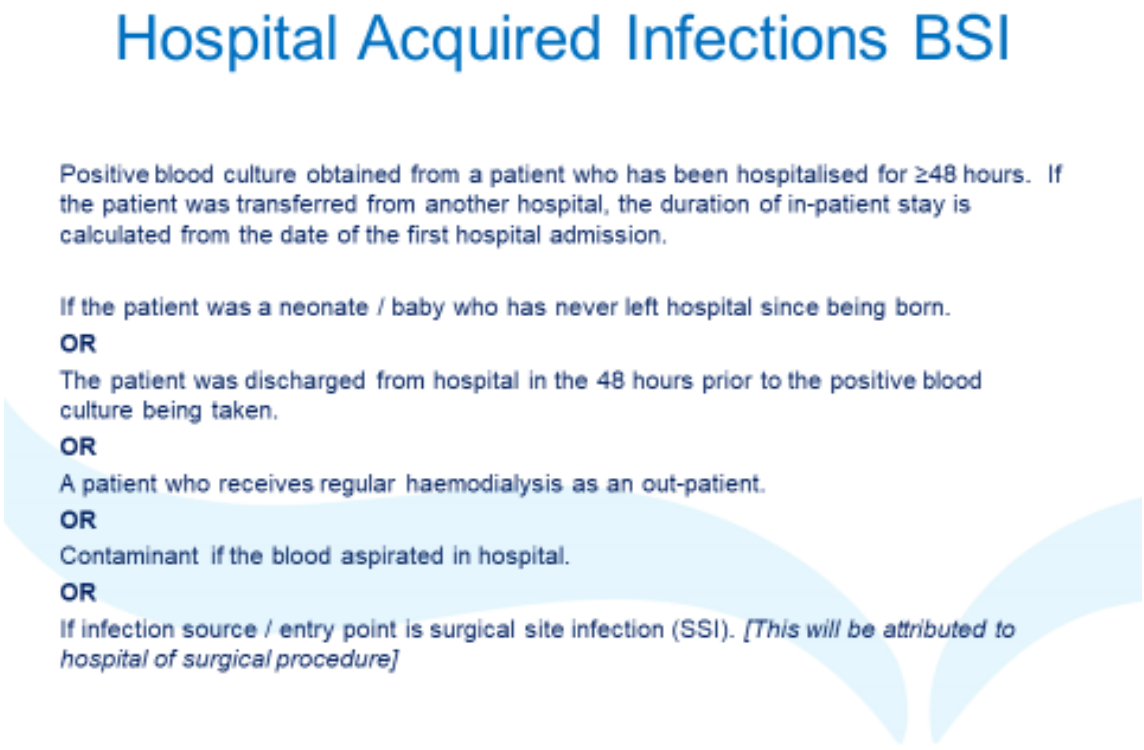
15. Patients do get infections as they are susceptible (as noted above). As hospitals are not sterile, they inevitably can be and will be a source of infection. However, determining whether the hospital is, in fact, the source is not straightforward and even if it is, this does not mean that the particular infection was avoidable. This will be explored later in this Paper.

16. As it is difficult to determine whether the hospital (or healthcare setting) may be the source in any particular case, in order to be able to carry out surveillance, assumptions must be made. The term originally used was nosocomial[2], but this has since been replaced

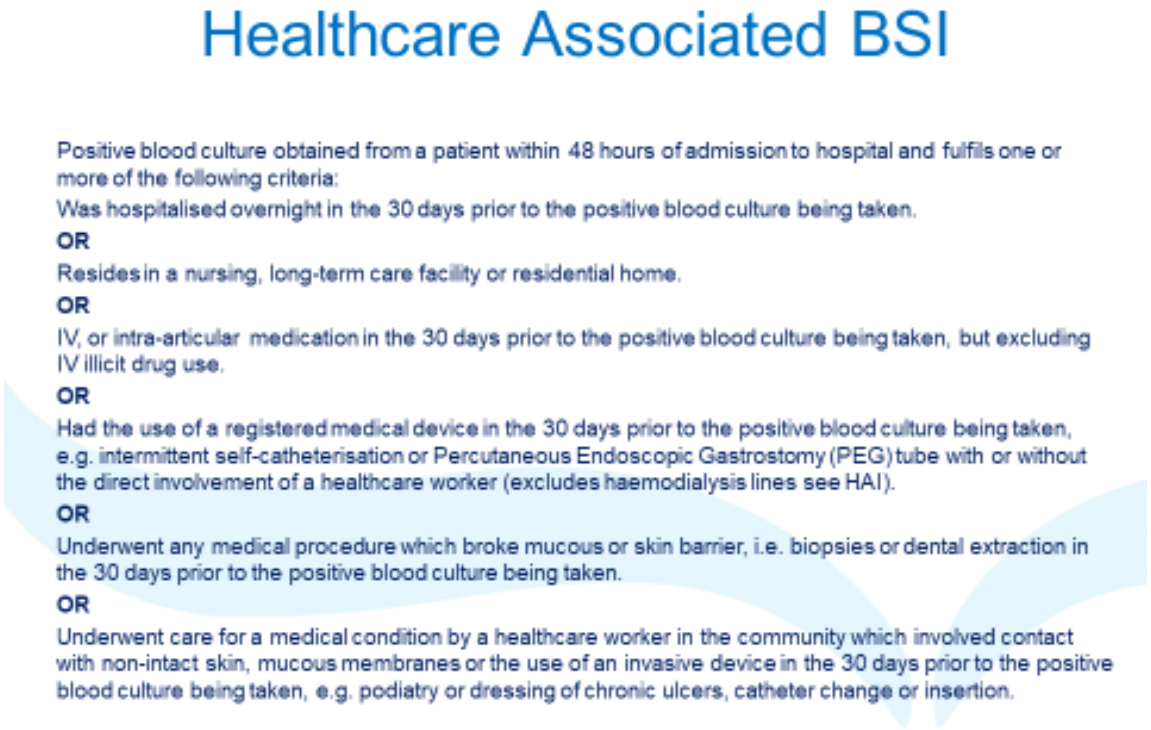
[2] Derived from the Greek *nosokomos* meaning "one that tends the sick".

by the terms hospital acquired infection (HAI) and healthcare associated infection (HCAI). These terms are defined and set out below, per the slides previously provided to the Inquiry. As can be seen the defining characteristic is the timescale in which the infection develops and that neither definition indicates causation.

17. Once a micro-organism enters a susceptible body, it will multiply and this process takes time for there to be a sufficient amount of growth before a clinical infection has developed. This incubation period, meaning the time duration between exposure to the pathogen and the appearance of disease symptoms, varies significantly depending on the particular micro-organism. Although the definition of HAI sets the cut-off as 48 hours from admission, the incubation period for the infection is often uncertain and can be significantly longer: for example, the incubation period for *Cryptococcus neoformans* infections can be up to 102 days and can be much longer when latency and dormancy is taken into account.[3] Also these definitions include periods when the patient may have been exposed outwith the healthcare setting, for example whilst at home or in the community. Therefore, these definitions are not helpful in attributing causation; this is not surprising as the definitions are deliberately conservative, and are designed to inform a precautionary approach to infection control.



[3] Report from the Cryptococcus Incident Management Team Expert Advisory Sub-Group by Dr John Hood.



The approach of infection control and prevention (IPC) Teams

18. As noted above, if a patient develops an infection, determining if the interaction with the hospital or healthcare setting was, in fact, the source is not straightforward: whether that be from other people in the hospital (such as staff or visitors); a moveable item (such as a toy, a newspaper, or a scalpel); or the built environment (such as a shower head or tap outlet). The approach of the IPC Team is based on these defined HAI and HCAI surveillance parameters as governed by the National Infection Prevention and Control Manual ("NIPCM"), in which it will be assumed the hospital is the source until this can be ruled out. Mitigation measures are often implemented before the results of any investigations into the source of the infection are known. This approach is necessary in order to ensure infection rates are as low as reasonably practicable. IPC Teams therefore essentially operate on a reverse burden of proof, the standard of which is high, as noted above. The Case Note Review, as is to be expected from IPC practitioners, adopted a reverse burden of proof as is set out in their report at section 3.6.6.[4]

[4] At page 44 of the Overview Report: "For cases that we considered to be Unrelated to the hospital environment, we agreed either that key issues such as a (relative) lack of opportunity to acquire bacteria from the hospital environment over a period of time consistent with the development of bacteraemia, and/or strong alternative hypotheses about the origin of the bacteraemia, had to be present."

19. Accordingly, having regard to the surveillance parameters applied by IPC practitioners, particular care must be taken when considering the views expressed by them when seeking to determine whether the source of any particular infection may have been attributable to a hospital built environment.

Questions Posed by the Inquiry

20. Turning to the questions that the Inquiry has posed, and taking each in turn, there are a number of aspects that must be considered.

(a) Was the built environment in an unsafe state in that it presented the opportunity for pathogens to come into contact with patients?

21. What is "unsafe" or "an unsafe state"?

22. As described above, the built environment is not sterile and therefore the micro-organisms in the built environment will come into contact with patients. As a consequence, in any acute hospital setting there will always be an unavoidable background rate of infection; this issue is considered in detail at paras 39- 45 below. Further, with any building that is in use there will be localised operational or maintenance issues that require to be addressed. To that extent, it may always be said of any hospital environment that its built environment is "unsafe".

23. What is assumed, therefore, is that the question which is posed is intended to ascertain whether it is accepted that the built environment of the hospital was "unsafe" in the sense that there existed at the relevant time systemic or widespread issues relating to the built environment which, as a consequence, resulted in an increased level of exposure to micro-organisms, and manifested in an increased rate of infections from environmental micro-organisms found in the built environment. Given the remit of the Inquiry to explore the extent to which ventilation and water issues impacted adversely on patient safety, these issues are the principal focus in considering the question of whether the built environment was "unsafe" in the sense that we understand the term to be meant.

Technical approach

24. There are broadly two approaches that can be taken to attempt to answer this question from a technical perspective. The first approach is whether the design met the relevant technical standards or guidance, but this approach relies on the assumption than non-compliance is the same as being "unsafe" which may not be supported by evidence. The second approach is whether testing of the systems provides evidence of any widespread issues.

Ventilation

25. There has been no factual evidence placed before the Inquiry thus far of any suggested link between ventilation and any known case of infection. Very little evidence has been led thus far on patient experience related to ventilation: the evidence led at the September- November 2021 hearings on the experience and perceptions of patients and families referenced concerns about ventilation at the QEUH in the briefest of terms, with concern about sources of infection associated with water being the predominant theme. Similarly, the Case Note Review and the Oversight Board Report focus primarily on issues surrounding water safety and infection. However, specific concerns were raised by the whistle-blowers as to the adequacy of ventilation in the QEUH, with particular focus on its role in the infection with *Cryptococcus neoformans* of two patients who died whilst being treated at the QEUH.

26. There is an absence of standards or guidance on the testing of air quality in hospitals. Thus, in relation to ventilation, the question of whether or not the design met the relevant technical standards or guidance is the only question which is applicable. The Inquiry has heard evidence in relation to guidance pertaining to ventilation systems, notably the guidance as set out in SHTM 03-01.[5] It is important to note that, in terms of its status, SHTM 03:01 is peer produced guidance which is there to support, rather than replace, appropriate management and engineering expertise, and compliance with its guidance is not mandatory.[6] Whilst it is accepted that ventilation on wards within QEUH did not comply with SHTM standards, there remains, however, a question about the practical effect of that non-compliance, if any, from the perspective of infection prevention and control and patient safety.

27. In that regard, it is important to note that, in evidence, microbiologist Professor Humphries questioned the evidential basis for the standards as set out in SHTM 03-01 from a microbiological perspective. In particular, he questioned in evidence what scientific basis exists for the rate of air changes being as they are in the guidance and advised the Inquiry that there is no precise science that he is aware of which sets rates of air changes per hour as they appear in SHTM. Whilst acknowledging the importance of ventilation in preventing infection, he took a more holistic view in relation to infection prevention and control and emphasised that ventilation is just one aspect in what should be a series of measures in place to prevent infection, including the use of prophylaxis. In addition, he noted that the relevant standards appear to have been derived from research carried out by Dr Owen Lidwell in 1972, at a time when hospital wards tended to be configured as

[5] Scottish Health Technical Memorandum: Ventilation for Healthcare Premises 03:01.
[6] [redacted].

Nightingale wards and long before the more recent prevalence of single bedrooms on wards, which is preferred from an infection prevention and control perspective.[7]

28. Therefore, where there is a deviation from the guidance as set out in SHTM 03:01, it is far from evident that any such deviation would render the hospital "unsafe". There is no evidence to support why SHTM proposed minimum ventilation requirements are as they are, and there is nothing to suggest that particular rates of air changes themselves have any direct impact upon rates of infection. This has been examined specifically in relation to Ward 4C by Dr Samir Agrawal[8], who concluded that although the ventilation system serving Ward 4C does not meet the SHTM 03-01 there is no evidence of a material increase in the risk of airborne infection as a result, a position which is supported by the low rates of documented airborne infections.[9]

29. In relation to the two patients who suffered infection with *Cryptococcus neoformans*, ventilation arrangements at the QEUH were subject to intensive and thorough scrutiny, in order to explore any and all hypotheses which could be considered to show a link between the patients' infections and the ventilation within wards 4C and 6A where these patients had been treated within the QEUH. The Cryptococcus IMT Expert Sub-Advisory Group was established and chaired by Dr John Hood, consultant microbiologist. Following extensive work, the group concluded that it was highly unlikely that the 2 affected patients had been infected with *Cryptococcus neoformans* as a result of the hospital environment: from around 3000 air samples which had been taken from within or near QEUH at that time, no *Cryptococcus neoformans* spores had been identified. Genotyping of the infection of the 2 patients in question showed that their cases were different genotypes. In particular, the hypothesis that *Cryptococcus* spores had been able to enter the air handling unit during a filter change in the plant room, and thereafter travel down duct work to wards 4C and 6A, was deemed to be unfeasible, not least because no filter changes had occurred during the index period of infection.[10]

30. Thus, there is no evidence that the ventilation arrangements in the QEUH could be described as causing or contributing to the built environment at the QEUH being fairly categorised as in an "unsafe state."

Water

31. The position in relation to water systems is, perhaps, more complex to illustrate from the perspective of NHS GGC, particularly given the focus and reported findings of the Case Note Review. The Inquiry has not yet heard evidence in relation to water systems. The

[7] Professor Hilary Humphries statement and parole evidence to Inquiry, May 2022 hearing.
[8] Consultant haematologist at St Bartholomew's Hospital, London.
[9] Expert Report 18 May 2021.
[10] Report from the Cryptococcus Incident Management Team Expert Advisory Sub-Group by Dr John Hood.

design of water systems is intended to limit the growth of micro-organisms, and there are specific requirements on water quality. In relation to the water system it is important to note that the design and commissioning was the responsibility of the contractor, Multiplex, and was checked by the Project Supervisor, Capita. Again, in adopting a technical approach to the question of whether water systems at the QEUH might be classified as "unsafe", and the two aspects of such an approach, consideration may be directed to (a) whether the system was compliant with any set standards or guidance, and (b) whether testing of the system has, in fact, revealed any widespread issues. Both approaches can be utilised here, however any failure to control microbial growth would require to be evidenced through testing. As such the second approach is the preferred approach.

32. The requirements on water testing principally relates to standards of "wholesomeness" at the time of commissioning and monitoring in certain areas of the hospital for particular organisms.[11] Requirements and guidance on water testing are limited to only a few organisms (namely coliforms, *E. Coli*, *Legionella* and *Pseudomonas*) and total viable counts (TVCs). In relation to TVCs, the guidance does not provide any acceptable limits.[12] Full details on the requirements and guidance on water testing, which NHS GGC has exceeded in relation to the QEUH since its opening in 2015, is provided in the report by Dr Dominique Chaput.[13]

33. There is no guidance on whether the presence of other micro-organisms in hospital water systems is acceptable. This means that where hospital water is tested for a different micro-organism, such as *Cupriavidus pauculus* and it is found, there is no guidance that would permit the result to be interpreted to show whether or not the water was "unsafe". Water systems, whether in hospitals, office buildings or domestic premises, are not routinely tested to ascertain the range of micro-organisms that are present.[14] As water is not intended to be sterile, it would follow that it should be expected that water-borne micro-organisms would be present and this has been shown to be the case in other

[11] The Public Water Supplies (Scotland) Regulations 2014, SHTM 04-01, and Pseudomonas aeruginosa routine water sampling in augmented care areas for NHS Scotland (Health Protection Scotland, 2018 draft).

[12] In November 2022, HTM 04-01, the applicable standard for safety of healthcare water systems in England and Wales and the equivalent of Scotland's SHTM 04-01, was scrutinised in an [redacted] Amongst his findings, the Coroner made a recommendation to the Secretary of State for Health and Social Care that HTM 04-01 that required urgent review and amendment as it contains guidance only on the identification and control of legionella and pseudomonas and no other micro-organisms. See Karen Starling and Anne Martinez - Prevention of future deaths report - 2022-0368 (judiciary.uk)

[13] Summary of legislation and guidance for routine microbiological water tests carried out at QEUH Adults and RHC by Dr Dominique Chaput, dated 9 December 2022.

[14] ARHAI Report NHSScotland's Approach to Microbiological Water Testing dated July 2022.

hospitals.[15] Therefore, no conclusion as to whether or not the water system was "unsafe" can be drawn merely from the presence of such micro-organisms.

34. However, the established guidance on testing can be used as a marker of water quality as a substitute for whether or not the water system is "unsafe". Testing carried out from 2015 onwards does not demonstrate that there is any noteworthy issue with water quality.[16]

35. If it is considered that seeking to answer this question from a technical perspective is not sufficient, an alternative approach can be taken, although that too is also not without its challenges.

Clinical approach

36. An alternative approach to ascertaining whether the built environment was "unsafe" is to look at whether any effect can be demonstrated, i.e. determine whether any harm (infections) have arisen. As described above, patients will get infections, and it is inevitable that some of these will have been due to micro-organisms acquired from the hospital built environment. This is particularly the case with immunocompromised patients. By way of example, a review of data from five London hospitals during 2009-2011 found that in 112 children with cancer there were 149 significant blood stream infection episodes involving 266 significant bloodstream isolates.[17] This averages as more than one significant blood stream infection episode per patient with more than one organism per episode.

37. The key question therefore is not whether there have been infections that are linked to the built environment, but rather whether there is an increased rate of infections from micro-organisms related to the built environment.[18] In theory, if there is an "unsafe state" then that should increase the level of exposure to micro-organisms and manifest in an increased rate of infections from environmental micro-organisms found in the built environment.

38. Infections are multifactorial. Whilst the questions that the Inquiry is seeking to answer focus on the source, differences in transmission and susceptibility/opportunity factors are just as significant (if not more so). Many of the patients and families who gave evidence

[15] *Cupriavidus* spp. and other waterborne organisms in healthcare water systems across the UK; T Inskter et al; Journal of Hospital Infection 123 (2022) 80-86. It is also present in drinking water in Glasgow – Khan et al. 2016, Chemosphere 152:132, and Khan et al. 2016, Environmental Processes 3:541.

[16] Microbiological testing of Water and Environmental Samples from QEUH 2015- 2020: Overview of sample numbers and test results; and Water Testing Summary for whole of QEUH campus 2015- 2020, both dated 3 March 2023 by Dr Dominique Chaput.

[17] Calton EA et al. Pediatr Blood Cancer 2014;61(7):1239-1245.

[18] It is the rate of infection, not the number of infections as is noted in the Closing Submissions by Counsel to the Inquiry at paras 192-193, that is relevant as a large hospital will have a higher number of infections and the QEUH is one of the largest acute hospital campuses in Europe.

at the evidential hearing in 2021 described having a central line. A central line breaches the body's primary barrier to infection (the skin), the entry point is a wound and the line itself is a foreign body directly into major blood vessels upon which bacteria can grow and travel. Changes in the type of device, the surgical technique of insertion, subsequent manipulation and care of that line can all impact the likelihood of the patient developing an infection regardless of the source.[19] If an increased rate of infection from micro-organisms related to the hospital environment can be shown, this does not of itself demonstrate that the built environment is "unsafe". It would be only an indicator that the built environment *may* be "unsafe" and further investigation would be required to establish the position as there may be a number of confounding factors present. For example, if a person, whether patient, staff or visiting family member, is unknowingly colonised by a micro-organism, they may show no signs of infection themselves. Contact between that person with a patient or patients within the hospital environment may then result in transmission of micro-organisms, causing infection. This may, in turn, result in an increase in rate of infection related to the hospital environment as a whole, without any issue with the built environment itself being a factor per se and without anything to suggest the hospital built environment could properly be described as "unsafe." The fundamental question is whether an increased rate of infections related to the built environment can be shown: if no increased rate can be demonstrated, that would be an indicator that the built environment is not "unsafe".

39. In order to evidence whether or not there is an increased rate of infection from micro-organisms related to the built environment at the QEUH and RHC, this requires a comparison of infection rates against other hospitals to be carried out. There are a number of challenges with carrying out such an exercise. The main challenges are:

    - It is not straightforward to define what would constitute "environmental organisms" as very few organisms are found solely in environmental sources.[20]

    - Infection rates will vary if the patient populations being compared are different. Factors such as the case-mix of patients and levels of deprivation are relevant. Patients from the Greater Glasgow area are generally more socially deprived and therefore have poorer health outcomes compared to the population as a whole due to factors such as smoking, alcohol, drug use etc. It would therefore follow that areas with high levels of ill health may also have higher rates of HCAIs. Also, in respect of a number of care services, such as paediatric cancers, QEUH and RHC

[19] This was the subject of a significant quality improvement work from 2017- 2019, led by Chief Nurse for Paediatrics, Jennifer Rodgers, and has led to dramatic reduction in the central line associated blood stream infection (CLABSI) rate. See CLABSI QI presentation for ICG Subgroup (June 2021).

[20] It should be noted that the classification used by HPS/ARHAI in their Review of NHSGG&C paediatric haemato-oncology data (dated October 2019) was in fact "provided by the NHS GGC lead Infection Control Doctor" i.e. Dr Inkster, and her views are not necessarily shared by other microbiologists in NHS GGC.

are a tertiary centre and will therefore have the most complex and sick patients in Scotland. Again, a higher rate of HCAIs may be expected.

40. Notwithstanding these challenges, where comparative data exists or can be obtained, this can be a useful indicator. In particular, given that a higher rate at the QEUH and RHC might be expected for the reasons above, if these comparisons show that infections rates at QEUH and RHC are, in fact, in line with the rest of Scotland this would be a strong indicator that the built environment is not unsafe. The QEUH consists of five teaching hospitals combined into one: despite its sheer size, and its complex patient mix, infection rates at the QEUH compare favourably to national rates.

41. ARHAI collect infection data from all Health Boards in Scotland and have published quarterly reports on the rates of infection for certain organisms since at least Q4 2014.[21] These reports define an expected "normal variation" and demonstrate that from Q4 2014 to Q2 2022 NHS GGC has been within the expected "normal variation" throughout, except for one occasion.[22] The published data is for NHS GGC as a whole and not specific to the QEUH and RHC. NHS GGC asked ARHAI for specific information on the performance of QEUH and RHC and the response from ARHAI confirmed that the rates were still within these parameters.[23]

42. ARHAI also carry out a periodic national point prevalence survey of HAIs across all of NHS Scotland. The last survey was conducted during September to November 2016. The overall prevalence of HAIs during this survey in the QEUH was 4% and in the RHC 3.6%, both lower than the national rate of 4.5%.[24]

43. The ARHAI Review of NHS GGC paediatric haemato-oncology data[25] carried out a comparison with other health boards and found that the rate of positive blood cultures for the RHC during the period of June 2015 to September 2019 was lower for Gram-positive organisms and that there was no difference for Gram-negative organisms or environmental organisms. The rate was higher for environmental plus enteric organisms, but this is due to a higher rate of enteric (i.e. gut) organisms and not environmental organisms. This may reflect the higher complexity of patients at the RHC who may be more prone to developing infections from their gut flora.

44. The Case Note Review does not provide any comparative data on infection rates. The only comparison noted in the Case Note Review is in relation to adverse events and the

[21] Available online at https://www.hps.scot.nhs.uk/publications/. The incidence rates provided are for meticillin sensitive *Staphylococcus aureus* and meticillin resistant *Staphylococcus aureus*, *Staphylococcus aureus* bacteraemias, *Clostridium difficile* infection, and *Escherichia coli* bacteraemias. It should be noted that the methodology used to generate the funnel plots "are based on the same calculations as the control limits in SPC charts" - https://learn.nes.nhs.scot/2470.
[22] *Clostridioides difficile* infection rate in Q2 2019.
[23] Appendix 1 - Summary of Patient Safety Indicators by Sandra Devine.
[24] Appendix 1 - Summary of Patient Safety Indicators by Sandra Devine.
[25] Report dated October 2019. See also Appendix 1 - Summary of Patient Safety Indicators by Sandra Devine.

Paediatric Trigger Tool. In this regard the Case Note Review concluded that "NHS GGC is comparable with reports from other tertiary care hospitals."[26]

45. None of these comparison exercises indicate that, during the period with which the Inquiry is concerned, there was an increased rate of overall infection, or of infection from micro-organisms related to the built environment at the QEUH or RHC. Indeed, the ARHAI comparisons with other health boards found that infection rates at the QEUH and RHC are as good, if not better, than those of other NHS boards. The NHS GGC Director of IPC, Sandra Devine, has collated the information from the varying sources of these indicators, which is attached to this Paper at Appendix 1. Considering the patient population served by both hospitals, a very reasonable inference may be drawn from these findings that the built environment at the QEUH and RHC was not in an unsafe state during the period with which the Inquiry is concerned and, in fact, continues to be safe.

(b) If the built environment was in an unsafe state is there a link between infections suffered and the unsafe state of the built environment?

46. This question seeks to establish whether there is a causal connection between infections and an "unsafe" built environment. If infections are to be expected, the mere presence of such infections does not demonstrate per se that the built environment is "unsafe" or that there is a link.

47. In particular, as noted above, where there is no guidance or standards on the presence or absence of the particular types of micro-organisms that caused these infections it cannot be concluded that the built environment is "unsafe". Indeed, if an organism is known to be found in water, and the water is tested and the organism is found that leads to the question, so what? Furthermore, as noted above, there is no evidence of an increased rate of infection at the QEUH, a factor which would be required in order to evidence an "unsafe state". Accordingly, it is reasonable to conclude that the built environment is not "unsafe".

48. Should the alternative position be taken i.e. that for some, as yet unidentified reason it is considered that the built environment was in an "unsafe" state, establishing a link between that state and infections suffered is very difficult as any and all potential sources of exposure must be taken into account. The identification of an organism from a blood culture only identifies the species (e.g. *Staphylococcus aureus*) and not the actual causative organism itself. It is important to note that there is scope for error in this identification. Conventional identification methods, as used in a diagnostic laboratory, are significantly less accurate compared to whole genome sequencing e.g. 17 out of 155 (11%) of isolates identified as *Cupriavidus* spp. by the diagnostic laboratory were found to be

[26] Sections 3.4.5 and 8.6.2 of the Case Note Review Overview Report. See also commentary in 2 Report p.6.

different organisms on whole genome sequencing.[27] Taking an analogy of a shop being broken into and items being stolen, this is the equivalent of identifying that it was a human (*Homo sapiens*) who committed the offence. It does not identify which human it was and, in particular, does not assist if the alleged offence was committed in an area where humans are typically to be found (in the same way that many environmental organisms are ubiquitous e.g. *Cupriavidus* spp.).[28]

49. The built environment is only one of the possible sources of micro-organisms to which patients are exposed, and it does not even represent the largest pool of micro-organisms (that being the patients themselves). Furthermore, in current medical practice patients are no longer confined to hospital for treatment, but have shorter periods as an in-patient with continuing treatment on a day case or out-patient basis. Even where a patient may be an in-patient for an extended period, patients are often allowed out of hospital "on pass". In the event of an infection occurring, however, it is only the hospital built environment in respect of which testing is carried out; none of the other possible sources are tested. As noted above, as incubation periods vary significantly and as the transmission of the micro-organism may not be direct (e.g. from outside the hospital, on the hands of a visitor, or that it has become part of the patient's own flora for a period prior to infection), identifying when, and the circumstances in which, a patient was exposed to a particular organism is not straightforward, in particular in the absence of comprehensive testing.[29]

50. Taking all these factors into account, it is considered that, save in the two discrete cases to which reference has already been made, it would be difficult to conclude with any degree of confidence that an infection was causally linked to the built environment; in fact, quite the contrary.

51. Further, if there are circumstances in respect of an individual patient which could result in such a conclusion being made, given that, for the reasons previously stated, there will always be some infections caused by the built environment as it is not sterile, it is even more challenging to conclude that the infection was the result of an "unsafe state of the built environment". To put it another way, how can it be said that but for the "unsafe state of the built environment" the patient would not have developed the infection when the built environment will always be a potential source?

[27] Application of whole genome sequencing to identify relationships among isolates of *Cupriavidus* spp., *Enterobacter* spp., and *Stenotrophomonas* spp. isolated from clinical samples and from water and drainage associated sources within the healthcare environment, by Prof. A Leanord and D Brown, dated 18 Jan 2023. This was also shown to be the case in the publication by T Inskter et al (see footnote 15) where 4 out of 9 isolates identified by conventional methods as *Cupriavidus* spp. were found to be *Xenophilus aerolatus*.

[28] This is because the purpose of identifying the causative organism is so that appropriate treatment can be administered, not to identify the source of the infection.

[29] E.g. Report from the Cryptococcus Incident Management Team Expert Advisory Sub-Group by Dr John Hood.

52. It is against this background that Whole Genome Sequencing (WGS) is of critical importance to the issue of causation being considered by the Inquiry. WGS is a relatively novel tool, but is already recognised as the gold standard for the identification of micro-organisms, and the analysis of possible outbreaks of infection. Reverting to the analogy given earlier, WGS provides the genetic fingerprint of the human who broke into the shop, which would allow the individual to be identified. In relation to the infections at the QEUH with which the Inquiry is concerned, comprehensive investigation, applying WGS, has been undertaken by Professor Alistair Leanord and Professor Tom Evans, in which the most common Gram-negative infections identified were examined, and it was found that no link could be shown between the built environment and those infections except for a single case of *Cupriavidus pauculus* in 2016.[30] It is considered that, in these circumstances, it cannot on any reasonable view be said that a single linked case of *Cupriavidus pauculus* (plus a single linked case of *Mycobacterium chelonae*) constitutes a built environment which was in an "unsafe state", in particular as these organisms are known to be present in drinking water in any event.[31]

(c) If the built environment was in an unsafe state has it now been addressed?

53. The findings narrated above, and the inferences to be drawn from them, would suggest that this question is redundant, but if a different view were to be taken, what constitutes an "unsafe" or safe state would need to be clearly defined, together with guidance on how that is to be assessed in order for this to be determined. No such definition or guidance currently exists.

54. Notwithstanding the findings above, consistent with the approach of IPC, NHS GGC has undertaken significant works to improve the environment at the QEUH and RHC. This has included a refurbishment of RHC wards 2A/B and an upgrading of the filtration on wards 4C and 6A from F7 level to F9 level. The improvement works are detailed in the responses provided to various RFIs.

55. Further, in relation to water treatment and testing, since 2018, the routine water sampling plan at the QEUH has been expanded and has coincided with the installation of the chlorine dioxide dosing system to eliminate bacteria in water. From 2018, all routine water testing now currently carried out across the QEUH adult hospital and RHC exceeds requirements and recommendations set out in national guidance (where such guidance

[30] See footnote 27 regarding the Report by Prof. A Leanord. Reports by Prof. T Evans all dated 5 March 2023: Report on *Stenotrophomonas* Infection at Queen Elizabeth Hospital University Glasgow; Report on *Enterobacter* Infection At Queen Elizabeth Hospital University Glasgow; Report on *Cupriavidus* Infection at Queen Elizabeth Hospital University Glasgow. Separately as part of the IMT investigations, only one other case was also identified as being linked to the built environment, that being the case of [redacted] who tested positive for *Mycobacterium chelonae* in 2019.

[31] https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/mycobacterium-chelonae. See also footnote 15 above.

exists) in terms of testing frequency, locations tested (general as well as high risk), types of tests performed and thresholds to trigger action. Much of the routine testing carried out at these sites is bespoke to NHS GGC as there are no formal requirements and recommendations applicable to these tests.[32]

(d) Whether it is NHS GGC's position that unless one can categorically confirm connection e.g. [redacted], then there is no basis to conclude that there may nevertheless be likely/very likely to have been a connection?

56. It is not NHS GGC's position that unless WGS confirms a link that there is *no* basis to conclude that an infection may be linked to the built environment. Every case will depend on its own facts and circumstances. However, for the reasons detailed above (which are non-exhaustive) without WGS (or another highly discriminative method of typing) it would be difficult to reach such a conclusion with any degree of confidence. This is particularly the case in the circumstances that arose in the RHC in 2018, where instead of there being multiple infections by a single species (akin to a standard outbreak), there were infections from multiple different genera and species.[33] In this regard, the ARHAI Report stated that the "data presented in this report do not provide evidence of single point of exposure".[34]

57. Further, as noted above, even if it could be concluded, on the balance of probabilities, that a particular infection was linked to the hospital, it is accepted that such infections will always occur in hospital environments from time to time. In any hospital there will be a recognised "background rate" of infection. This renders it particularly difficult to then conclude that, where such a connection between a particular infection and the built environment is found to have existed, that an inference may be drawn that the built environment of the hospital was therefore in an "unsafe state" at the material time.

58. In relation to the importance of WGS in identifying the source of any infection, one of the arguments that has been made against it is that species of micro-organisms that exist in the environment are genetically diverse and therefore if no link is found then that can simply mean sampling failed to pick it up and is not evidence that there is no link.[35] It is true that species of micro-organisms in the external environment are genetically diverse (the level of diversity will depend on the micro-organism); however to say that this is the same in a hospital built environment is no more than an assumption as there is little published scientific literature which demonstrates the level of genetic diversity that exists within hospital built environments. Using a considerably more extensive data set than was

[32] Summary of legislation and guidance for routine microbiological water tests carried out at QEUH Adults and RHC by Dr Dominique Chaput, dated 19 Dec 2022.
[33] The significance of this issue is a matter which has been considered by Prof. Al Leanord and about which he is able to provide further comment.
[34] HPS Review of NHS GGC paediatric haemato-oncology data, dated October 2019.
[35] This being the position of Dr Inkster and Dr Peters, but also the position expressed by the Case Note Review Overview Report at p.96.

available at the time of the Case Note Review, the work undertaken by Professor Alistair Leanord and Professor Tom Evans would indicate that there is, in fact, a more limited degree of genetic diversity within an individual hospital than might be expected to be seen in the community. Therefore if, using an appropriate data set, WGS demonstrates no link between a patient's infection and a micro-organism obtained from the built environment through sampling, then it is more likely than not that any such infection was unconnected to the hospital built environment. When considered against the analysis by Professors Leanord and Evans of this extensive data set, the proposition that a link could nonetheless exist, despite not having been demonstrated by WGS, would seem to be one of speculation rather than scientific foundation. Taking the argument that is being made against WGS to its natural conclusion, the suggestion would appear to be that, as sampling would never be able to definitively show the absence of a link, that WGS, as a consequence, has no value: that clearly cannot be right, in particular where extensive sampling has taken place.

59. In relation to the approach taken by the Case Note Review the following observations are made in addition to those already made earlier. Insofar as the issue of sampling is concerned (upon which the Case Note Review placed considerable reliance), it is important to recognise its obvious limitations, namely that the only potential source that was sampled following the discovery of an infection was the hospital built environment. Any other sources such as the patient, their visitors, staff and the patient's home environment (all of which represent larger pools of micro-organisms that the patient is exposed to) were not sampled, and it is considered that the absence of these potential sources having been considered, must inevitably undermine significantly any conclusion reached on the source of the micro-organisms.

60. For example, the genus *Klebsiella*, amongst other sources, is often present in surface waters used for human consumption or for recreational purposes and can survive in water distribution systems despite chlorination.[36] *Klebsiella* spp. is also is a normal commensal of the human intestinal tract.[37] *Klebsiella pneumoniae* has commonly been found as a coloniser in human stools and "is strongly linked to subsequent infection" as patients who are colonised are 4 to 6.9 times more likely to develop an infection compared to non-colonised patients.[38] In healthy individuals, there is a high clonal diversity of strains carried.[39] It is the second most prevalent Gram negative infection in the UK. *Klebsiella* was only isolated in 3 samples from 10,311 samples (of which 6,183 looked specifically for

[36] https://onlinelibrary.wiley.com/doi/10.1002/tox.2540030512.
[37] https://www.gov.uk/government/collections/klebsiella-species-guidance-data-and-analysis
[38] Martin RM et al. Msphere. 2016 Sep-Oct;1(5):e00261-16 and Gorrie et al. Clin Infect Dis. 2017 Jul 15;65(2):208-215.
[39] Lepuschitz S et al Front Microbiol. 2020 Nov 24;11:58108.

Gram negative organisms) taken from the water in the QEUH and RHC between 2015 and 2020.[40]

61. In total, 30 infections of *Klebsiella* were examined by the Case Note Review and it was concluded that 10 were "Most Likely" to be associated with the environment and 18 were in other categories.[41] Given (i) the vastly greater numbers of *Klebsiella* spp. organisms that form part of the normal gut flora compared to what may be present in the water system; (ii) that any presence of *Klebsiella* spp in the water system is of doubtful clinical significance;[42] and (iii) that it has been shown that colonisation is significantly more likely to be the source, it is difficult to conclude that the most likely source was the water and not the patient themselves without such a link being demonstrated by WGS. It is not clear how the Case Note Review reached that conclusion in those 10 cases.

62. Finally, although the Case Note Review reaches conclusions as to the likelihood that infections were linked to the hospital environment, the Case Note Review does not define the criteria used to categorise the cases in relation to likelihood.[43] In the absence of such definition, it is difficult to attach any weight to the conclusions reached by the Review, in particular when taken together with the other observations and criticisms which have already been made elsewhere in this Paper.[44]

Conclusion

63. It is the position of NHS GGC that, when the available evidence is set apart from theories and hypotheses as to the safety of the QEUH campus, notably those put forward by the "whistle-blowers", the suggestion that the built environment of the QEUH is "unsafe" in the sense that it poses, or has at any time ever posed, an increased risk of infection to its patients does not withstand scrutiny. The Board took advice from the Lead Infection Control Doctor, and external organisations, predominantly ARHAI, at all times in responding to all hypotheses which were put forward in relation to infection prevention and control and has conducted more extensive surveillance than any other NHS Board as a result. Each hypothesis advanced by the "whistle-blowers" as to the risks to patient

[40] Microbiological testing of environmental samples from the Queen Elizabeth University Hospital and Royal Hospital for Children, 2015-2020 by Dr Dominique Chaput, dated 3 March 2023.
[41] At p.70 Table 5.4.
[42] https://onlinelibrary.wiley.com/doi/10.1002/tox.2540030512. Note the abstract states "There is no evidence that waterborne *Klebsiella* play any significant part in the epidemiology of these hospital-acquired infections. *Klebsiella* in water supplies should therefore not to be considered a hazard to human health."
[43] These are not provided in the Case Note Review Overview Report. As NHS GGC does not have access to the individual reports for each case it is unknown whether these are provided for in those. Furthermore, the conclusions reached by the Case Note Review appear to be based on the subjective opinion of the authors (see p.56) and this opinion is heavily caveated (e.g. "it is not possible to state this with certainty" and "Neither phenomena prove that some of the bacteraemias had hospital environment sources, but the observations are consistent with this hypothesis").
[44] NHS GGC has provided separately a detailed response to the Case Note Review, which was submitted to the Inquiry in response to RFI 1 on 1 March 2021.

safety posed by the QEUH built environment have, on thorough and proper investigation, been demonstrated to be unsubstantiated.

64. As will be clear, there is no evidence to demonstrate any increased rate of infections within QEUH from micro-organisms related to the built environment. When looked at properly and scientifically, the evidence demonstrates that the QEUH and RHC campus provides a safe environment for its patients.

Peter Gray KC

and

Emma Toner, Advocate

5 April 2023.

Appendix 1 - Summary of Patient Safety Indicators by Sandra Devine

Introduction

The question posed on a number of occasions throughout all of the reviews has been did the estates issues in QEUH/RHC, impact on the safety of the patients who received clinical care within these buildings? The sequencing of organisms within clinical cases/environment is explored in reports elsewhere, however, this paper aims to describe what indicators we have that can provide some assurance that patient outcomes on this campus were as expected or in some instances better than expected. Although not as definitive as we would wish for, these indicators are used across NHS Scotland and could be considered collectively as a proxy for whole system performance. Certainly, at the very least, it places QEUH/RHC performance in terms of patient outcomes within the context of NHS Scotland as a whole.

In the background section it is proposed that several factors should be considered when we try to analyse how QEUH/RHC performs in the context of the significant challenges faced by this complex health care system and the current case mix in QEUH i.e. those most at risk of infection due to their vulnerability from across Scotland and how, despite this, these hospitals perform well when compared to other less complex systems when reviewing the limited data that we have available to us. In the absence of comparative data, this paper attempts to demonstrate the systems and processes in place and local outcomes if available.

Background

The Queen Elizabeth University Hospital, Glasgow, opened in April 2015. The campus has 1,860 beds with a full range of healthcare specialities, including a major emergency department/trauma centre. In addition to the 14-floor hospital building, the Royal Hospital for Children is situated on the campus. The hospital campus also retains a number of other services in adjacent facilities. This includes maternity services, the Institute of Neurological Sciences and the Langland's Building for medicine of the elderly and rehabilitation.

Regional/National Services QEUH (Main Stack)

The QEUH/RHC has a number of specialist services and deal with some of the most vulnerable patients in the west of Scotland. The following are housed in the main building:

- Renal inpatient services (only site in GGC with in-patient renal beds)
- Adult Bone Marrow Transplantation – Regional Service
- Chimeric Antigen Receptor T (CAR-T) – National Service
- Adult cystic fibrosis services – Regional Service
- Infectious Diseases - Regional Service
- Haematology Oncology Services
- 88 Critical Care Beds (42 beds in Edinburgh Royal Infirmary)

Regional/National Services RHC

The Royal Hospital for Children, Glasgow is one of the largest paediatric care centres in the UK and provides a wide range of complex medical, surgical, cardiac and mental health services to children across Scotland and indeed the UK.

- RHC is the Major Trauma Centre for children in the West Coast of Scotland. Regional Service.
- The Scottish Paediatric Cardiac Service (SPCS) is based at the Royal Hospital for Children (RHC) and is the tertiary referral centre for children and young adults with heart conditions. National Service.
- RHC provides a national tertiary service for children and young people with airway problems throughout Scotland. National Service.
- The Paediatric Neurosciences Unit provides a comprehensive array of diagnostic and support services for children and young people from all over the West of Scotland. Regional Service
- Paediatric Intensive Care Unit is one of the largest in the UK, bed numbers are double that of the Royal Hospital for Children and Young People in Edinburgh.

Social Deprivation

Below is a map produced by Scottish Index of Deprivation (2020) which clearly demonstrates areas of high deprivation (red) across the Scottish central belt. Public Health Scotland describes the impact of deprivation on health in that:

People who live in poorer areas in Scotland are more likely to die early from disease and have more years of ill health.

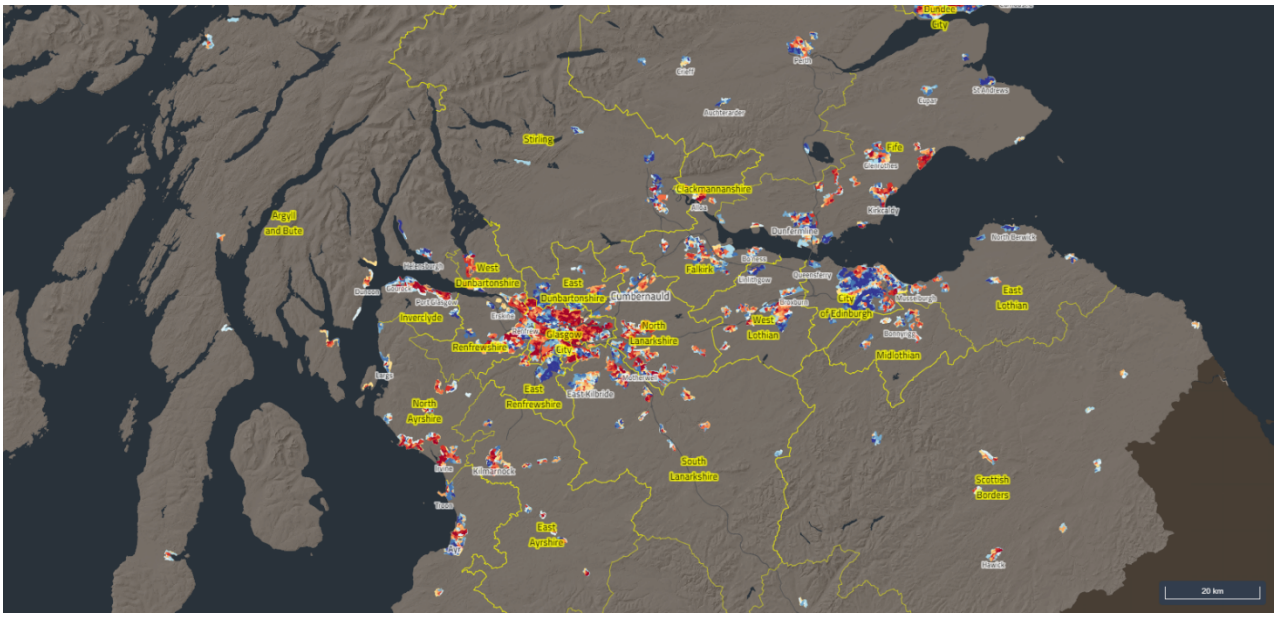
The Scottish Burden of Disease Study (2016) Deprivation Report shows that

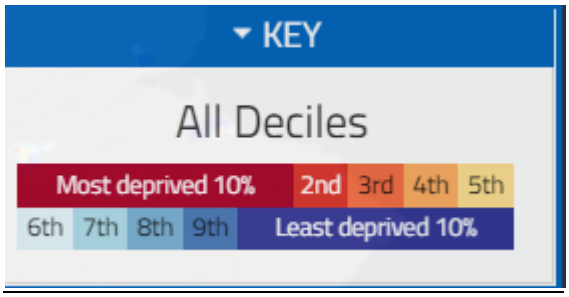
- poorer areas have double the rate of illness or early death than richer areas
- people in Scotland's richest areas are more likely to live in ill health than die early due to ill health, and the number of years of life affected are much smaller

Comparing rates of illness across boards has always been problematic in Scotland because it has a diverse socio-economic spread. Patients from Greater Glasgow are more socially deprived and therefore have poorer health outcomes due to factors such as smoking, alcohol, drug use etc. Compared to the population as a whole. Illness in itself requires contact with healthcare and we know that anyone who received medical care is at greater risk of infection,

it would therefore follow that areas with high levels of ill health may also have higher rates of healthcare associated infections.

Ref :Scottish Index of Multiple Deprivation 2020





Clinical Governance Review of Patient Safety and Clinical Indicators on the QEUH Campus

In order to ensure an assessment of clinical quality and safety provided at the QEUH Campus, a review of patient safety and clinical data and information was commissioned by the Board's Clinical and Care Governance Committee in 2021.

The report that is embedded below provides a summary of data and information relating to the Queen Elizabeth University Hospital campus. It brings together and considers information that is processed through the existing governance arrangements for services at the campus.

The report includes information and data covering the following:

- Clinical governance arrangements and the oversight of clinical quality
- Infection control data
- Hospital Standardised Mortality Ratio (HSMR)
- Scottish National Audit Programme (SNAP)
- Clinical Quality Publications

- Patient and carer feedback QEUH and RHC
- Incident reporting
- National Services

This review would suggest that there is no indication that QEUH or RHC were exceptions in terms of the information available.

Infection Prevention and Control (IPC) Specific Indications and Systems

1. National Point Prevalence Survey of Healthcare Associated Infection (HAI) & Antimicrobial Prescribing (AMP) 2016 National Point (nhs.scot) (extract)

   Healthcare associated infections (HAI) are a major public health concern and a significant cause of morbidity and mortality globally. The European Centre for Disease Prevention and Control (ECDC) estimates that 3.2 million patients develop a HAI every year in Europe. In 2011, it was estimated that one in twenty Scottish inpatients had an infection associated with healthcare delivered in a Scottish hospital. The inpatient cost of HAI originating in Scottish acute care hospitals was estimated to be £137 million a year with an additional 318,172 bed days required in order to care for patients with HAI; the equivalent of a large teaching hospital occupied for one year. A significant proportion of HAI are considered avoidable and prevention of these infections provides an opportunity to improve patient outcome and reduce unnecessary costs within healthcare systems.

   Nationally it is considered that a robust and current evidence base that is specific to Scottish hospital settings is necessary to inform the development of local and national strategies to reduce HAI and contain antimicrobial resistance (AMR). National point prevalence surveys (PPS) are undertaken every five years in Scotland in order to take stock of the current epidemiological situation and to review local and national policy.

   This study surveys every patient within the NHS Scotland in every ward for every type of hospital-acquired infection. This type of surveillance is resource intensive which is why it can only be carried out once every 5 years but does give information on where to target resources nationally to have the most impact.

   The study aims to:

   a) Measure the specific types and overall prevalence of HAI.

   b) Measure the overall prevalence of antimicrobial prescribing and types of antimicrobials prescribed, as well as compliance with Scottish Antimicrobial Prescribing Group (SAPG) hospital-based empirical prescribing and surgical prophylaxis prescribing indicators.

   c) Describe the organisation of IPC and antimicrobial stewardship programmes.

   d) Identify priority areas for future interventions to prevent and control HAI, for antimicrobial stewardship and for future targeted incidence surveillance of HAI.

e) Contribute to the European Centre for Disease Prevention and Control (ECDC) prevalence survey and inform the European strategy to reduce HAI and antimicrobial resistance.

The overall prevalence of hospital-acquired infections in QEUH during this survey (2016) was 4%. The National rate was 4.5%. QEUH has some of the most vulnerable and complex patients in Scotland and, despite this, the rate was lower than the national average.

The Children's Hospitals throughout Scotland are sufficiently different that comparisons are less meaningful (Royal Hospital for Children Glasgow: 3.6%; Royal Aberdeen Children's Hospital: 0%; and Royal Hospital for Sick Children Edinburgh: 7.7% - ref Prevalence of HAI in Scottish acute inpatients 2016).

The anticipated 2021 survey was not undertaken due to the COVID 19 pandemic therefore, more recent data is not available for comparison. At this moment, it is unclear when this survey will be repeated.

2. Annual Operational Plan (AOP) targets - Standards on Healthcare Associated Infections and Indicators on Antibiotic DL (2022) 13 (Previously DL (2015)19 & DL(2019)23)

In October 2019, a letter was sent to NHS Scotland Boards on the required antibiotic use indicators and healthcare associated infection (HAI) targets (DL(2019)23). The standards and indicators were set as:

a) A 10% reduction of antibiotic use in Primary Care (excluding dental) by 2022.

b) The use of WHO Access antibiotics (NHSE list) ≥60% of total antibiotic use in acute hospitals by 2022.

c) The use of intravenous antibiotics in secondary care defined as DDD / 1000 population / day will be no higher in 2022 than it was in 2018.

d) Gram-negative bacteraemia (healthcare associated E. coli bacteraemia) (ECB): A reduction of 50% in healthcare associated infections by 2023/24, with an initial reduction of 25% by 2021/22.

e) *Staphylococcus aureus* bacteraemia (SAB): Reduction of 10% in the national rate of healthcare associated SAB from by 2022.

f) *Clostridioides difficile* infection (CDI): Reduction of 10% in the national rate of healthcare associated Clostridioides difficile infection, with (CDI) by 2022.

Percentage reductions in SABs, CDI and ECB were measured against individual NHS Scotland Boards' current levels, rather than taking a "best in class" approach as previously. The Directors Letter referenced above extended the time to achieve these standards to March 2023. Addendum 1 demonstrates the NHS GGC performance since the targets were introduced.

3. ARHAI Hospital Level Review of AOP in RHC/QEUH

In 2019, NHSGGC requested an external review of how QEUH and RHC performed against these targets when compared to similar types of hospitals; below is the response from Health Protection Scotland (HPS) (now ARHAI).

Hospital attributed cases of Clostridioides difficile infection (CDI), Escherichia coli bacteraemia (ECB) and Staphylococcus aureus bacteraemia (SAB) for 2016, 2017 and 2018 (Q1 to Q3) were compared to peer hospitals with similar patient population using funnel plot analysis. The Queen Elizabeth University Hospital (QEUH) and the Royal Hospital for Children (RHC) were not highlighted as an exception (rate above the 95% confidence limit) in any of the plots for 2016, 2017 and 2018 (Q1 to Q3).[1]

4. HPS (ARHAI) Report November 2019[2]

The report summary and conclusions note:

- Approximately a third of cases of positive blood culture of environmental organisms had a polymicrobial episode.
- The data presented in this report do not provide evidence of single point of exposure and there is a need to continually monitor the risk in this patient population.
- All patients within this cohort are at risk from developing gram-negative bacterium due to their co morbidities and treatment plan.
- NHS GGC should consider current control measures around restriction on services for newly diagnosed patients, as there is no evidence from the HPS review of the data that supports the continued restriction of services.

Overall rates - The report notes that in comparison with other Health Boards:

- The incidence of positive blood cultures was lower for Gram-positive group throughout the time period. This includes the entire 2015-19 time period and the specific periods in question - both Oct 2017 – Sept 2019 plus Oct 2018 - Sept 2019.
- There is an increase in gram negatives from 2017 – 2019. This is primarily driven by increase in enterics (enteric organisms are bacteria that exist in the intestines of animals and

[1] The peer hospitals for QEUH were Aberdeen Royal Infirmary (ARI), Forth Valley Hospital (FVH), Glasgow Royal Infirmary (GRI), Ninewells Hospital (NWH), Royal Alexandra Hospital (RAH), Royal Infirmary of Edinburgh (RIE), University Hospital Crosshouse (UHC) and Western General Hospital (WGH).
The peer hospitals for RHC were Royal Aberdeen Children's Hospital and Royal Hospital for Sick Children.
ECB and SAB cases were hospital attributed assigned through enhanced surveillance ECOSS webtool. For CDI cases were categorised through linkage with Scottish Morbidity records (SMR01) for a patient with CDI onset on day 3 or later following a hospital admission on day one.
The denominator was hospital level 'total occupied bed days (TOBDs)' using ISD1 data.
Funnel plot analysis was based on an over-dispersed Poisson regression model.

[2] HPS Website - Review of NHSGG&C paediatric haemato-oncology data (scot.nhs.uk)

humans) rather than environmental organisms. Overall there is no difference in environmental organisms but there is an increase in environmental plus enterics. (? Population differences as not directly comparable or due to complex case mix, however logic would suggest that the more vulnerable the population the higher the risk of infection and both population and complex case mix were present in the cohort of children cared for in RHC).

Summary of data Presented in HPS (ARHAI) Report 2019 - Review of NHSGG&C paediatric haemato- oncology data.

	Gram Pos	Gram Negs	Environmental	Environmental & Enteric
June 2015 – Sept 2019 (since move to RHC)	LOWER RR 0.76 (0.70-0.83) P< 0.001	No Difference RR 1.18 (0.96-1.42) P= 0.07	No Difference RR 1.42 (0.94-2.16) P= 0.11	HIGHER RR 1.86 (1.42-2.47) P< 0.001
Oct 2017 – Sept 2019 (2 yr period)	LOWER RR 0.74 (0.66-0.84) P< 0.001	HIGHER RR 1.31 (1.00-1.73) P= 0.05	No Difference RR 1.36 (0.77-2.52) P= 0.39	HIGHER RR 1.70 (1.17-2.53) P< 0.005
Oct 2018 – Sept 2019 (Last yr)	LOWER RR 0.77 (0.64-0.93) P< 0.005	No Difference* RR 1.23 (0.85-1.8) P= 0.3	No Difference * RR 0.93 (0.41-2.23) P= 1	No Difference *RR 1.26 (0.74-2.18) P= 1

*Caution re small numbers

Note

The HPS report published in November 2019 HPS Website - Review of NHSGG&C paediatric haemato-oncology data (scot.nhs.uk) noted that 'In the last year following the move to QEUH (October 2018 to September 2019) there was no difference in the rate for Gram-negative group … , environmental including the enteric group … or environmental group … however the rate was lower for the Gram-positive group … '. **This means that NHSGGC has equivalent or lower infections rates than the other sites in Scotland despite having a more complex case mix.**

5. Report from the Cryptococcus Incident Management Team Expert Advisory Sub-Group

Cryptococcus neoformans is a fungus that lives in the environment throughout the world. People can become infected with *C. neoformans* after breathing in the microscopic fungus, although most people who are exposed to the fungus never get sick from it. *C. neoformans* infections are rare in people who are otherwise healthy; most cases occur in people who have weakened immune systems, particularly those who have advanced HIV/AIDS (CDC).

Since the opening of RHC/QEUH there have been two cases of *Cryptococcus neoformans* both in November/December 2019. This site provides healthcare for some of the most profoundly immunocompromised patients in the West of Scotland. There have been no cases before or since 2019 and over 3000 air, samples from the site have been analysed. None of the air samples have isolated this organism.

The report's rationale as to why it considered latency to be the most likely hypothesis is summarised below:

The very significant issue of dormancy and reactivation. The most probable hypothesis as concluded in the report from the sub group was that the patients acquired the *Cryptococcus neoformans* prior to their admission to the QEUH/RHC and the infection lay dormant until their immune system was sufficiently compromised by their co-existing conditions. The literature review supports this hypothesis. However, as reported in many other cases within the literature, due to the length of time that may have elapsed since first exposed and the complexity of how reactivation occurs, this is very difficult to prove.

Reasons why this was concluded:

[redacted] patients with particular [redacted] (as both patients had) are not the only patients at risk of infections with *C. neoformans.* There are a wide variety of other diseases that predispose to this infection noting that the QEUH/RHC is the biggest acute hospital in Scotland and will contain many patients who are/were at risk. If there is a fundamental issue, with the building why didn't other patients acquire *C. neoformans* either before or since? Infection caused by *Cryptococcus neoformans* is a rare disease in adults and even rarer in children. Commoner in males than females - twice as common in males than females). Please also note that no cases of adult males in this cluster, or in the past 7 years. Why not, if adult males are most at risk?

Nosocomial (hospital-acquired cases) cases are very very rare (worldwide). Only one other cluster of *C. neoformans* infection in hospitalized patients has been reported in the literature. In Arkansas in 2013, six patients in a community hospital developed blood stream and respiratory infections. Bird habitats at the hospital and staff who had contact with birds were investigated, but no definitive source was established, and environmental sampling was negative. Isolates from the clinical cases appeared genetically diverse, as three separate MLST (multilocus sequence typing) types were identified.

Please note that the Genomics of the above 2 cases and 2 others from the community (in Greater Glasgow & Clyde, around the same time) showed 4 completely different Genotypes.

There were no environmental isolates of *C. neoformans* found, within or near, QEUH/RHC in some 3000 air samples.

The adult case was cared for in ward 4c. Ward 4C has a cohort of renal beds and carries out in the region of 140 Renal Transplants per year. Note that there has never yet been any cases of *Cryptococcus neoformans* infections in any of these patients. Again, why not? as this group of patients are at risk of contracting *C. neoformans* infections.

As stated in the introduction to this section, the aim of healthcare ventilation is to mitigate the risk of airborne pathogens but it can never eliminate this risk. The sections on aspergillus, specifically the findings of the HIS review and the report by Dr J Hood on *C. neoformans* demonstrate that the procedures and processes that are in place are safe and that in the case of *C. neoformans* the report from Dr Hood dismisses the possibility that the air within QEUH was a source in this incident.

6. Summary

The question posed at the beginning of this paper was "did the estates issues in QEUH/RHC impact on the safety of the patients who received clinical care within these buildings?". This paper is a summary of what we can say with regards to patient safety using the indicators that are available. The data presented show that QEUH had lower rates of hospital acquired infection than other hospitals in Scotland, that WGS has not supported links to the environment (water and air) that our population is vulnerable due both to deprivation and the resulting ill health associated with deprivation. The context of health provision must also be considered in that GGC provides new, innovative, national services that often require more creative, complex, aggressive or invasive techniques to cure patents of disease that unfortunately often has, as an unintended consequence, an increased risk of infection.

The ARHAI definition of High Risk (of infection) units are[3]:

- Heamatology
- Oncology
- BMT
- Stem cell transplant units
- Neonatal Units
- Paediatric ICUs
- Adults ICUs
- Any other care areas where patients are severely immunocompromised through disease or treatments*.

QEUH Campus has **all** of the services above and the following services where patients are considered to be immucompromised:

[3] www.nipcm.hps.scot.nhs.uk/media/1680/2019-08-water-incidents-info-sheet-v1.pdf

* Renal Inpatient Beds, Cystic fibrosis in patients (adults and children), ID in- patient and it is also the West of Scotland Trauma Centre (adults and children).

All of this information should be considered collectively and should provide a global overview of patient outcomes.

Addendum 1

There have been several significant changes to the reporting and presentation of CDI, ECB and SAB in the timeframes and an explanation of this is included in the graphs below. This demonstrates reduction in key infections over a prolonged period of time with continuous improvement demonstrated.

Staphylococcus aureus bacteraemia (SAB)

The line graph below (fig.1) displays the total number of SAB cases each quarter from December 2005 (n=230) to December 2019 (n=91). This equates to a 60% reduction in cases over 12 years. The linear trendline in the graph also shows the decrease in case numbers to date. From Quarter 1 2020 only healthcare associated infection (HCAI) cases are displayed and the dotted orange line is the HCAI standard aim of a reduction of 10% of HCAI cases to be achieved by March 2023 (based on individual NHS Board status at March 2019). We have estimated this to be 69 HCAI cases or less per quarter.

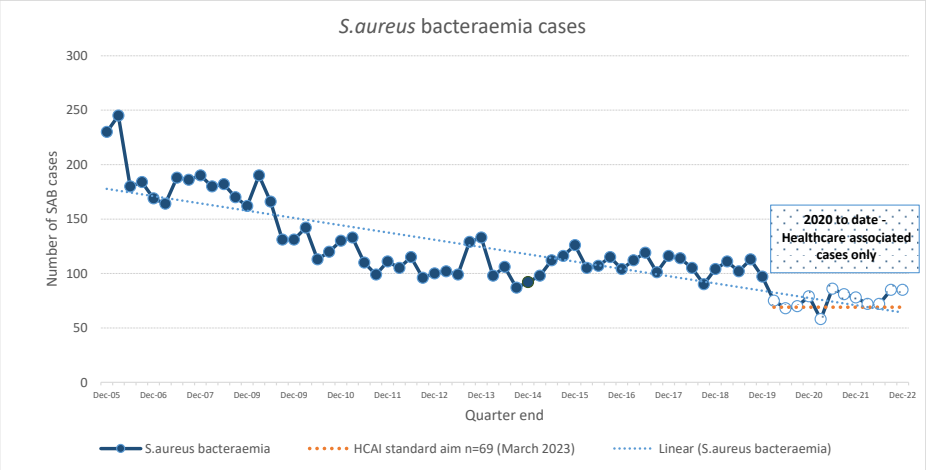


Fig.1 S.aureus bacteraemia cases in NHSGGC Q4-2005 to Q4-2022

Figure 2 displays the rate of SAB with corresponding bed days. The numerator of cases changed as explained above (all cases then healthcare associated cases only), however the bed day rate methodology also changed with reporting from Q2 2017. From 2005 until this point, occupied bed day data used different national definitions for the individual reporting of SAB (Acute Occupied Bed Days) and CDI (Acute and Non-acute Occupied Bed Days). The inclusion of E.coli bacteraemia surveillance in 2017 provided a revised and standardised approach by using the same occupied bed day data for all three measures (OBD). Community onset cases would now be reported separately from Healthcare Associated cases using the denominator rate of cases per 100,000 health board population. Bed day and population data is provided by ISD (a division of National Services Scotland).Dual reporting of rates was undertaken from this period and retrospective HCAI rates were published by Health Protections Scotland (now ARHAI).

HEAT target reductions for SAB were established in 2007, initially with a 35% reduction in cases, however a defined reduction rate of 26 cases per 100,000 acute occupied bed days was to be achieved by March 2013, and then a further reduction to 24 cases per 100,000

AOBDs. In October 2019, three HCAI standards were introduced for implementation in 2020. For SAB, this was a reduction of 10% in Healthcare Associated cases by March 2022. This is currently extended until March 2023.

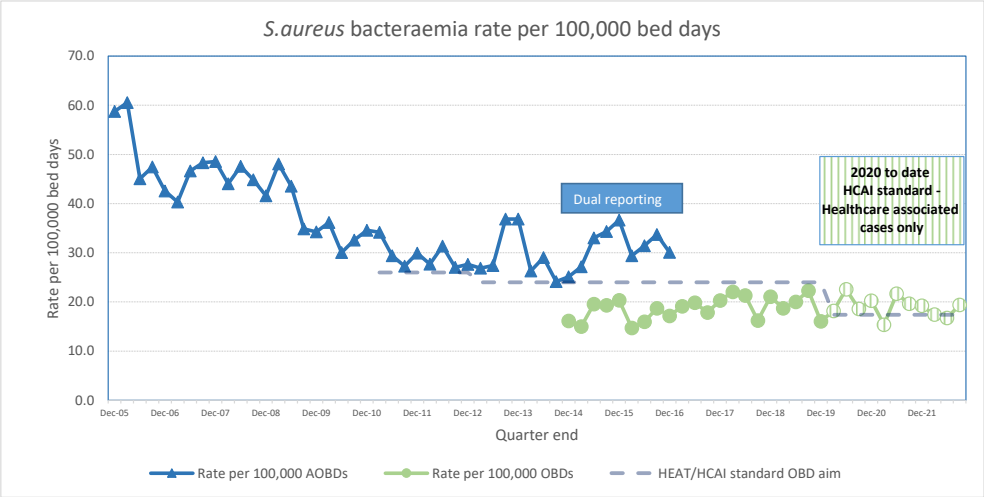


Fig.2 S.aureus bacteraemia rate per 100,000 bed days in NHSGGC Q4-2005 to Q3-2022 (Q4 data not available at time of report compilation)

Clostridioides difficile Infection (CDI)

Reporting methodology for CDI has also changed, with data on cases aged 65 and over first reported in Q4 2006. Inclusion of cases in ages 15 to 64 were reported from Q2 2009 onwards, however different occupied bed day data were used for both age groups. CDI cases from out with the hospital setting were also included (GPs, care homes, hospices etc.)

From the first quarter of 2007 (n=472) to the end of 2019 (n=81), there has been a reduction of 83% in CDI cases. The dotted trendline in Figure 3 highlights this significant reduction.

As with SAB, from 2020 only HCAI cases are included, with the current 10% reduction aim to be attained by March 2023. This equates to 51 cases or less per quarter.

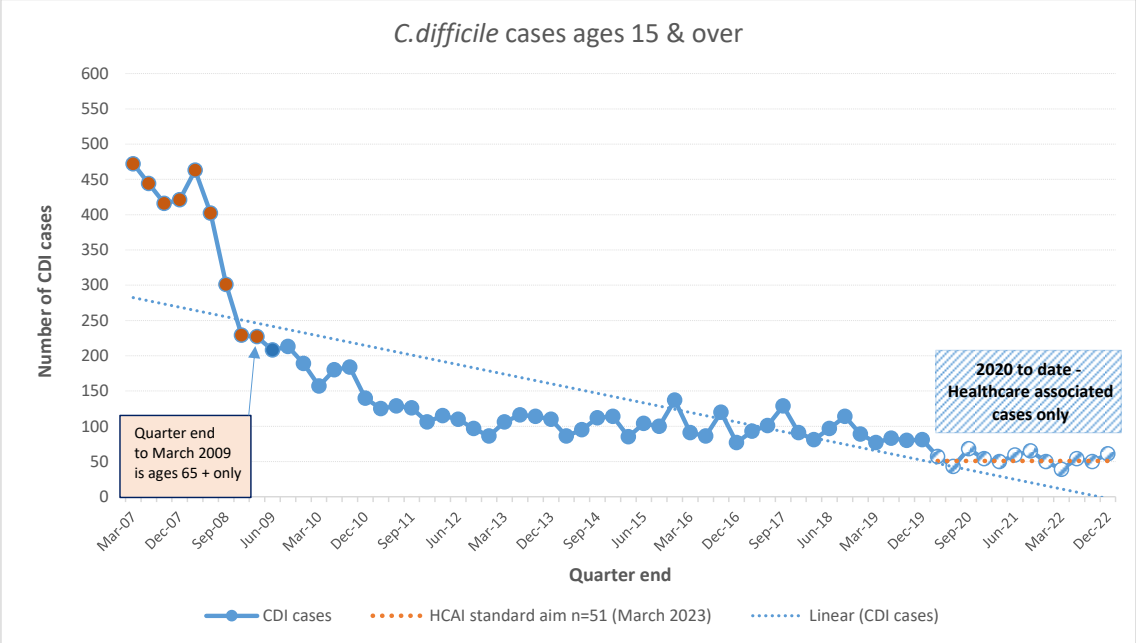


Fig.3 C.difficile cases in NHSGGC Q1-2007 to Q4-2022

Figure 4 displays the variations in national reporting since 2007. It should be noted that NHSGGC have been on or below HEAT/HCAI standard aim over this period.

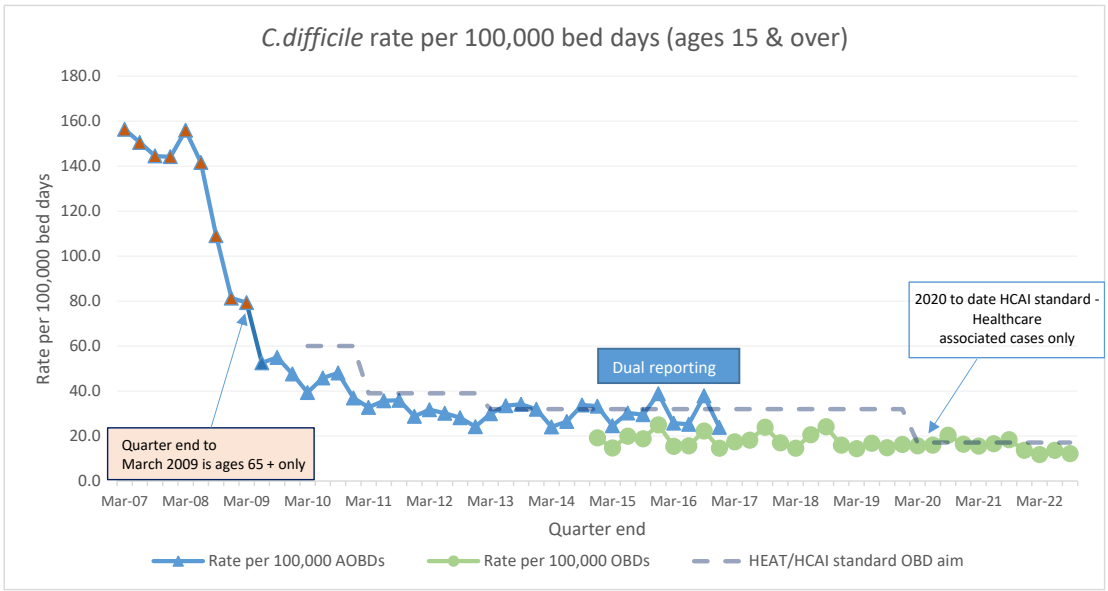


Fig.4 C.difficile rate per 100,000 bed days in NHSGGC Q1-2007 to Q3-2022 (Q4 data not available at time of report compilation)

Escherichia coli bacteraemia (ECB)

National enhanced surveillance of *E.coli* bacteraemia commenced in Q3 2016 and healthcare associated cases account for just over half of all NHSGGC cases to date (3496 compared to 3225 community associated cases). Many ECB cases are not amenable to quality improvement

reduction measures e.g. hepatobiliary, therefore there has been a slower reduction of cases in the past six years.

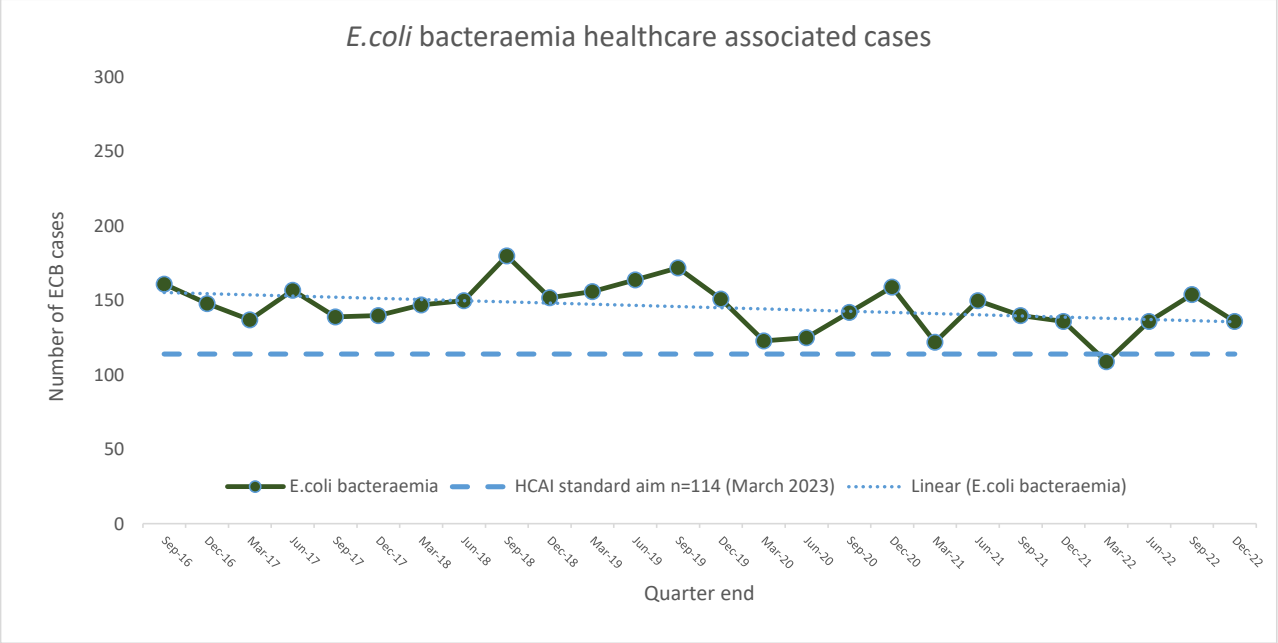


Fig.5 E.coli bacteraemia cases in NHSGGC Q3-2017 to Q4-2022

The HCAI standard for ECB is a reduction of 25% in Healthcare Associated cases by March 2022. This is currently extended until March 2023. This remains a challenging aim for NHS Scotland as a whole.

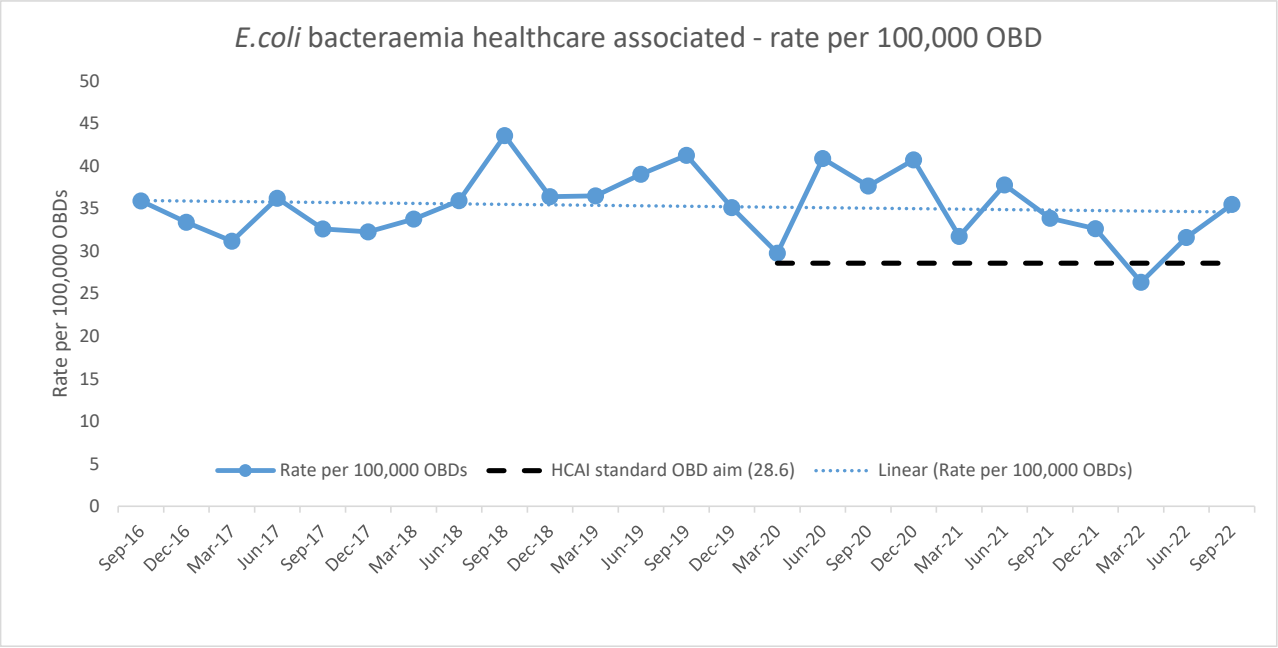


Fig.6 E.coli bacteraemia rate per 100,000 bed days in NHSGGC Q3-2016 to Q3-2022 (Q4 data not available at time of report compilation)

Water System Risk Assessment

NHS Greater Glasgow & Clyde

Queen Elizabeth University Hospital And Royal Hospital for Children

Report Issue Date: January 2019
Latest Recommended Review Date: Ongoing as current remedial works completed

LEGIONELLA RISK ASSESSMENT

Report carried out by	DMA Canyon Ltd
Address	14 Canyon Road Netherton Wishaw ML2 0EG
Telephone No.	[redacted]
Fax No.	[redacted]
e-mail	office[redacted]
Website	www.dmacanyon.co.uk
DMA Contacts	Allan McRobbie Compliance Manager [redacted] Mike Kinghorn Director [redacted] David Watson Director [redacted]

Dates of Assessment (On Site)	Ongoing assessment during October - December 2018
Draft Submission for Review	January 2019 (Interim information submitted at time of assessment)
Final Submission	TBC
Risk Assessors	David Watson Assisted by; Allan McRobbie & Mike Kinghorn (Technical Assistance) Euan Renfrew & Craig Guyer (Plant Items) Fraser Murray & James Kyle (Hot and Cold Water Outlets) Jamie Clayforth (General site and system knowledge and guidance)

Risk Assessor assisted on site by (Site Representative)	Mel MacMillan
Knowledge of systems being surveyed	Good

Report Commissioned by:	Phyllis Urquhart (NHS Estates)
Report Issued to:	Phyllis Urquhart (NHS Estates)
Format of Report:	Electronic
	The findings included within the report have been communicated throughout the assessment process by Craig Guyer, Allan McRobbie and David Watson of DMA Canyon Ltd to NHS Estates staff both verbally and where appropriate electronically.

N.B. The findings and recommendations presented in this report have been based on information made available and inspection of areas made accessible by site staff during the survey. DMA are only able to assess areas/systems, which they have been given access to and using information supplied by site personnel. This survey was undertaken only on pipe work/areas that were accessible and visible, and it is possible that some sections remained hidden during the survey. Schematic drawings, where produced, and how services link up, have been assumed to run as indicated using basic engineering principles and our experience. However, no responsibility can be accepted for systems and/or areas, which DMA have not been provided access to, or as a result of incorrect, misleading information supplied or information not provided. No guarantees as to the completeness of the information within this report are provided.

WATER SYSTEM RISK ASSESSMENT

DMA Staff Training and Competency

All DMA staff attending site are fully trained and deemed competent by DMA management for the tasks they have been allocated to carryout.

DMA training records are held centrally by DMA Canyon Ltd.

Copies of the relevant personnel training certificates can be supplied upon request.

Training and competency records for site/client/other staff involved in Legionella control should also be held by client. Records for those carrying out the Risk Assessment will be submitted as an appendix to this document.

DMA will only offer Legionella control services for which we have LCA accreditation.

An up to date copy of our LCA certificate and accreditation details can be found at www.dmacanyon.co.uk

For information on the LCA code of conduct for service providers and other information on the LCA requirements please refer to http://www.legionellacontrol.org.uk/

Legionella Control Association

Legionella Control Association

A Code of Conduct for Service Providers

Certificate of Registration

This is to certify that the following company has submitted a registration under the Conditions of Compliance as laid out in the LCA's Code of Conduct for Service Providers

Name of Company: **DMA Canyon Ltd**

Registration Number: **2012/2218** Certificate valid until: **31st August 2019**

Registration under the following services categories:

(1) Legionella Risk Assessment Services
- 1.1 Hot and Cold Water Services
- 1.2 Evaporative Cooling Systems
- 1.3 Process and Other Systems
- 1.4 Healthcare Risk Assessment

(2) Water Treatment Services
- 2.1 Chemicals
- 2.2 Dosing and/or Control Systems
- 2.3 On-site Analytical and Monitoring Services

(3) Hot and Cold Water Monitoring and Inspection Services
(4) Cleaning and Disinfection Services
(5) Independent Consultancy Services
(6) Training Services
(7) Legionella Analytical Services
- 7.1 Sampling
- 7.2 Laboratory Analysis
- 7.3 Interpretation of Analysis

(8) Plant and Equipment Services
- 8.1 Installation
- 8.2 Refurbishment
- 8.3 Servicing
- 8.4 Design and Supply

This Certificate is only valid if the Company named is listed on the LCA website www.legionellacontrol.org.uk/directory.php

WWC THE WATER MANAGEMENT SOCIETY

Signed: [redacted] *Chairman, Executive Committee*

BACS

[redacted] *Certificate Secretary*

Legionella Control Association Limited. www.legionellacontrol.org.uk

Registered in England and Wales No. 5502723

WATER SYSTEM RISK ASSESSMENT

Table of Contents

Section 1

Executive Summary

WATER SYSTEM RISK ASSESSMENT

Executive Summary

Building Overview

(System information below adapted from information provided by Brookfield in 2015 with Legionella Control comments by DMA)

This assessment covers the QEUH (Adult) Hospital and the adjoining Royal Hospital for Children. The Adult Hospital is 14 storeys, including the basement, with approximately 1100 beds and the Children's Hospital is 5 storeys, including the basement, with approximately 250 beds.

This facility has the largest Critical Care complex, one of the largest Emergency Departments in Scotland, offers acute specialist inpatient care, medical day care services and outpatient clinics servicing the local population.

The Children's Hospital provides specialist services to the West of Scotland and the wider population of Scotland in addition to the full range of secondary care services to people of Greater Glasgow and Clyde. Specialist services include cardiology and cardiac surgery, renal and bone marrow transplantation. For a number of these specialised services, the Children's Hospital is recognised as the sole provider in Scotland.

The construction phase ended in January 2015 with phased occupancy of patient areas beginning in April 2015 and full working occupancy achieved in July 2015. There have been departmental changes and small scale works in the intervening period (e.g. ward use changes and the required service alterations) though no significant water system alterations have been notified to DMA prior to this report being commissioned.

In early 2018 an issue with regards to Cupriavidus bacteria being detected in the system water was identified in Wards 2A & 2B of the Children's Hospital. Disinfection works were carried out in these wards by DMA at this time. An extensive sampling regime was also implemented across the hospital which identified this and other bacterial control issues on the water system generally.

A decision was taken at this time by Infection Control, Clinical Staff and Estates to fit anti-microbial (PALL) filters in "high risk" areas throughout the hospital. Initially filters were fitted by both Estates staff and DMA (supported by Morris & Spottiswood), in locations as instructed by Infection Control, with the management and exchange of the filters being allocated to DMA in the period afterwards. These filters remain in place at time of report, and are anticipated to remain in place until such times as all parties are satisfied the water system(s) are brought back into specification (microbiologically).

In late 2018 Wards 2A & 2B in the Children's Hospital was closed to allow for extensive alterations to be made to the local water system, running hot flow and return services as close as is practical to the outlets, changing taps and WHBs, trough sinks removed from anterooms within the isolation rooms in 2A and other rooms repurposed to suit ward operations. In December 2018 NHS GG&C released a statement highlighting that whilst these wards were closed the opportunity to upgrade the air conditioning system would be taken. It is anticipated that this will take approximately 12 months to complete and the wards will remain closed for this period.

In light of the issues identified NHS GG&C commissioned the Water Solutions Group (Tim Wafer) to write a specification for a chlorine dioxide (ClO_2) background dosing system for the domestic water system in the Adult and Children's Hospital. The installation of the dosing units was contracted to Scotmas Ltd with temporary units being installed to supply Wards 2A & 2B in November 2018.

Dosing units were specified for various critical points throughout the water system with the bulk water tank supply units being switched on in December 2018, with the other units scheduled to be commissioned throughout January 2019.

Extensive alteration works to the pipework in the various plantrooms throughout the hospital were required in order for the ClO_2 units to be installed.

Other remedial works have been implemented on the water system in light of the issues found, including surveys of the drainage system[1], cleaning and disinfection of WHB and shower drains and Optitherm flow regulator/diffuser replacement regime.

[1] DMA have not been provided with a copy of the report on the drainage system. This is outwith the scope of DMA's work. DMA would be unable to comment on the accuracy, or technical elements contained within this report.

WATER SYSTEM RISK ASSESSMENT

Please note *that the plantroom surveys were conducted prior to the installation of the chlorine dioxide (ClO_2) dosing units and the associated alteration works required to allow for the installation of these units. It is recommended that the plantrooms are resurveyed upon completion of these works (Anticipated to be completed in late January 2019).*

During the period from report being commissioned and being presented to NHS GG&C, plantroom and risers were surveyed and draft copies of these sections of this report were issued to Estates, with issues identified also being reported both verbally and electronically to Estates.

Town Mains

There are 2 separate incoming mains water supplies serving the cold water storage tanks within the basement plantroom of the Adults and Children's hospital building, and a separate dedicated fire main line supplying the fire tanks in the adjacent plantroom.

The incoming mains enter the building in the MTHW/Chilled Plantroom (Govan Road Mains) and basement tank room (Hardgate Road Mains) and run into the tank room to serve four off "Raw" water storage tanks and two Trades water tanks. These incoming mains both have double check valves and water meters fitted.

The water meters are linked to the BEMS system and allow the user to cross reference the quantity of water used against the quantity indicated on the external meter.

The Hardgate Road (small) mains supply feeds only the main fire sprinkler tanks in the basement fire tank plantroom.

The RHS 'Trades' Water tank has been drained and isolated, with the mains supply to this removed.

There are various short deadlegs on the domestic water mains which may be used as drain down points, injection points or emergency bypass connection points. Some of these connection points are being utilized by Scotmas for testing/sensor points for the chlorine dioxide (ClO_2) background dosing systems which are being installed. DMA would recommend any which are not utilised in this way are incorporated into the site flushing regime, where they are not already included.

DMA have described both the Govan Road and Hardgate Road supplies as medium risk due to the drain points etc. on the pipework for which there is no record of flushing. We have described the Hardgate Road (small) as a High Risk due to the low turnover to the Fire Suppression system.

CWSTs and Filtration System

QEUH Adult and Children's Hospital CWSTs

There are 10 domestic water storage tanks in the building which are all situated in the basement tank room.

Raw Water Tanks 1A/1B and 2A/2B are supplied by two town mains (Govan Road and Hardgate Road) to ensure continuity of supply in case of a town mains failure. The Raw Water tanks supply the Bulk Water tanks 1A/1B and 2A/2B via two 0.2 micron filtration sets (level of filtration advised by Estates).

All four tanks can be linked together (via outlets) to supply both filtration units. There is a short section of link pipework, which can be opened or closed depending on operational requirements, between the tanks R1A/1B and R2A/2B which can allow each set of tanks to supply separate filtration units, or all tanks to supply both filtration units. When the link pipework is closed tanks R1A/1B supply filtration unit 1 with R2A/2B supplying filtration unit 2.

The filtration units fill separate Bulk Water Tanks (filtration unit 1 supplying 1A & 1B and filtration unit 2 supplying 2A & 2B). There appears no way to reconfigure set-up to allow the filtration units to fill the other tanks under fault conditions, other than backfilling through the outlet distribution pipework from the post filter tanks. Filtration sets should be maintained in accordance with manufacturer's instructions and maintenance schedule.

DMA understand that there is an intention in 2019 to alter the filtration pipework and to install a third filtration unit to provide additional capacity, reliability and redundancy.

WATER SYSTEM RISK ASSESSMENT

Bulk Water Tanks 1A and 1B are linked, with 2A and 2B also linked. All four tanks can be linked together (via outlets) to supply domestic cold water including drinking water to the building with the exception of the trades system. There is a short section of link pipework, which can be opened or closed depending on operational requirements, between the tanks 1A/1B and 2A/2B which can allow each set of tanks supplying separate zones and plantrooms (calorifiers) within the hospital, or all tanks to supply all areas. When the link pipework is closed tanks 1A/1B supply plantrooms 21/22/41 and the corresponding outlets in these zones with 2A/2B supplying plantrooms 31/32/33 and the corresponding outlets in these zones.

The CWSTs were cleaned and disinfected in summer 2018 by DMA. Large amounts of debris were found in the water tanks, including large particles of rust coloured materials (particularly in the Govan Road supplied tanks), sponges in a Raw water tank (believed to have been left over from initial pre-handover cleaning and disinfections, bolts/washers in post filter tanks (again believed to have been left over from initial pre-handover cleaning and disinfection).

N.B. It should be noted that there is no separate dedicated supply to the Renal (or other medical) systems, with all being fed from the Bulk Water system. This means that system disinfections will require to be very carefully scheduled or carried out locally as the disinfection procedure/chemical may interfere with the renal/medical systems and impact on patient welfare. DMA understands that suitable filtration and testing regimes have been implemented on the renal system in light of the ClO_2 dosing systems being installed, and that supply pipework to the renal plants have been altered to bypass the local ClO_2 "top-up" units.

Emergency procedures should be considered and formulated to allow for system disinfection if required.

Alternatively, a separate independent supply should be considered for this system.

There are 2 No. water booster sets in the water tank room. Each booster set is set to a different set point pressure depending on which plantroom and area it serves. In the event of failure each booster can also be switched to the other set point pressure.

- BS01 – Feeding Plantroom 31, 32 & 33 - 7.7 Bar
- BS02 – Feeding Plantroom 21, 22 & 41 – 5 Bar

The expansion vessels attached to the CWST booster sets are not of a flow through design and they are not insulated.

From the 2 No. water booster sets there are 8 domestic water systems:

- Plantroom 21
    - Via a Pressure reducing valve (PRV) the BCWS feed 21CAL01/02/03
- Plantroom 22
    - Via a Pressure reducing valve (PRV) the BCWS feed 22CAL01/02/03
- Plantroom 31 – 122
    - BCWS feeds 31CAL01/02/03
- Plantroom 31 – 128
    - Via a Pressure reducing valve (PRV) the BCWS feeds 31CAL07/08/09
- Plantroom 31 – 129
    - BCWS feeds 31CAL04/05/06
- Plantroom 32
    - BCWS feeds 32CAL01/02/03
- Plantroom 33
    - BCWS feeds 33CAL01/02/03
- Plantroom 41
    - BCWS feeds 41CAL01/02/03

The water supply into each plantroom is metered by a CWS flow meter. This allows for monitoring of specific parts of the system for energy purposes.

There are numerous connection points on the domestic water system within plantrooms and risers (which DMA have assumed were installed for flushing purposes and bypasses) which are creating deadlegs on the system. It is advised that these be removed wherever practicable or a register of the locations created and points incorporated into the site flushing regime. These were noted during the plantroom surveys, though DMA have been advised that a programme of removing these wherever practical is under way by Estates. DMA shall

WATER SYSTEM RISK ASSESSMENT

review these connection points when plantrooms are next surveyed, anticipated after the completion of the ClO_2 dosing system installation programme.

The Trades Water System supplies "Non-domestic" outlets such as bib taps in plantrooms, irrigation connections points and the 12th floor heli-pad fire suppression system. One side of the Trades tank was valved off with the mains supply to this tank being removed. It would appear that this tank has been offline since the construction phase. DMA would advise should this tank ever be brought back online it is cleaned and disinfected prior to the tank being reinstated.

There are various connection points onto other "non-domestic" outlets from the domestic water system such as renal dialysis, endoscopy wash, pressurisation units, steam humidifier units (DMA advised all supply pipework to these are now removed) and MRI chiller cooling which are connected to the Bulk Water system. It is expected that as the lines to these systems will often have a very low turnover, a double check valve or similar should be fitted as close as practicable to the tee-off point to prevent potentially stagnant water from contaminating the domestic system, or preferably these are switched to the Trades Water system.

N.B. for information on Fire Suppression Tanks please see section 8.

Calorifiers (PHE's with Storage Vessels)

The calorifiers are situated in various plantrooms on the 2nd, 3rd and 4th floors of the building feeding designated zones within the hospital building. See supportive data following which identifies which calorifiers feed which areas.

Each set of calorifiers is a bank of 3-linked calorifiers fed from the boosted Bulk Water system, with heat source being via a plate heat exchanger on the outside of each calorifier fed from the MTHW system. A circulating pump on each calorifier/plate heat exchanger ensures the water is circulated throughout each vessel to maintain temperature.

The distribution temperatures were above 55°C at outlets (and on supply to TMVs) in the majority of areas tested with direct hot feeds above 55°C (see outlet section for supportive data and exceptions). **N.B.** This will require to be reviewed upon completion of Optitherm tap monitoring element in the "high-risk" areas of this assessment.

It should be noted however that whilst carrying out flushing works and ClO_2 testing in wards 2A & 2B during December 2018 there were multiple instances of hot temperatures dropping off and being recorded at <55°C. This was reported to Estates on each occasion, with DMA advised there were issues in the Energy Centre which were causing a reduction in the MTHW supply to the Adult & Children's Hospital, which had a knock on effect to the calorifiers. Generally when advised issues were rectified the temperatures recovered quickly to ≥60°C within the wards.

Distribution flow temperatures were consistently above 60°C, with return temperatures to calorifiers consistently above 55°C on all calorifiers (Plantroom 21 calorifiers just above 55°C), as recommended within L8/HSG 274 Part 2 and SHTM 04-01. All base temperature appeared satisfactory at time of survey also (26/09/18)

The expansion vessels attached to the calorifiers are not of a flow through design as recommended in HSG 274 Part 2 (info Box 2.1) and SHTM 04-01 Part A (Para 8.22) and they are not insulated as recommended in SHTM 04-01 Part A (Para 8.22). Estates advised that there is an intention to alter the pipework and vessels to accommodate flow through vessels in early 2019.

Generally water flushed from drain on calorifiers and expansion vessels ran clear either instantly or after only a very short period of time (typically <10 seconds). No internal inspection records for calorifiers were available.

WATER SYSTEM RISK ASSESSMENT

Hot and Cold Water Systems

The domestic cold water system within the hospital is fed from the Bulk Water tanks located in the basement tank room of the hospital. DMA have been informed there are no outlets fed directly from Town Mains within the building.

"Non-domestic" outlets such as bib taps in plantrooms, irrigation connections points (now removed) and the 12th floor heli-pad fire suppression system are fed from the Trades Water tanks. Please refer to the section 5 for information and supporting data relating to the CWSTs.

There are however some connection points onto other "non-domestic" outlets such as renal dialysis (both plant and individual 'emergency' points), endoscopy wash, pressurisation units, steam humidifier units and MRI chiller cooling which are connected to the Bulk Water system.

N.B. NHS Estates have fitted 'Emergency Dialysis' points on cold water system since the initial installation. NHS should confirm location of all Emergency Dialysis Points and ensure System Drawings and Asset Lists (not produced as part of this assessment) are updated to reflect this. Additional filtration and testing procedures should be incorporated into the use of these emergency points in light of the chlorine dioxide background dosing systems being installed on the domestic water system.

There are also numerous connection points and drain points on the domestic water system within plantrooms and risers (which DMA have assumed were installed for flushing purposes and bypasses) which are creating deadlegs on the system. It is advised that these be removed wherever practicable or a register of the locations created and points incorporated into the site flushing regime.

The domestic hot water systems are fed from a series of Calorifiers located on the 2nd and 3rd floors in the adult hospital and on the 4th floor of the children's hospital. These calorifiers feed different areas/zones within the Hospital. Please refer to section 6 for information and supporting data relating to the calorifiers.

Access to record temperatures within the hospital were restricted prior to December 2018 as DMA were advised no panels could be removed to access pipework in patient areas. This meant that in many areas only mixed hot temperatures could be recorded. In December 2018 an HAI Scribe was issued to Estates and subsequently to DMA which permitted panels to be removed in "low risk" patient areas. "Low-risk" areas were generally described as locations where PALL filters were not fitted. A separate HAI Scribe was provided to allow the Horne Optitherm tap to be bypassed to draw direct hot water through the tap using a flushing kit in "high-risk" areas, generally described as those areas with PALL filters fitted. This allowed for "low-risk" temperatures to be recorded for this survey in December 2018, with the "high-risk" areas scheduled to be recorded in January 2019.

Cold water temperatures recorded by DMA vary with some indicating heat gain on the cold water system. Investigations should be carried out as to the reasons for this with appropriate remedial actions taken e.g. additional insulation, installation of flushing valves, manual flushing of outlets, servicing of TMVs to reduce likelihood of back flow of hot into cold (or opposite). Sampling, disinfections and background dosing should be considered as part of the escalation process should any issues persist.

DMA were advised flushing valves are installed at a number of points on the domestic cold water system in the lower floors of the Adult and Children's Hospitals however Estates were unable to confirm the location of all valves. The operating conditions for the valves (e.g. temperature controlled/timed) should be reviewed to ensure these are suitable for the intended purpose. It may be prudent to consider additional dump valves at the end of main or sub-ordinate pipe work runs to improve cold water flow throughout site.

DMA understands that investigations into remote temperature monitoring systems, to record temperatures at critical points on the hot and cold system (e.g. sentinels, sub-ordinate flow and returns etc.) are being undertaken, though no decision on the system has been taken at the time of this report.

The hot water temperatures recorded at outlets were generally satisfactory with only a small number of local excursions. We would advise this is investigated and the flow and return commissioned as appropriate. At the time of initial assessment in 2015 DMA were advised that there are minimal localised "tertiary" loops, with the drops to outlets running from above the ceiling (approx. 2m). Alterations have been made to the hot flow and return system in Wards 2A & 2B to bring the flow and return loops down as close as practical to the actual outlets, though these Wards remain out of use at the time of this report (Though the water system is live with a flushing regime implemented)

WATER SYSTEM RISK ASSESSMENT

It was generally noted that hot temperatures rose quickly when DMA were recording temperatures throughout the building and the flow and return circuits appear to be circulating hot water in most areas (please refer to following pages for supporting data and exceptions). **N.B.** This will require to be reviewed upon completion of Optitherm tap monitoring element in the "high-risk" areas of this assessment.

Domestic water pipework runs above ceilings throughout the building. Access for ongoing monitoring of flow and return loops is problematic as ceiling tiles cannot be easily removed within the hospital environment and alternative methods of monitoring should be considered should current BEMS monitoring points not be sufficient for the hot flow and return system (e.g. additional BEMS monitoring points installed).

The recent provision of the HAI Scribes for temperature monitoring in the "low-risk" and "high-risk" areas should allow for more accurate temperature monitoring at outlets going forward.

As noted during previous assessment pipework within the Hospital is generally labelled and insulated where visible.

Issues were identified with WHB drains backing up, which in light of the issues identified with potential retrograde contamination from drains to taps, along with the potential reduction in use of outlets where WHBs not draining freely should be rectified.

The vast majority of Thermostatic mixing valves (TMVs) installed are TMV taps, (Horne Optitherm in clinical areas and Armitage Shanks in non-clinical areas) with the only exceptions noted being infrared outlets in non-patient area toilets with infrared taps which have a TMV mounted approximately 0.5m from the outlet. Thermostatic mixing valves (TMVs) should be regularly serviced as per the manufacturers instructions and in accordance with the Written Scheme for site which should include input from the relevant NHS departments (e.g. Estates, Clinical, Infection Control, Authorising Engineer, Compliance Team, Health & Safety, Water Safety Group etc. – please note DMA's attendance at Water Safety Group meetings has not been requested) for local infection control guidance for bacterial control taking into account the location, design, operation, servicing and requirements of infection control.

Horne Optitherm TMV taps are designed to be demounted for maintenance and servicing elsewhere. Specific service method statements and maintenance requirements for these items in these areas should form part of the written scheme.

Showers appear to be a standard design throughout the hospital with no adjustable heads noted during the survey. However, no cleaning and disinfection of shower heads and hoses or replacement regime is in place at present, though Colin Purdon and Andy Wilson were investigating options in relation to showers at the time of this report. As showers have not been part of a regular cleaning regime up to this point we would advise consideration is given to changing all heads and hoses with new WRAS approved components prior to the commencement of a new cleaning/replacement regime.

DMA were advised by Mercury Engineering and Estates in 2015 that all materials fitted during the construction were WRAS approved and therefore do not support bacterial growth. However, DMA have been advised that some sections of pipework may have been 304 Stainless Steel rather than 316 Stainless Steel and that not all pipework was WRAS approved. It is advised that should this be the case confirmation should be sought from the manufacturers and/or installers that the pipework is of a suitable standard and that this will not contribute to microbial growth, or in any other way impact on the safe operation of the water system(s). Alternatively, independent testing of the non-WRAS approved materials could be undertaken to confirm suitability or otherwise of the materials and components in question.

EPDM flexible hoses have been installed in a small number of non-clinical areas with the only patient areas DMA have noted as having flexible hoses being the connection to Arjo baths (both connections to the hot/cold system and internally within the actual bath). Wherever practicable DMA would recommend all flexi hoses are removed and connections hard piped. Where flexible hoses cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered. In healthcare premises additional guidance on the replacement and use of flexible hoses is provided in the "safety action notice SAN(SC)09/03".

Flexible hoses have also been noted on the boosted bulk water system on pressure reducing valves. If possible, these should be hard piped (stainless steel) or WRAS approved hoses with linings other than EPDM should be considered. Should these not be available for these types of units/connections then a regular inspection and replacement schedule should be implemented for these.

WATER SYSTEM RISK ASSESSMENT

The bib taps, irrigation points (which DMA have been informed are no longer connected to the water system) and 12th floor heli-pad fire suppression system are fed from the Trades system with very long pipework runs through the building and plantrooms to the outlets. DMA would advise all points on the trades system should be included in the site flushing regime. Please also refer to section 8 for information on other risk systems.

No outlets on the Trades system have been designated as "sentinel outlets". Due to the type of system and the extended pipe runs to the outlets it may be prudent to designate all outlets from this system as sentinel and include in monthly monitoring and site flushing regime. DMA understands that a programme or removing all non-essential bib taps and outlets on the Trades water system is under way by Estates.

It should be noted that the information and recommendations included within these pages relates to the outlets surveyed only though many of the conditions highlighted are likely to be replicated throughout the hospital. Issues and information included should not be taken as a complete data set and should be treated as a representative sample of the system conditions found within the hospital. (NHS records should also be consulted for additional information e.g. temperature excursions)

Other Risk Systems

There are various 'Other Risk Systems' on site which may create a risk from Legionellosis and or other waterborne bacteria. Please refer to Section 8 of this assessment for details of other systems.

Water Systems Governance and Documentation

DMA completed a Gap Analysis and a review of the Written Scheme and Governance procedures as part of this assessment, which identified gaps in the PPM programme and areas where the Written Scheme are Governance procedures could be amended and expanded upon were identified. Records for tasks advised as completed by NHS Estates were not always available for assessment at the time of issue.

Pleaser refer to Section 9 of this document for further information on Governance and Documentation and Section 10 for guidance on the tasks which are recommended for inclusion within the Written Scheme and PPM regime.

WATER SYSTEM RISK ASSESSMENT

Risk Assessment Summary

Site Name	Queen Elizabeth University Hospital (Adults) Royal Hospital for Children	
No of Storeys	14 in Adult Hospital and 5 in Children's Hospital (including basement).	
Date of construction	Completed and handed over to NHS in January 2015 for phased occupation. Full occupancy achieved in July 2015.	
Date water services last upgraded	Original system with minor modifications	
Is building used by potentially "at Risk" groups?	Yes – persons with acute medical conditions	As the building is used by persons with acute underlying medical conditions which increases susceptibly to contracting legionellosis then the requirements for L8, HSG 274 and HTM/SHTM 04-01 compliance is of paramount importance.
Risk Rating	Due to the ongoing microbiological control issues identified within the water system(s) on site and the gaps identified in the Governance and PPM control regime, the increased susceptibility of some system users the water systems would be categorised as: • Potential for system to pose a hazard – Possible *(Mitigated by the control measures implemented during 2018)* • Condition of system being assessed (deficiencies/non-compliances found) - Major Therefore the water systems and the control regime would be classified as **High Risk**	

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Water Source Hardgate Road (Large)	Deadlegs (drain points/injection points) should be removed or incorporated into low use outlets flushing regime.	2			
Water Source Govan Road	Deadlegs (drain points/injection points) should be removed or incorporated into low use outlets flushing regime.	2			
Water Source Hardgate Road (Small)	As this mains line is likely to have a low turnover of water DMA would recommend the NHS confirms that this main is separated from domestic water mains by a double check valve or similar (possibly external to building) to prevent potentially stagnant water from contaminating the domestic mains.	2			
Hose Connection Point in Basement MTHW Plantroom (Govan Road Mains)	Strip out and remove this section of pipework ensuring all deadleg creation is removed or alternatively if this supply is required reconfigure pipework to include Category 5 protection, via a purpose made Cat 5 tank & pump.	2			
Water Source (All)	Confirm water utility company (Scottish Water) has been notified about installation of Chlorine Dioxide systems and any actions they have requested are implemented.	2			
Water Source (All)	All plant items, pipework and valves should be labelled for identification purposes.	4			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Trades Water Tank 1	Evidence of stagnation – tank cleaned in July 2018. This would suggest water turnover in the trades systems is minimal. All trades system outlets and tank should be included within site flushing regime.	2			
Trades Water Tank 1	Outlet to offline tank (2m) should be disconnected to remove deadleg or incorporate this into site flushing regime.	2			
Basement Plantroom CWST Supply (See also Water Source info)	On the Govan Road mains line to CWSTs there are two short 22mm deadlegs (one upturned, one downwards) and a 54mm connection point (upturned) prior to tank isolation valves – these should be included within site flushing regime.	2			
Basement Plantroom CWST Supply (See also Water Source info)	On the Hardgate Road mains line to CWSTs there is a 54mm connection point (upturned) prior to tank isolation valves – this should be included within site flushing regime.	2			
Basement Plantroom All CWSTs	There is a deadleg to the tank drain valve (on all Raw and Bulk/Filtered water tanks), measuring 0.7 – 1.0 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised by Estates these are included within the site flushing regime.	2			
Basement Plantroom All CWSTs	It was noted during this survey that these tanks have stainless-steel flange supports which may permit water ingress similar to hollow tank lid supports. Hollow tank supports are recommended to be replaced with solid support beams within HSG 274 and SHTM 04-04. Hollow flange supports are a much less common support structure and it is recommended that these supports are checked to ensure that they are not permitting water ingress, and if found that they are, should be removed and replaced with solid alternatives.	2			
Basement Plantroom Raw Water CWSTs	There is a link/breach pipe on the outlets prior to the filter units which can be opened to allow all tanks to supply both of the filters. This was open at time of survey, though DMA have noted this link/breach pipe closed on previous visits. This line should be opened and flushed as part of site flushing regime.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Basement Plantroom Raw Water CWSTs	There are connection points/deadlegs (28mm) at low level on both of the supply lines to the filtration units form the Raw Water tanks just prior to the filtration units – these should be included within site flushing regime.	2			
Basement Plantroom Bulk (Post Filter) CWST	There is a connection point at high level on supply line prior to inlets to filtered water tanks 1A & 1B and 2A & 2B – this should be included within site flushing regime.	2			
Basement Plantroom Bulk (Post Filter) CWST	There are connection points/deadlegs (54mm) at low level on both of the supply lines to the pump sets form the Bulk/Filtered Water tanks just prior to the pump sets – these should be included within site flushing regime.	2			
Basement Plantroom Boosted Lines	On the riser to Plantrooms 41/22 there is a connection point (54mm) immediately after isolation valve (DMA understand this was used to fill system directly from mains during construction phase, bypassing the filtration units) – this should be included within site flushing regime.	2			
7.7 Bar Pump Set	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible a drain (and isolation valve where compliant with Water regs) should be fitted (small vessel) and vessels included in site flushing regime.	2			
5 Bar Pump Set	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible a drain (and isolation valve where compliant with Water regs) should be fitted (small vessel) and vessels included in site flushing regime	2			
Trades Water Tank 1	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible a drain (and isolation valve where compliant with Water regs) should be fitted (small vessel) and vessels included in site flushing regime.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Drainage Lines to Sump(s) within Basement Tank Room	Consideration should be given to installing inline non-return devices to each drainage pipework to minimise potential for back-flow should submersible pumps fail, and sumps fill completely. Filter manufacturer/installer should be consulted to ensure any restriction caused by backflow prevention devices do not impact on the filter unit operation.	2			
Basement Plantroom All CWSTs	The existing spill slots or weirs are not of the correct size for these tanks and are required to be upgraded to a correctly sized spill over weir(s) in order to provide adequate Category 5 protection.	2			
Trades Tank	The spill over weir to offer Category 5 protection is of the wrong size and materials requires to be upgraded to the correct diameter weir and constructed of a suitable WRAS approved material.	2			
Basement Tank Room Pipework Flanges	It should be confirmed that flanges where corrosion has been noted are not in contact with the system water, replacing any non WRAs approved materials which are in contact with the system water.	2			
Basement Plantroom Boosted Lines	There is a link pipe between the 5 bar and 7.7 Bar pipework systems after the booster sets. DMA advised previously by estates this section is drained and is in place for emergency purposes, should either of the booster sets fail to allow for water services to be maintained to the hospital. Prior to being put into use the link section should be thoroughly flushed and disinfected.	3			
Basement Plantroom Bulk (Post Filter) CWST	There is a link/breach pipe on the outlets prior to the pump sets which can be opened to allow all tanks to supply both of the pump sets. This was closed at time of survey, though DMA have noted this link/breach pipe open on previous visits. This line should be opened and flushed as part of site flushing regime.	3			
Basement Plantroom All CWSTs	Additional access hatches on tanks for cleaning/inspection purposes should be considered.	3			
5 Bar Pump Set	Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable).	3			
7.7 Bar Pump Set	Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable).	3			
Trades Water Tank 1	Ideally a drain should be fitted to pump manifold to allow end of lines to be flushed (if practicable).	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Booster Pumps	Ensure both booster pump sets have adequate back flow/check valve devices integral to the booster sets. If found not to have integral check valves, consider installing suitable back flow devices to tank supplied inlet pipework to pump sets.	3			
Basement Plantroom All CWSTs	Water filled glass traps should be fitted to all overflows and warning pipes.	4			
Trades Tank	Consideration should be given to placing both sides of this tank back on line and lowering the stored capacity of each tank	Manufacturer Recommend-ation			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Calorifier P21 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P21 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P22 - 01/02/03	Evidence of heat gain in expansion vessels for calorifiers 02 and 03 (Temperatures of 40.2°C and 37.0°C recorded on shell of expansion vessels). Investigate cause of heat gain and correct.	2			
Calorifier P22 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P31 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P31 - 04/05/06	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P31 - 07/08/09	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P32 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P32 - 01/02/03	There was a noted leak from the hot flow pipework on calorifier 03 with insulation saturated. This may account for the slightly low flow temp of 59.1°C. The leak should be investigated and corrected, and if necessary insulation repaired/replaced.	2			
Calorifier P33 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			
Calorifier P41 - 01/02/03	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Calorifier P41 - 01/02/03	Unable to flush drains properly as water spraying over floor and onto AHU rather than running directly into the drain. Drain lines should be amended to ensure calorifier and expansion vessels able to be run.	2			
Calorifier P21 - 01/02/03	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			
Calorifier P22 - 01/02/03	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			
Calorifier P31 - 01/02/03	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			
Calorifier P31 - 04/05/06	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			
Calorifier P31 - 07/08/09	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			
Calorifier P32 - 01/02/03	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible the expansion vessel should be included in site flushing regime.	2			
Calorifier P33 - 01/02/03	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			
Calorifier P41 - 01/02/03	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 21	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime with hose running into (and being left in) the floor drain being removed when not in use.	2			
Plantroom 21	There is a branch from the Boosted Cold Water Services (BCWS), dropping from high level and measuring approximately 150mm of 54mm pipework. This should be removed if no longer required or included within site flushing regime.	2			
Plantroom 21	The BCWS branches at high level near pumps PR21 PU03/04/05 SCW and passes through a check valve approximately 300mm from branch and runs (in what appears to be 22mm) for approximately 100m to supply humidifiers at 21AHU23 & 21AHU32(humidifiers in fault mode at time of survey). DMA advised previously all humidifiers offline and not in use. AHU lines should be removed (ensuring no deadlegs remain) if no longer required or incorporated into site flushing regime.	2			
Plantroom 21	15 mm lines branch from same line as supplying the AHUs and run approximately 50m to HTG pressurisation units (at pumps PR21 PU11/12/13 SH), with a separate branch running approximately 10m to CHW pressurisation unit (at pumps PR21 PU03/04/05 SCW). Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted to fast fill connection.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
All Plantrooms	Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection - See calorifier/plantroom sections for details of locations.	2			
Plantroom 22	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime with hose running into (and being left in) the floor drain being removed when not in use.	2			
Plantroom 31	There is a line branching at high level from the cold supply to Calorifiers 31-04/05/06 with a check valve fitted approximately 1metre from the tee off point which then runs approximately 20 metres to RPZ on supply line to MRI Chillers (emergency cooling supply), with a second branch starting just after check valve and running approximately 25 metres to Humidifier at 31AHU53 which is electrically live (though panel stating unit on "Standby"). DMA advised previously all humidifiers offline and not in use. AHU lines should be removed (ensuring no deadlegs remain) if no longer required or incorporated into site flushing regime.	2			
Plantroom 31	Line to MRI Chiller should, if practicable, be switched to trades system (confirm water quality, pressure and flow rates etc. required to chiller prior to amending supply line), or line incorporated into site flushing regime.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 31	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime.	2			
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	Optitherm Servicing and Thermal Disinfection Station (and line for future connection) should be incorporated into site flushing regime, or removed fully from use leaving no deadlegs (DMA currently flush lines daily whilst on site).	2			
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	Expansion vessel should ideally be changed to a flow through design.	2			
Plantroom 32	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime with hose running into (and being left in) the floor drain being removed when not in use.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 33	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime with hose running into (and being left in) the floor drain being removed when not in use.	2			
Plantroom 41	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime with hose running into (and being left in) the floor drain being removed when not in use.	2			
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level which runs approximately 8 metres and reducing 22mm. This line formerly supplied a pressurisation unit and Condair Humidification units at 41AHU27A, though these has now been disconnected, and then continued on to supply a pressurisation unit and Condair Humidification units at 41AHU27B, which have also been disconnected. There is a clear braided hose on the end of the 22mm line where it now terminates. This line should be removed if no longer required.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 41	There is also a 3m deadleg (15mm) to a valve from this line at 41AHU24 – this line should be removed if no longer required or incorporated into the site flushing regime. Alternatively if this supply is required reconfigure pipework to include Category 5 protection, via a purpose made Category 5 tank & pump.	2			
General Deadleg Flushing	Where deadlegs have been identified and are being incorporated into a site flushing regime prior to removal, hoses should not be run from deadleg and left in floor drain, or other receptacle which could create a potential backflow contamination risk. Hoses should be removed between flushing or coiled and tied up off the floor. Should there be concerns regarding hoses being used by contractors or other personnel in a way which could create a backflow risk suitable signage and additional backflow protection should be considered at terminal points (e.g. double check valves).	2			
RPZ Valves	Ensure that all RPZ valves are installed and registered in accordance with water bylaws and are serviced annually with all reports forwarded on to the water authority in accordance with the water bylaws requirements. This will also apply to any additional RPZs fitted to the water system(s) on site.	2			
Children's Renal System Plant Room/Plantroom 21	The deadleg created when supply to Renal plant was reconfigured should be removed. If deadleg cannot be removed then line should be included in site flushing regime, with hose running into (and being left in) the floor drain being removed when not in use.	2			
Calorifier P21 - 01/02/03	Base temperature gauge on calorifier 01 appears to be reading incorrectly – this should be recalibrated or replaced.	3			
Calorifier P21 - 01/02/03	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Calorifier P22 - 01/02/03	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
Calorifier P22 - 01/02/03	Calorifier 03 flow temperature gauge reading incorrectly – this should be recalibrated or replaced.	3			
Calorifier P31 - 01/02/03	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
Calorifier P31 - 01/02/03	Calorifier 02 & 03 flow temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Calorifier P31 - 04/05/06	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
Calorifier P31 - 07/08/09	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
Calorifier P31 - 07/08/09	Temperature gauges on calorifiers 08 & 09 appear to be reading incorrectly – these should be recalibrated or replaced.	3			
Calorifier P32 - 01/02/03	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
Calorifier P32 - 01/02/03	Some temperature gauges appear to be reading incorrectly – these should be recalibrated or replaced.	3			
Calorifier P33 - 01/02/03	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
Calorifier P33 - 01/02/03	Calorifier temperature 01 gauge at base appears to be reading incorrectly – This should be recalibrated or replaced.	3			
Calorifier P41 - 01/02/03	Fit caps to ends of spare circulation pump and disinfect prior to use.	3			
All Plantrooms	Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantrooms. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions - See calorifier/plantroom sections for details of locations.	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	As the TMV/Filter Service Room is not a clinical area it is advised that insulation is fitted on hot and cold pipework as close as is practical to the outlets. This would aid in minimising heat gain in cold line to this room.	3			

Plantroom	Zone	Level	Riser	Dept	Room ID/Name	Recommendations	Remedial Action Category	Assigned to	Actions Taken	Completed
31 7/8/9	K	9	T5	Corridor	Facilities WS9-027	Cold temperature slow to drop (≈60 secs to drop below 20°C) - This should be monitored and if necessary a flushing regime implemented	2			
31 7/8/9	H	10	T5	Ward C	GENW19-034 (Bathroom)	Cold Temperature very slow to drop below 20°C (>120 seconds) - investigate and correct.	2			
31 7/8/9	K	10	T5	Corridor	Facilities WS10-027	Hot tap is loose and spinning round, resulting in poor water flow. Tap should be tightened/repaired.	2			
32	F	11	T12 T1	Ward A	Room 1 GENW21-001	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.	2			
32	F	11	T12	Ward A	Room 15 GENW21-033	Cold very slow to drop below 20°C - Investigate and correct.	2			
33	J	10	T13 T2	Ward D	GENW18-028 (Bedroom)	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.	2			
33	J	11	T13 T2	Ward D	Room 44 GENW22-028	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.	2			
33	J	11	T13	Ward D	Room 42 GENW22-033	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.	2			
		0		children's A&E	EMC-100 (Triage)	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.	2			
41	A	0	M18	Observation	Room 10 OBW-020	Bathroom used as store and outlet appear unused. Outlet should be removed if no longer required or incorporated into site lfushing regime.	2			

41	B	0	M38	OPD	OPD-073 (Plaster Room)	Cold temperature slow to drop (≈60 secs to drop below 20°C) - staff advised no patients in room that monring prior to testing. This should be monitored and if necessary a flushing regime implemented	2			
41		2		Ward 2C	Bed10 ARU-015	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.	2			
41	B	2	M38	Asceptic Unit	ASU-036 (Changing Room)	Outlets appear to have been removed from Changing Room (ASU-039) - ensure all dealdegs removed behind panel.	2			
41		3		Ward 3C	Play Room GW1-046	Sign up at sink advising not to use for washing hands as water very hot. Ensure outlets are run every day or included within site flushing regime	2			
41	B	3	M38	Ward 3B	GW2-036 (Play Room)	Cold temperature slow to drop (≈40 secs to drop below 20°C) - This should be monitored and if necessary a flushing regime implemented	2			
41	C	3	M39	Ward 3A	GW3-043 (Play Room)	Sign up at sink advising not to use for washing hands as water very hot. Ensure outlets are run every day or included within site flushing regime	2			
41	B	3	M36	3A - 3C Corridor	Toilet GWS-033	Hot temperature slow to rise (>60 secs to reach 50°C) - Investigate and correct	2			
41	C	4	M39	Child Forensic Psychology	Toilet DCFP-013	No flow through tap on hot setting - investigate and correct.	2			
41	C	4	M39	Child Forensic Psychology	Kitchen DCFP-049	No Access - Sign on door preventing access to all staff. Outlets should be included in site flushign regime until kitchen put back into use.	2			
					All Showers	All showers should have suitable retaining rings on the shower riser pole to prevent the showers from being able to reach, and potentially be submerged into adjacent sanitaryware.	2			
					Sluicemasters	Ensure all sluice masters located throughout the hospital are checked to ensure they have suitable integral backflow protection installed.	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Children's 4th Floor CC4-021 (Riser M39)	Cold temperature too high - investigate and correct.	2			
Children's 1st Floor CC1-021 (Riser M39)	Hot return temperature too low - investigate and correct.	2			
Children's Ground Floor CC0-021 (Riser M39)	Deadlegs on hot flow and hot return lines should be removed if no longer required or incorporated into site flushing regime.	2			
Children's 4th Floor Across from DCFP-050 (Riser M36)	Hot return temperature too low - investigate and correct.	2			
Children's 3rd Floor Across from GWS-035 (Riser M36)	Hot return temperature too low - investigate and correct.	2			
Children's 4th Floor CC4-008 (Riser M38)	Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Children's Ground Floor CC0-008 (Riser M38)	Deadlegs on hot flow, hot return and cold lines should be removed if no longer required or incorporated into site flushing regime.	2			
Children's 3rd Floor CC3-013 (Riser M18)	Hot return temperature too low - investigate and correct.	2			
Adults 11th Floor Ward A CA11-006 (Riser T1)	Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 11th Floor Ward A GENW21-068 (Riser T12)	Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 11th Floor Ward A GENW21-068 (Riser T12)	Hot return temperatures too low - investigate and correct.	2			
Adults 11th Floor Ward A GENW21-068 (Riser T12)	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water.	2			
Adults 11th Floor Ward B GENW24-068 (Riser T4)	Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 11th Floor Ward B GENW24-068 (Riser T4)	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water.	2			
Adults 9th Floor Ward B GENW16-068 (Riser T4)	Evidence of damage to insulation and corrosion etc. from leak on hot pipework. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 11th Floor Ward C GENW23-068 (Riser T5)	Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 11th Floor Ward C GENW23-068 (Riser T5)	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 11th Floor Ward C GENW23-068 (Riser T5)	There is a leak from the cold line (Possibly at ½" valved connection) which is dripping/running down pipework to floors below leaving a white residue and corroding components on pipework and in risers below. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 10th Floor Ward C GENW19-068 (Riser T5)	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 9th Floor Ward C GENW15-068 (Riser T5)	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 8th Floor Ward C GENW11-068 (Riser T5)	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 7th Floor Ward C GENW7-068 (Riser T5)	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 4th Floor Ward C RENW-212 (Riser T5)	Evidence of damage to insulation and corrosion etc. from leaks on hot pipework. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.).	2			
Adults 11th Floor Ward D GENW22-068 (Riser T13)	Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 11th Floor Ward D GENW22-068 (Riser T13)	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water.	2			
Adults 11th Floor Ward D Next to CA11-014 (Riser T2)	Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 2nd Floor Dialysis Centre RENO-0861 (Riser T13)	Hot return temperature too low - investigate and correct.	2			
Adults Atrium OPD1 OPD1-059 (Riser T13)	Hot return temperature too low - investigate and correct.	2			
Adults 1st Floor Critical Care Offices CCW-230 (Riser M5)	Hot return temperature too low - investigate and correct.	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 1st Floor Coronary Care CCU-069 (Riser M6)	Hot return temperature too low - investigate and correct.	2			
Adults 3rd Floor Plantroom 31 at 31AHU29 (Riser M7)	15mm line to open end (Valved off) - this should be removed.	2			
Adults 3rd Floor Plantroom 31 at 31AHU19	Hot return temperature too low - investigate and correct.	2			
Children's 3rd Floor CC3-021 (Riser M39)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Children's 2nd Floor CC2-021 (Riser M39)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Children's 1st Floor CC1-051 (Riser M36)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Children's 4th Floor CC4-008 (Riser M38)	Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Children's 3rd Floor CC3-008 (Riser M38)	Small section of insulation missing on cold pipework (Approx. 1m) - this should be replaced.	3			
Children's 1st Floor CC1-008 (Riser M38)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 6th Floor Ward A CA6-006 (Riser T1)	Small section of insulation missing - this should be replaced.	3			
Adults 5th Floor Ward A A5-006 (Riser T1)	Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Adults 4th Floor Ward A CA4-006 (Riser T1)	Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Adults 10th Floor Ward A GENW17-068 (Riser T12)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 9th Floor Ward A Next to GENW13-068 (Riser T12)	Hot return temperature gauges reading incorrectly – these should be recalibrated or replaced.	3			
Adults 4th Floor Ward A RENW-278 (Riser T12)	No labelling on cold pipework labelling should be fitted.	3			
Adults 5th Floor Ward B GENWD-068 (Riser T4)	Cold, Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Adults 11th Floor Ward C GENW23-068 (Riser T5)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 8th Floor Ward C GENW11-068 (Riser T5)	Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 7th Floor Ward C GENW7-068 (Riser T5)	Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Adults 5th Floor Ward C GENWC-068 (Riser T5)	Hot return temperature gauges reading incorrectly – these should be recalibrated or replaced.	3			
Adults 4th Floor Ward C RENW-212 (Riser T5)	Hot return temperature gauges reading incorrectly – these should be recalibrated or replaced.	3			
Adults 4th Floor Ward C RENW-212 (Riser T5)	No labelling on cold pipework (main riser) labelling should be fitted.	3			
Adults 10th Floor Ward D GENW18-068 (Riser T13)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 9th Floor Ward D GENW14-068 (Riser T13)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 8th Floor Ward D GENW10-068 (Riser T13)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 7th Floor Ward D GENW6-068 (Riser T13)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 5th Floor Ward D GENWB-068 (Riser T13)	Cold, Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Adults 11th Floor Ward D Next to CA11-014 (Riser T2)	There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 10th Floor Ward D CA10-014 (Riser T2)	There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 9th Floor Ward D CA9-014 (Riser T2)	There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 8th Floor Ward D CA8-014 (Riser T2)	There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 7th Floor Ward D CA7-014 (Riser T2)	There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 6th Floor Ward D CA6-014 (Riser T2)	There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 5th Floor Ward D CA5-014 (Riser T2)	Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Adults 4th Floor Ward D CA4-014 (Riser T2)	Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	3			
Childrens 1st Floor Theatre Corridor THE-027 (Riser M30)	Cold, Hot flow and return pipework unlabelled - labelling should be fitted.	3			
Childrens Ground Floor X-Ray/Imaging Corridor RCG-008 (Riser M30)	Cold, Hot flow and return pipework unlabelled - labelling should be fitted.	3			
Childrens Ground Floor X-Ray/Imaging Corridor RCG-008 (Riser M30)	Sections of insulation missing on cold, hot flow and hot return pipework (Approx. 1m) as it drops through floor - this should be replaced.	3			
Childrens 1st Floor Theatre THE-143 (Riser M27)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 1st Floor HDU Unit 1 CCW-046 (Riser M1)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 1st Floor Coronary Care CCU-069 (Riser M6)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 1st Floor Atrium STW-012 (Riser M10)	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 1st Floor Atrium STW-012 (Riser M10)	Sections of insulation missing on cold, hot flow and hot return pipework (Approx. 1m) as it runs to supply services - this should be replaced.	3			
Adults 3rd Floor Plantroom 31 at 31AHU19	Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced.	3			
Adults 3rd Floor Plantroom 31 at 31AHU19	Cold pipework appears labelled incorrectly (wrong way round) abiove 31AHU19 - labelling should be corrected.	3			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Arjo Baths	Maintain in accordance with manufacturers/installers instructions. Where flexible hoses (i.e. internal to bath unit) cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered. Consider shortening shower hoses as it was noted that these can in some areas reach into adjacent WCs and WHBs. DMA advised these are maintained by a sub-contractor, though no details of the maintenance contract provided at time of survey. Contractual obligation should be confirmed in written scheme.	**2 (also PPM Regime)**			
Dental Equipment	HSG 274 Part 3 states "Drain down, clean, flush and disinfect all system components, pipework and bottles twice daily. Disinfectant contact time as recommended by manufacturer. Take microbiological measurements (Refer to Decontamination HTM 01-05) SHTM 04-01 Part G states "Drain down and clean at the end of each working day". It should be confirmed what equipment is fed from CWST/booster and bottled water. HTM 01-05 provides advice and recommendations for on-going maintenance and this should be followed in addition to manufacturers and installers instructions. Clarify governance and maintenance responsibilities within the written scheme.	**2 (also PPM Regime)**			
Emergency Showers	HSG 274 Part 3 recommends minimum six-monthly flushing of emergency/deluge shower, though Risk Control Notice 11/advises "flush through and purge to drain twice per week– source SHTM 04-01 Part G. NHS Estates should formulate an appropriate flushing regime and maintain in accordance with manufacturers/installers instructions. Showerheads should be incporated into site showerhead disinfection and/or replacement regime.	**2 (also PPM Regime)**			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Irrigation System	Ensure former connection points are included in site flushing regime or removed leaving no deadlegs.	**2 (also PPM Regime)**			
Renal Dialysis (Adult)	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained.	**2 (also PPM Regime)**			
Renal Dialysis (Adult)	The renal tank and/or pipework should be reconfigured to accommodate the installation of a suitably sized spill slot/weir to provide Category 5 protection to the hospitals boosted cold water supply.	**2**			
Renal Dialysis (Adult – Emergency Points)	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Include in twice weekly flushing regime. Ensure suitable backflow prevention in placed Due cognisance of ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained.	**2 (also PPM Regime)**			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Renal Dialysis (Children)	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained.	**2 (also PPM Regime)**			
Renal Dialysis (Children)	The renal tank and/or pipework should be reconfigured to accommodate the installation of a suitably sized spill slot/weir to provide Category 5 protection to the hospitals boosted cold water supply.	**2**			
Endoscopy Wash Filtration Unit	Maintain in accordance with manufacturers/installers instructions and current NHS (SHTM) protocols. Ensure aerosol creation is minimised during maintenance and testing procedures.	**2 (also PPM Regime)**			
Endoscopy Wash Filtration Unit	Category 4 protection should be fitted to the domestic cold water line to the Endoscopy Wash Plant (E.g. PRZ Valve).	**2**			
Water Softeners	Maintain in accordance with manufacturers/installers instructions (including cleaning and disinfection of resin and brine tanks). Confirm responsibilities. Ensure aerosol creation is minimised during maintenance and testing procedures.	**2 (also PPM Regime)**			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Medical Gases/Medical Equipment (e.g. Nebulisers, incubators, etc.)	Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system and Infection Control/Clinical staff where appropriate. Control procedures within appropriate SHTM (or other relevant guidance) for system being assessed should be taken in to account during assessment(s). Any water softeners or other filtration equipment connected to these systems should be assessed at this time. Devise a control scheme based on the risk assessment.	**2 (See also Section 8B)**			
Emergency Cooling (MRI chiller)	Connection point to MRI unit(s) should be included in site flushing regime. A check valve has been fitted approx. 1m from the tee off to the MRI unit, with an RPZ fitted just prior to line running through wall to the units. Ensure aerosol creation minimised when running to drain in emergency use and during flushing.	**2 (also PPM Regime)**			
Air Conditioning/Ventilation	Maintain in accordance with manufacturers/installers instructions and as required under SHTM 03-01 and SHTM 04-01 Part G.	**2 (also PPM Regime)**			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Basement Fire Suppresion System	Consider clean and disinfection of the CWST and then regular inspection as per domestic water tanks with cleaning/disinfection as required by inspection.	**2**			
Basement Fire Suppresion System	Minimise aerosol creation during maintenance procedures. Consider wearing suitable masks to prevent ingestion as recommended by the FIA guidance, and prevent access by unauthorised personnel into test area.	**2**			
Basement Fire Suppresion System	Given the potential control issues described above, but the need for such a system to be in place, it would be prudent to consider a permanent chemical dosing system, and/or filtration system, for this water system with suitable testing and monitoring included. The fire system supplier should also confirm that the addition of any chemical treatments will be suitable for use with the system and not create any detrimental issues with the use or maintenance of the system or provide suitable options.	**2**			
Basement Fire Suppresion System	If chemical dosing systems are implemented then control and management parameters and procedures should be compiled along with procedures for correction of out of specification results and any escalation procedures that may be required.	**2**			
Basement Fire Suppresion System	Weir overflow, overflow and warning pipework connected at inappropriate heights to function as intended. This should be corrected.	**3**			
Basement Fire Suppresion System	Rodents screens should be fitted to overflow and warning pipes.	**3**			
Basement Fire Suppresion System	Maintain in accordance with manufacturers/installers instructions.	**PPM Regime**			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
Basement Fire Suppresion System	This fire tank has been installed directly on to a concrete base and therefore has an internally flanged base. It is recommended that where possible all tanks should be externally flanged and built on suitable level tank piers and steel supports 500mm from ground to base of the tank. This tank appears to be leaking at present (Water on floor around tank) which may be due to it being built on a potentially uneven surface, although further investigation would be required to establish.	**N.B.** This is not a legionella or backflow risk, only recommended good practice from tank manufacturers			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
12th Floor Fire Suppresion System	Minimise aerosol creation during maintenance procedures (if practicable). Maintain in accordance with manufacturers/installers instructions.	2			
12th Floor Fire Suppresion System	Ensure all points on the trades system (including inlet to fire tank) are included in site flushing regime.	2			
12th Floor Fire Suppresion System	Consider implementing a sampling regime to include the storage tank and points on the system and the supply. This would be particularly important during summer months where ambient temperatures are likely to be higher.	2			
12th Floor Fire Suppresion System	It is advised temperature monitoring and visual inspection should be carried out on the Storage Tank on a weekly basis prior to testing and should the storage temperature exceed 20 C then additional precautions should be considered (E.g. flush the tank to reduce stored water temperature, manually dose tank with suitable disinfectant chemical if no automated system installed)	2			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
12th Floor Fire Suppresion System	Given the potential control issues described above, but the need for such a system to be in place, it would be prudent to consider a permanent chemical dosing system, and/or filtration system, for this water system (though it should be confirmed that any chemicals used on this system would not interfere with the foam used for emergencies) with suitable testing and monitoring included. The fire system supplier should also confirm that the addition of any chemical treatments will be suitable for use with the system and not create any detrimental issues with the use or maintenance of the system or provide suitable options.	**2**			
12th Floor Fire Suppresion System	If chemical dosing systems are implemented then control and management parameters and procedures should be compiled along with procedures for correction of out of specification results and any escalation procedures that may be required.	**2**			
12th Floor Fire Suppresion System	We would advise a full clean and disinfection is carried out, including through the cannons, if practicable. The manufacturer should be consulted to confirm which disinfectant(s) are suitable.	**2**			
12th Floor Fire Suppresion System	Increased turnover of the system may be achieved by additional flushing, which may be automated or manual. However, the poor make-up may result in a reduction in the volume of stored water immediately afterwards which may have an impact in emergency situations. Similarly reducing the capacity of stored water may have a detrimental impact in emergency situations.	**2 - Further Information required**			

Location/Plant Item	Recommendation	Remedial Action Category	Assigned to	Actions Taken	Completed
12th Floor Fire Suppresion System	Rodents screens should be fitted to overflow and warning pipes.	**3**			
12th Floor Fire Suppresion System	Maintain in accordance with manufacturers/installers instructions.	**PPM Regime**			

Section 3

Site/Client Details

WATER SYSTEMS RISK ASSESSMENT

Site/Client Details

Client	**GG&C QEUH**
Client address	Queen Elizabeth University Hospital 1345 Govan Road Glasgow
Client contact	Phyllis Urquhart
Telephone No.	[redacted]
E-mail	[redacted]
Mobile No.	[redacted]
Building Being Assessed	**Queen Elizabeth University Hospital (Adults) and Royal Hospital for Children**

Method of Submission	Electronic

WATER SYSTEMS RISK ASSESSMENT

General Site Details

Site	Queen Elizabeth University Hospital (Adults) and Royal Hospital for Children
Age of building	Opened in 2015 (Building and Commissioning 2011-2015)
Years since upgrade/renovation of water services	Original System with small local modifications only
Purpose/use of building	Office/administration, Hospital
Operational cycle of the water system being assessed?	Continuous
Potentially affected population	Staff, Contractors, Visitors, Patients, General public
Is the building used by "at risk" or "particularly vulnerable" persons	Yes - Acute medical conditions
Total number of people usually in building (including staff/sub-contractors visitors/pupils etc.)	Unknown - client to confirm
Applicable Legionella standard(s)	L8, SHTM 04-01

WATER SYSTEMS RISK ASSESSMENT

Identification of Systems and Scope of Assessment

Domestic Water System		Present on site
Evaporative cooling tower or condenser systems (and associated water system)		None identified to DMA
Fountains and water features		None identified to DMA
Hydrotherapy Pool		Present on site Covered under separate assessment
Whirlpool/Arjo Baths		Present on site
Dental equipment		Present on site
Vehicle wash systems (inc. Trolley Wash & Power Washing Plant)		None identified to DMA
Emergency showers		Present on site
Irrigation systems		Present on site (Advised all disconnected now)
Sprinkler/Wet fire-fighting systems		Present on site To be covered under separate assessment
Water softeners		Present on site
Industrial process water systems		None identified to DMA
Machine coolants		None identified to DMA
Air washers, wet scrubbers, particle and trivial gas scrubbers		None identified to DMA
Spray humidifiers		Steam Humidifiers present (Advised no longer in use)
Ultrasonic humidifiers/foggers and water misting systems		None identified to DMA
Recycled Water Systems		None identified to DMA
Closed heating water systems (MTHW)		Present on site
Closed chilled water systems		Present on site
Other 'at-risk' systems	Renal Dialysis Plant (x2) (Plus other emergency dialysis points within wards)	Present on site
	Endoscopy Wash/Filtration Unit	Present on site
	Medical Gases/Medical Equipment (e.g. Nebulisers, incubators etc.)	Present on site
	Emergency Cooling (MRI Chiller)	Present on site

N.B. Systems assessed in this document as per client specification.

WATER SYSTEMS RISK ASSESSMENT

Legionella Control Measures Currently Used on Site

What is the primary control method for legionella control for the domestic water systems currently used on site and are there any supplementary or replacement control systems on site?[#]	
	Control measure
Temperature controlled	Primary
Chlorine dioxide[#]	Secondary [#]*Chlorine Dioxide dosing systems being installed in late 2018 and early 2019 to cover domestic water systems.*
Hydrogen peroxide/silver ion	Not used
Silver/copper ion	Not used
Ultraviolet	Not used
Other (0.2µm filters between Raw and Bulk Tanks)	Secondary

[#] If any method other than, or in addition to, temperature is used as method of control then details of records/regime can be found in section 9.

Section 4

Water Source

WATER SYSTEM RISK ASSESSMENT

Summary of Risk Potential

Town mains water is generally not expected to present a significant risk for the contamination of a system with legionella, though it may be assumed that legionella in low concentrations could be present in the mains water on occasion. Therefore it must be assumed that it is not practical to prevent legionella entering the water system at some point.

There are, in addition, other bacteria, contaminants and physical factors that can create a risk to mains water users in the building.

Where the water source to the site is from a natural source, e.g. River, lake, spring or private water supply then the potential for legionella contamination increases.

N.B. Unless specifically stated otherwise the incoming mains/water source has been assessed from point of entry to the building. External & underground water services which serve the building and are not visible have not been assessed.

Please refer to water source sheets for specific recommendations and risk ratings.

WATER SYSTEM RISK ASSESSMENT

Id no.		Hardgate Road (Large)	Recommendations and Comments	Assigned to	Completed
Labelled		Mains: Yes Pipework: Yes Valves: No	Deadlegs (drain points/injection points) should be removed or incorporated into low use outlets flushing regime. (2) All plant items, pipework and valves should be labelled for identification purposes. (4) **Comments:** No access to point where incoming mains enters the building as passage locked off. Access only available up to point where it enters into the tank room.		
Access		Good			
Type		Town mains			
Supply company		Scottish Water			
Services supplied		CWSTs – (Raw Water)			
Location		Basement Main Tank plantroom			
Size		150mm			
Material		MDPE, Stainless steel			
Double check valve fitted		Yes			
Drain/injection point		None visible			
Temperature (ºc)		14.1			
Pipework insulated		Yes			
Incoming Water	pH	7.2			
	Residual free chlorine	<0.1			
Isolation valve		Yes			
Deadlegs		See comments			
Non WRAS materials		None visible			
Level of Risk		Medium			

WATER SYSTEM RISK ASSESSMENT

Id no.		Govan Road	Recommendations and Comments	Assigned to	Completed
Labelled		Mains: Yes Pipework: Yes Valves: No	Deadlegs (drain points/injection points) should be removed or incorporated into low use outlets flushing regime. (2) All plant items, pipework and valves should be labelled for identification purposes. (4) **Comments:** Water meter and check valve in main tank room after connection to trades water tank.		
Access		Good			
Type		Town mains			
Supply company		Scottish Water			
Services supplied		CWSTs (Raw Water and Trades)			
Location		Basement MTHW/Chilled Plantroom			
Size		150mm			
Material		MDPE, Stainless steel			
Double check valve fitted		Yes			
Drain/injection point		Yes			
Temperature (ºc)		14.8			
Pipework insulated		Yes			
Incoming Water	pH	7.2			
	Residual free Chlorine	<0.1			
Isolation valve		Yes			
Deadlegs		See comments			
Non WRAS materials		None visible			
Level of Risk		Medium			

WATER SYSTEM RISK ASSESSMENT

Id no.		Hardgate Road (Small)	Recommendations and Comments	Assigned to	Completed
Labelled		Mains: Yes Pipework: Yes Valves: No	As this mains line is likely to have a low turnover of water DMA would recommend the NHS confirms that this main is separated from domestic water mains by a double check valve or similar (possibly external to building) to prevent potentially stagnant water from contaminating the domestic mains. (2) All plant items, pipework and valves should be labelled for identification purposes. (4)		
Access		Good			
Type		Town mains			
Supply company		Scottish Water			
Services supplied		Fire tanks			
Location		Basement Main Tank plantroom			
Size		54mm			
Material		MDPE, Stainless steel			
Double check valve fitted		Yes			
Drain/injection point		Yes			
Temperature (ºc)		-			
Pipework insulated		Yes			
Incoming Water	pH	-			
	Residual free Chlorine	-			
Isolation valve		Yes			
Deadlegs		None visible			
Non WRAS materials		None visible			
Level of Risk		Potentially High though only connected into fire fighting system.			

Section 5

Cold Water Storage Tanks

WATER SYSTEM RISK ASSESSMENT

CWSTs and Filters

QEUH Adult and Children's Hospital CWSTs

There are 10 domestic water storage tanks in the building which are all situated in the basement tank room.

Raw Water Tanks 1A/1B and 2A/2B are supplied by two town mains (Govan Road and Hardgate Road) to ensure continuity of supply in case of a town mains failure. The Raw Water tanks supply the Bulk Water tanks 1A/1B and 2A/2B via two filtration sets (level of filtration advised by Estates). All Raw Water tanks were linked at the time of survey, though can be set up to feed filters units separately if required.

The filtration units fill separate Bulk Water Tanks (filtration unit 1 supplying 1A & 1B and filtration unit 2 supplying 2A & 2B). There appears no way to reconfigure set-up to allow the filtration units to fill the other tanks under fault conditions. Filtration sets should be maintained in accordance with manufacturer's instructions and maintenance schedule.

Bulk Water Tanks 1A and 1B are linked, with 2A and 2B also linked. All four tanks can be linked together (via outlets) to supply domestic cold water including drinking water to the building with the exception of the trades system. The link between the tanks 1A/1B and 2A/2B was closed at the time survey with Filtered Tanks 1A/1B supplying the 5 Bar pump set to plantrooms 21/22/41 and the corresponding outlets in these zones with 2A/2B supplying the 7.7 Bar pump set to plantrooms 31/32/33 and the corresponding outlets in these zones.

N.B. It should be noted that there is no separate dedicated supply to the Renal (or other medical) systems, with all being fed from the Bulk Water system. This means that system disinfections will require to be very carefully scheduled or carried out locally as the disinfection procedure/chemical may interfere with the renal/medical systems and impact on patient welfare.

There are 2 No. water booster sets in the water tank room. Each booster set is set to a different set point pressure depending on which plantroom and area it serves. In the event of failure each booster can also be switched to the other set point pressure.

- BS01 – Feeding Plantroom 31, 32 & 33 - 7.7 Bar
- BS02 – Feeding Plantroom 21, 22 & 41 – 5 Bar

The expansion vessels attached to the CWST booster sets are not of a flow through design and they are not insulated.

From the 2 No. water booster sets there are 8 domestic water systems:

- Plantroom 21
    - Via a Pressure reducing valve (PRV) the BCWS feed 21 CAL01/02/03
- Plantroom 22
    - Via a Pressure reducing valve (PRV) the BCWS feed 22 CAL01/02/03
- Plantroom 31
    - BCWS feeds 31 CAL01/02/03
- Plantroom 31
    - Via a Pressure reducing valve (PRV) the BCWS feeds 31 CAL07/08/09
- Plantroom 31
    - BCWS feeds 31 CAL04/05/06
- Plantroom 32
    - BCWS feeds 32 CAL01/02/03
- Plantroom 33
    - BCWS feeds 33 CAL01/02/03
- Plantroom 41
    - BCWS feeds 41 CAL01/02/03

WATER SYSTEM RISK ASSESSMENT

The water supply into each plantroom is metered by a CWS flow meter. This allows for monitoring of specific parts of the system for energy purposes.

The Trades Water System supplies "Non-domestic" outlets such as bib taps in plantrooms, irrigation connections points (DMA understand these are now all disconnected) and the 12th floor heli-pad fire suppression system. One side of the Trades tank was isolated and drained with the make-up to the tank removed.

There are various connection points onto other "non-domestic" outlets such as renal dialysis, endoscopy wash, pressurisation units, steam humidifier units and MRI chiller cooling which are connected to the Bulk Water system.

WATER SYSTEM RISK ASSESSMENT

					Recommendations	Assigned to	Completed
Name/number of CWST		Raw Water Tank 1A			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments** CWST was cleaned and disinfected in June 2018 by DMA. It was then cleaned and disinfected again by DMA in September 2018 after repairs to drain valve carried out by other contractor. There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. Warning pipe appears to be lower than overflow and is therefore unlikely to run in the event of tank overflowing. **Supply to Filter Units** There is a link/breach pipe on the outlets prior to the filter units which can be opened to allow all tanks to supply both of the filters. This was open at time of survey, though DMA have noted this link/breach pipe closed on previous visits. This line should be opened and flushed as part of site flushing regime.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5x5x2 (1.6)					
Volume (litres)		50000 (40000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Town mains (Hardgate Road)					
Services supplied		Bulk Water CWSTs (via filtration units) – see Supply to Filter Units across					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		14.1	15.4	20.3			
Internal condition	Internal	Good					
	Waterline	None visible					
	Dirt & silt	Light Silt					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	After Bulk Water Tanks					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Raw Water Tank 1B			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in June 2018 by DMA. Warning pipe appears to be lower than overflow and is therefore unlikely to run in the event of tank overflowing.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5x5x2 (1.6)					
Volume (litres)		50000 (40000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Town mains (Govan Road)					
Services supplied		Bulk Water CWSTs (via filtration units) – see Supply to Filter Units in Raw Water Tank 1A information					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		TBC	15.0	20.3			
Internal condition	Internal	Good					
	Waterline	None visible					
	Dirt & silt	Light Silt					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		None visible					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	After Bulk Water Tanks					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Raw Water Tank 2A			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in June 2018 by DMA. Warning pipe appears to be lower than overflow and is therefore unlikely to run in the event of tank overflowing. Evidence of staining at waterline – this should be monitored.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5x5x2 (1.6)					
Volume (litres)		50000 (40000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Town mains (Hardgate Road)					
Services supplied		Bulk Water CWSTs (via filtration units) – see Supply to Filter Units in Raw Water Tank 1A information					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
			14.2	20.3			
Internal condition	Internal	Good					
	Waterline	Marked in corner					
	Dirt & silt	Light Silt					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		None visible					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	After Bulk Water Tanks					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Raw Water Tank 2B			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in June 2018 by DMA. Water filled glass traps should be fitted to all overflows and warning pipes. Evidence of staining at waterline – this should be monitored.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5x5x2 (1.6)					
Volume (litres)		50000 (40000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Town mains (Govan Road)					
Services supplied		Bulk Water CWSTs (via filtration units) – see Supply to Filter Units in Raw Water Tank 1A information					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
			14.1	20.3			
Internal condition	Internal	Good					
	Waterline	Marked in corner					
	Dirt & silt	Light Silt					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	After Bulk Water Tanks					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Bulk Water Tank 1A			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in July 2018 by DMA. Water filled glass traps should be fitted to all overflows and warning pipes.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		13.5x5x2 (1.6)					
Volume (litres)		135000 (108000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs via filter unit 1					
Services supplied		See Services Supplied across					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
			16.6	20.3			
Internal condition	Internal	Good					
	Waterline	None visible					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	See Booster Pump Information					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Bulk Water Tank 1B			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in July 2018 by DMA. Water filled glass traps should be fitted to all overflows and warning pipes.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		13.5x5x2 (1.6)					
Volume (litres)		135000 (108000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs via filter unit 1					
Services supplied		See Services Supplied in Bulk Water Tank 1A information					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
			17.3	20.3			
Internal condition	Internal	Good					
	Waterline	None visible					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	See Booster Pump Information					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Bulk Water Tank 2A			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in July 2018 by DMA. Water filled glass traps should be fitted to all overflows and warning pipes.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		13.5x5x2 (1.6)					
Volume (litres)		135000 (108000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs via filter unit 2					
Services supplied		See Services Supplied in Bulk Water Tank 1A information					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
			15.5	20.3			
Internal condition	Internal	Good					
	Waterline	None visible					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	See Booster Pump Information					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Bulk Water Tank 2B			Additional access hatches on tanks for cleaning/inspection purposes should be considered. (3) Water filled glass traps should be fitted to all overflows and warning pipes. (3) **Comments:** There is a deadleg to the tank drain valve, measuring approximately 0.7 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised these are included within the site flushing regime. CWST was cleaned and disinfected in July 2018 by DMA. Water filled glass traps should be fitted to all overflows and warning pipes.		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		13.5x5x2 (1.6)					
Volume (litres)		135000 (108000)					
Linked/single		Linked					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs via filter unit 2					
Services supplied		See Services Supplied in Bulk Water Tank 1A information					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
			15.8	20.3			
Internal condition	Internal	Good					
	Waterline	None visible					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		No					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted (in flange)					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	See Booster Pump Information					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

Bulk Water Booster Pump Information

Name/number of Booster Pumps	5 Bar Pump Set	**Recommendations and Comments**	**Assigned to**	**Completed**
Location	Basement Tank Room	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible a drain (and isolation valve where compliant with Water regs) should be fitted (small vessel) and vessels included in site flushing regime (3) Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable). (3)		
No. Of Pumps	5			
Vibration Couplings	No vibration coupling visible No flexible hoses visible			
Expansion Vessel	Yes 1 x small upright vessel mounted directly onto pump manifold 1 x Large upright vessel located adjacent to pumps set (no evidence of heat gain on expansion vessels)			
Drain on Vessel?	Yes - Able to be drained/flushed (large only)			
Services Supplied	Bulk Water Tanks 1A & 1B supply the 5 Bar pump set which in turn supplies plantrooms 21, 22 & 41.			

Name/number of Booster Pumps	7.7 Bar Pump Set	**Recommendations and Comments**	**Assigned to**	**Completed**
Location	Basement Tank Room	Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible a drain (and isolation valve where compliant with Water regs) should be fitted (small vessel) and vessels included in site flushing regime (3) Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable). (3)		
No. Of Pumps	5			
Vibration Couplings	No vibration coupling visible No flexible hoses visible			
Expansion Vessel	Yes 1 x small upright vessel mounted directly onto pump manifold 1 x Large upright vessel located adjacent to pumps set (no evidence of heat gain on expansion vessels)			
Drain on Vessel?	Able to be drained/flushed (large only)			
Services Supplied	Bulk Water Tanks 2A & 2B supply the 7.7 Bar pump set which in turn supplies plantrooms 31, 32 & 33.			

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Trades Water Tank 1			Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible a drain (and isolation valve where compliant with Water regs) should be fitted (small vessel) and vessels included in site flushing regime (3) Evidence of stagnation – tank cleaned in July 2018. This would suggest water turnover in the trades systems is minimal. All trades system outlets and tank should be included within site flushing regime. (2) Outlet to offline tank (2m) should be disconnected to remove deadleg or incorporate this into site flushing regime. (2) Ideally a drain should be fitted to pump manifold to allow end of lines to be flushed (if practicable). (3)		
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		2x1x1 (0.7)					
Volume (litres)		2000 (1400) litres					
Linked/single		Linked (to offline tank)					
M/U opposite draw off		Outlet on base					
Make up source		Town mains (Govan Road)					
Services supplied		Designated "non-domestic" outlets (i.e. irrigation, 12th floor heli-pad fire suppression and plantroom bib taps)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**			
		18.2	21.8	20.3			
Internal condition	Internal	Good					
	Waterline	None					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		Slight					
Deadlegs around CWST		Yes – on outlet to offline linked tank					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	Yes - 3					
	Vibration Couplings	No vibration coupling visible No flexible hoses visible					
	Expansion Vessel	Yes - upright					
	Drain on Vessel?	Able to be drained/flushed					

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Trades Water Tank 2 **(offline)**					
Location of CWST		Basement Tank plantroom					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	No			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		2x1x1					
Volume (litres)		2000 litres (empty)					
Linked/single		Linked (to online tank)					
M/U opposite draw off		Outlet on base					
Make up source		Town mains (Govan Road) – disconnected					
Services supplied		Designated "non-domestic" outlets (i.e. irrigation, 12th floor heli-pad fire suppression and plantroom bib taps)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**			
		N/A	N/A	20.3			
Internal condition	Internal	Empty					
	Waterline	Empty					
	Dirt & silt	Empty					
Water condition		Empty					
Stagnation		Empty					
Deadlegs around CWST		Yes – outlet from linked online tank to this tank					
Close fitting lid/screened vent		Yes	Fitted				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted					
Insulation		Yes - pre-fitted					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	See Trades Water Tank 1 information					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

Location	Recommendations and Comments	Assigned to	Completed
Basement Plantroom	On the Govan Road mains line to CWSTs there are two short 22mm deadlegs (one upturned, one downwards) and a 54mm connection point (upturned) prior to tank isolation valves – these should be included within site flushing regime. (2) On the Hardgate Road mains line to CWSTs there is a 54mm connection point (upturned) prior to tank isolation valves – this should be included within site flushing regime. (2) There is a deadleg to the tank drain valve (on all Raw and Bulk/Filtered water tanks), measuring 0.7 – 1.0 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – DMA advised by Estates these are included within the site flushing regime. (2) There is a link/breach pipe on the outlets prior to the filter units which can be opened to allow all tanks to supply both of the filters. This was open at time of survey, though DMA have noted this link/breach pipe closed on previous visits. This line should be opened and flushed as part of site flushing regime. (2) There are connection points/deadlegs (28mm) at low level on both of the supply lines to the filtration units form the Raw Water tanks just prior to the filtration units – these should be included within site flushing regime. (2) There is a link/breach pipe on the outlets prior to the pump sets which can be opened to allow all tanks to supply both of the pump sets. This was closed at time of survey, though DMA have noted this link/breach pipe open on previous visits. This line should be opened and flushed as part of site flushing regime. (2) There is a connection point at high level on supply line prior to inlets to filtered water tanks 1A & 1B – this should be included within site flushing regime. (2) There is a connection point on supply line (above the tanks) prior to inlets to filtered water tanks 2A & 2B – this should be included within site flushing regime. (2) There is a link/breach pipe on the outlets of the Bulk/Filter water tanks prior to the pump sets which can be opened to allow all tanks both pump sets. This was closed at time of survey, though DMA have noted this link/breach pipe open on previous visits. This line should be opened and flushed as part of site flushing regime. (2) There are connection points/deadlegs (54mm) at low level on both of the supply lines to the pump sets form the Bulk/Filtered Water tanks just prior to the pump sets – these should be included within site flushing regime. (2) There is a link pipe between the 5 bar and 7.7 Bar pipework systems after the booster sets. DMA advised previously by estates this section is drained and is in place for emergency purposes, should either of the booster sets fail to allow for water services to be maintained to the hospital. Prior to being put into use the link section should be thoroughly flushed and disinfected. (2) On the riser to Plantrooms 41/22 there is a connection point (54mm) immediately after isolation valve (DMA understand this was used to fill system directly from mains during construction phase, bypassing the filtration units) – this should be included within site flushing regime. (2)		

Section 6

Calorifiers & Associated Plantrooms

WATER SYSTEM RISK ASSESSMENT

Calorifiers (PHE's with Storage Vessels)

The calorifiers are situated in plantrooms on the 21 and 22 on the 2nd floor, plantrooms 31, 32 and 33 on the 3rd floor and plantroom 41 (Children's) on the 4th floor of the building feeding designated zones within the hospital building. See appendices 1 & 2 at end of this document which identifies which calorifiers feed which areas.

Each set of calorifiers is a bank of 3-linked calorifiers fed from the boosted Bulk Water system, with heat source being via a plate heat exchanger on the outside of each calorifier fed from the MTHW system. A circulating pump on each calorifier/plate heat exchanger ensures the water is circulated throughout each vessel to maintain temperature.

Distribution flow temperatures were consistently above 60°C, with return temperatures to calorifiers consistently above 55°C on all calorifiers (Plantroom 21 calorifiers just above 55°C), as recommended within L8/HSG 274 Part 2 and SHTM 04-01. All base temperature appeared satisfactory at time of survey also (26/09/18)

Generally water flushed from drain on calorifiers and expansion vessels ran clear either instantly or after only a very short period of time (typically <10 seconds).

Each calorifier set share a linked return which supplies all three calorifiers.

All calorifier expansion vessels are of a non-flow through type with the lines from the calorifier to each expansion vessel being approx. 2m long.

ID No./Name		P21 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 21						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Base temperature gauge on calorifier 01 appears to be reading incorrectly – this should be recalibrated or replaced. (3) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Short lines to drain/expansion vessel drains								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	61.5		62.3		62.4				
	Flow Gauge	62.0		60.0		62.0				
	Return	55.3		55.3		55.3				
	Base/Drain	62.5		62.5		63.2				
	Base Gauge	70.0		62.0		64.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 21	There is a branch from the Boosted Cold Water Services (BCWS), dropping from high level and measuring approximately 150mm of 54mm pipework. This should be removed if no longer required or included within site flushing regime. (2) The BCWS branches at high level near pumps PR21 PU03/04/05 SCW and passes through a check valve approximately 300mm from branch and runs (in what appears to be 22mm) for approximately 100m to supply humidifiers at 21AHU23 & 21AHU32(humidifiers in fault mode at time of survey). DMA advised previously all humidifiers offline and not in use. AHU lines should be removed (ensuring no deadlegs remain) if no longer required or incorporated into site flushing regime. (2) 15 mm lines branch from same line as supplying the AHUs and run approximately 50m to HTG pressurisation units (at pumps PR21 PU11/12/13 SH), with a separate branch running approximately 10m to CHW pressurisation unit (at pumps PR21 PU03/04/05 SCW). Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted to fast fill connection. (2) Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 21. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions. (3) **Note:** Connection to children's renal system is fed from the cold supply line within plantroom 21.		

ID No./Name		P22 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 22						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Evidence of heat gain in expansion vessels for calorifiers 02 and 03 (Temperatures of 40.2°C and 37.0°C recorded on shell of expansion vessels). Investigate cause of heat gain and correct. (2) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) Calorifier 03 flow temperature gauge reading incorrectly – this should be recalibrated or replaced. (3)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed Evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Short lines to drain/expansion vessel drains								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	63.3		63.6		63.0				
	Flow Gauge	64.0		64.0		100.0				
	Return	60.4		60.4		60.4				
	Base/Drain	63.0		63.0		62.5				
	Base Gauge	62.0		61.0		61.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 22	There is a branch from the Boosted Cold Water Services located at high level which measures approximately 10 metres of 54mm pipework before 1st tee off and a further 8 metres to HTG pressurisation unit. The BCWS also branches in 54mm and runs a further 8 metres before reducing to 15mm to supply CHW pressurisation unit. The BCWS branches also from cold supply at high level prior to the calorifiers and runs for approximately 40 metres through adjoining plant room areas to a fitted RPZ valve at 22AHU19 with no visible check valve fitted at tee off point. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. (2) 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. (2) Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 22. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions. (3)		

ID No./Name		P31 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 31						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) Calorifier 02 & 03 flow temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Short lines to drain/expansion vessel drains								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	61.7		61.1		60.6				
	Flow Gauge	62.0		65.0		65.0				
	Return	59.2		59.2		59.2				
	Base/Drain	61.0		62.5		63.0				
	Base Gauge	60.0		64.5		65.0				
Drain	Water Quality	Clear		Clear		Clear				

ID No./Name		P31 - 04/05/06						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 31						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Yes								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	04		05		06				
	Flow	61.5		61.7		62.8				
	Flow Gauge	62.0		61.0		64.0				
	Return	60.1		60.1		60.1				
	Base/Drain	62.0		63.0		63.0				
	Base Gauge	62.0		64.0		64.0				
Drain	Water Quality	Clear		Clear		Clear				

ID No./Name		P31 - 07/08/09						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 31						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Temperature gauges on calorifiers 08 & 09 appear to be reading incorrectly – these should be recalibrated or replaced. (3) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Short lines to drain/expansion vessel drains								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	07		08		09				
	Flow	62.3		61.6		62.4				
	Flow Gauge	62.0		50.0		70.0				
	Return	60.1		60.1		60.1				
	Base/Drain	62.3		61.0		61.2				
	Base Gauge	65.0		60.0		60.0				
Drain	Water Quality	Dirty – clear after 10 secs		Clear		Dirty – clear after 10 secs				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 31	There is a branch from the Boosted Cold Water Services located at high level above Calorifiers 31-01/02/03 which measures approximately 25 metres of 54mm pipework before 1st tee off and a further 10 metres before reducing to 15mm to supply HTG pressurisation unit at pumps PR31 PU11/12/13/14 SH. The BCWS also branches and runs for approximately 15m in 54mm and runs a further 15 metres before reducing to 15mm to supply CHW pressurisation unit at pumps 31 PU 01/02/03/04 SCW. There is a line branching at high level from the cold supply to Calorifiers 31-04/05/06 with a check valve fitted approximately 1metre from the tee off point which then runs approximately 20 metres to RPZ on supply line to MRI Chillers (emergency cooling supply), with a second branch starting just after check valve and running approximately 25 metres to Humidifier at 31AHU53 which is electrically live (though panel stating unit on "Standby"). DMA advised previously all humidifiers offline and not in use. AHU lines should be removed (ensuring no deadlegs remain) if no longer required or incorporated into site flushing regime. (2) Line to MRI Chiller should, if practicable, be switched to trades system (confirm water quality, pressure and flow rates etc. required to chiller prior to amending supply line), or line incorporated into site flushing regime. (2) Cold supply line to Calorifiers 31-04/05/06 branches as it enters Plantroom 31 at high level, through pressure reducing valves (with flexible hoses – see recommendation below) with a 54mm line running to supply the Endoscopy Wash unit (no backflow protection noted on line to Endoscopy Wash plant) and then continuing on to riser M12 where it appears to supply cold water services within the Adults Theatre area (hot services in this riser fed from Calorifiers 31-01/02/03). (2) Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. (2) 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. (2) Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 31. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions. (3)		

Location		Assigned to	Completed
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	A cold water line branches from the cold supply to calorifier 31/09. This line then splits to supply a plate heat exchanger behind the calorifiers and off in the other direction to supply a dishwasher spray wash outlet and a Horne Optitherm in the TMV/Filter Service Room. The Plate Heat Exchanger (PHE) heats the cold water and then circulates via a small pump through the PHE and around a flow and return circuit in the TMV/Filter Service Room. There are hot outlets off this line to the dishwasher spray wash outlet and the Horne Optitherm, in addition to a connection (via a switched solenoid) to the Optitherm Servicing and Thermal Disinfection Station. There is also a line for a future additional station (also connected via a switched solenoid) – though the line to this is isolated. There is an 8 litre expansion vessel fitted on the cold/hot return line, with the line to the vessel being approx. 1.5m long. The vessel does not have a drain on it to permit flushing of the vessel and the vessel is not of a flow-through design. There are check valves fitted on the cold line and the hot return line to the plate heat exchanger to prevent backflow. The Optitherm Servicing and Thermal Disinfection Station is not operational, and hasn't been in use since it as installed approximately 6 months prior to survey (Circa April 2018). This in effect is creating 2 deadlegs (one to the installed service station and one designated for future installation) of approximately 150mm. The dishwasher spray wash outlet and Horne Optitherm are in regular use by DMA, who are based in this room for filter and diffuser swap outs etc. Hot flow and return temperatures in excess of 60°C were measured at points along the flow and return circuit. Significant heat gain has been noted at the cold outlets in the TMV/Filter Service Room (up to 28°C) and cold temperatures can take up to 3 – 4 minutes to drop to temperatures consistent with other cold outlets in the building (Approx. 18°C at time of survey) Hot and cold lines are insulted in plantroom and above ceiling of the TMV/Filter Service Room, but no insulation in the actual room. **Recommendations** Expansion vessel should ideally be changed to a flow through design. (3) Optitherm Servicing and Thermal Disinfection Station (and line for future connection) should be incorporated into site flushing regime, or removed fully from use leaving no deadlegs (DMA currently flush lines daily whilst on site). (2) As the TMV/Filter Service Room is not a clinical area it is advised that insulation is fitted on hot and cold pipework as close as is practical to the outlets. This would aid in minimising heat gain in cold line to this room. (3)		

ID No./Name		P32 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 32						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible the expansion vessel should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Some temperature gauges appear to be reading incorrectly – these should be recalibrated or replaced. (3) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) There was a noted leak from the hot flow pipework on calorifier 03 with insulation saturated. This may account for the slightly low flow temp of 59.1°C. The leak should be investigated and corrected, and if necessary insulation repaired/replaced. (2)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Yes								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	63.9		63.6		59.1				
	Flow Gauge	66.0		64.0		60.0				
	Return	55.6		55.6		55.6				
	Base/Drain	62.8		62.5		63.0				
	Base Gauge	62.0		60.0		70.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 32	There is a branch from the Boosted Cold Water Services located at high level at which measures approximately 2 metres of 54mm pipework reducing to 15mm, running for 10 metres, supplying a pressurisation unit. There is a connection (54mm) line which runs to the rear of Plantroom 32 to connect into the Adults Renal System plant. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. (2) 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. (2)		

ID No./Name		P33 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 33						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. Fit caps to ends of spare circulation pump and disinfect prior to use. Calorifier temperature 01 gauge at base appears to be reading incorrectly – This should be recalibrated or replaced. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		None visible								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Yes								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	62.9		61.9		61.4				
	Flow Gauge	61.0		62.0		60.0				
	Return	59.3		59.3		59.3				
	Base/Drain	64.0		62.7		63.0				
	Base Gauge	78.0		64.0		62.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 33	There is a branch from the Boosted Cold Water Services located at high level (Near entrance to plantroom) which measures approximately 25 metres with 2 x drops of 2 metres in 54mm pipework to capped and valved off connection points and also branching and reducing to 15mm to supply pressurisation units (with no visible check valves) on the line. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. (2) 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. (2)		

ID No./Name		P41 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 41						Wherever possible/practical expansion vessels should be 'flow through' vessels and suitably insulated. Where this is not possible expansion vessels should be included in site flushing regime. (3) Fit caps to ends of spare circulation pump and disinfect prior to use. (3) Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) Unable to flush drains properly as water spraying over floor and onto AHU rather than running directly into the drain. Drain lines should be amended to ensure calorifier and expansion vessels able to be run. (2)		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW								
Make up source		CWST (Bulk)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	Yes, Appear in good condition								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Able to be drained/flushed No evidence of heat gain on expansion vessels								
Insulation		Yes								
Inspection Hatch (mm)		300mm								
Deadlegs around Calorifier		Yes								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	61.2		60.8		61.7				
	Flow Gauge	60.0		58.0		60.0				
	Return	57.0		57.0		57.0				
	Base/Drain	59.5		61.1		60.2				
	Base Gauge	60.0		62.0		62.0				
Drain	Water Quality	Unable to run		Unable to run		Unable to run				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level near 41AHU03B which runs approximately 10 metres in 15mm pipework to supply a CHW pressurisation unit. There is a branch from the Boosted Cold Water Services located at high level near 41AHU05 which runs approximately 3m to blanked valve before splitting to run to two separate HTG Pressurisation units in 15mm – a 4m line to one unit and a 15 metre line to the other unit. There is a branch from the Boosted Cold Water Services located at high level which runs approximately 8 metres and reducing 22mm. This line formerly supplied a pressurisation unit and Condair Humidification units at 41AHU27A, though these has now been disconnected, and then continued on to supply a pressurisation unit and Condair Humidification units at 41AHU27B, which have also been disconnected. There is a clear braided hose on the end of the 22mm line where it now terminates. This line should be removed if no longer required. (2) There is a branch from the Boosted Cold Water Services located at high level above 41AHU24 which measures approximately 20 metres of 15mm pipework to supply CHW pressurisation unit. There is also a 3m deadleg (15mm) to a valve from this line at 41AHU24 – this line should be removed if no longer required or incorporated into the site flushing regime. (2) Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. (2) 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. (2)		

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

Calorifier Wards and Areas supplied

Plantroom 21

Calorifiers 01, 02 & 03[1]	
Level	**Department**
Level 0	RHSC Emergency Department
Level 0	ADULTS Emergency Department
Level 0	ADULTS Acute Assessment
Level 1	ADULTS CCU
Level 1	ADULTS Critical Care

Plantroom 22

Calorifiers 01, 02 & 03[1]	
Level	**Department**
Level -1	FM and Kithcen
Level 0	ADULTS Discharge Lounge
Level 0	ADULTS OPD
Level 0	ADULTS Rehab and Therapies
Level 0	ADULTS Entrance
Level 0	ADULTS Retail
Level 0	ADULTS Snack Bar
Level 0	ADULTS Radiology
Level 0	ADULTS Pharmacy
Level 0	Medical Illlustration
Level 1	ADULTS OPD
Level 1	ADULTS Restaurant Visitors Dining and Coffee Lounge
Level 1	Nuclear Medicine
Level 1	RHSC Theatres
Level 1	RHSC Radiology & Interventional Radiology
Level 2	ADULTS Renal Dialysis OPD
Level 2	ADULTS Renal Dermatology OPD
Level 2	ADULTS Theatres
Level 2	ADULTS Endoscopy
Level 2	Female Change (Core D)

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

Plantroom 31

Calorifiers 01, 02 & 03[1]	
Level	**Department**
Level 0	ADULTS Acute Assessment
Level 1	ADULTS MDU
Level 1	ADULTS Stroke Ward
Level 2	ADULTS Theatres

Calorifiers 04, 05, 06[1]	
Level	**Department**
Level 4	ADULTS Haemo Oncology Ward
Level 4	ADULTS Core C Regen Kitchen
Level 5	ADULTS ENT Ward
Level 5	ADULTS Core C Regen Kitchen
Level 6	ADULTS Generic Ward
Level 6	ADULTS Core C Regen Kitchen
Level 7	ADULTS Generic Ward
Level 7	ADULTS Core C Regen Kitchen
Level 8	ADULTS Generic Ward
Level 8	ADULTS Core C Regen Kitchen
Level 9	ADULTS Generic Ward
Level 9	ADULTS Core C Regen Kitchen
Level 10	ADULTS Generic Ward
Level 10	ADULTS Core C Regen Kitchen
Level 11	ADULTS Generic Ward
Level11	ADULTS Core C Regen Kitchen

Calorifiers 07, 08, 09[1]	
Level	**Department**
Level 4	ADULTS Renal Ward
Level 5	ADULTS ENT Ward
Level 5	ADULTS Core C Regen Kitchen
Level 6	ADULTS Generic Ward
Level 6	ADULTS Core C Regen Kitchen
Level 7	ADULTS Generic Ward
Level 7	ADULTS Core C Regen Kitchen
Level 8	ADULTS Generic Ward
Level 8	ADULTS Core C Regen Kitchen
Level 9	ADULTS Generic Ward
Level 9	ADULTS Core C Regen Kitchen
Level 10	ADULTS Generic Ward
Level 10	ADULTS Core C Regen Kitchen
Level 11	ADULTS Generic Ward
Level11	ADULTS Core C Regen Kitchen

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

Plantroom 32

Calorifiers 01, 02, 03[1]	
Level	**Department**
Level 3	ADULTS Public Health Records
Level 4	ADULTS Higher Acute Renal Ward
Level 4	ADULTS Dirty Core D
Level 5	ADULTS Rheumatology Ward
Level 5	ADULTS Dirty Core D
Level 6	ADULTS General Ward
Level 6	ADULTS Dirty Core D
Level 7	ADULTS General Ward
Level 7	ADULTS Dirty Core D
Level 8	ADULTS General Ward
Level 8	ADULTS Dirty Core D
Level 9	ADULTS General Ward
Level 9	ADULTS Dirty Core D
Level 10	ADULTS General Ward
Level 10	ADULTS Dirty Core D
Level 11	ADULTS General Ward
Level 11	ADULTS Dirty Core D

Plantroom 33

Calorifiers 01, 02, 03[1]	
Level	**Department**
Level 4	ADULTS Renal Ward
Level 5	ADULTS General Ward
Level 6	ADULTS General Ward
Level 7	ADULTS General Ward
Level 8	ADULTS General Ward
Level 9	ADULTS General Ward
Level 10	ADULTS General Ward
Level 11	ADULTS General Ward

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

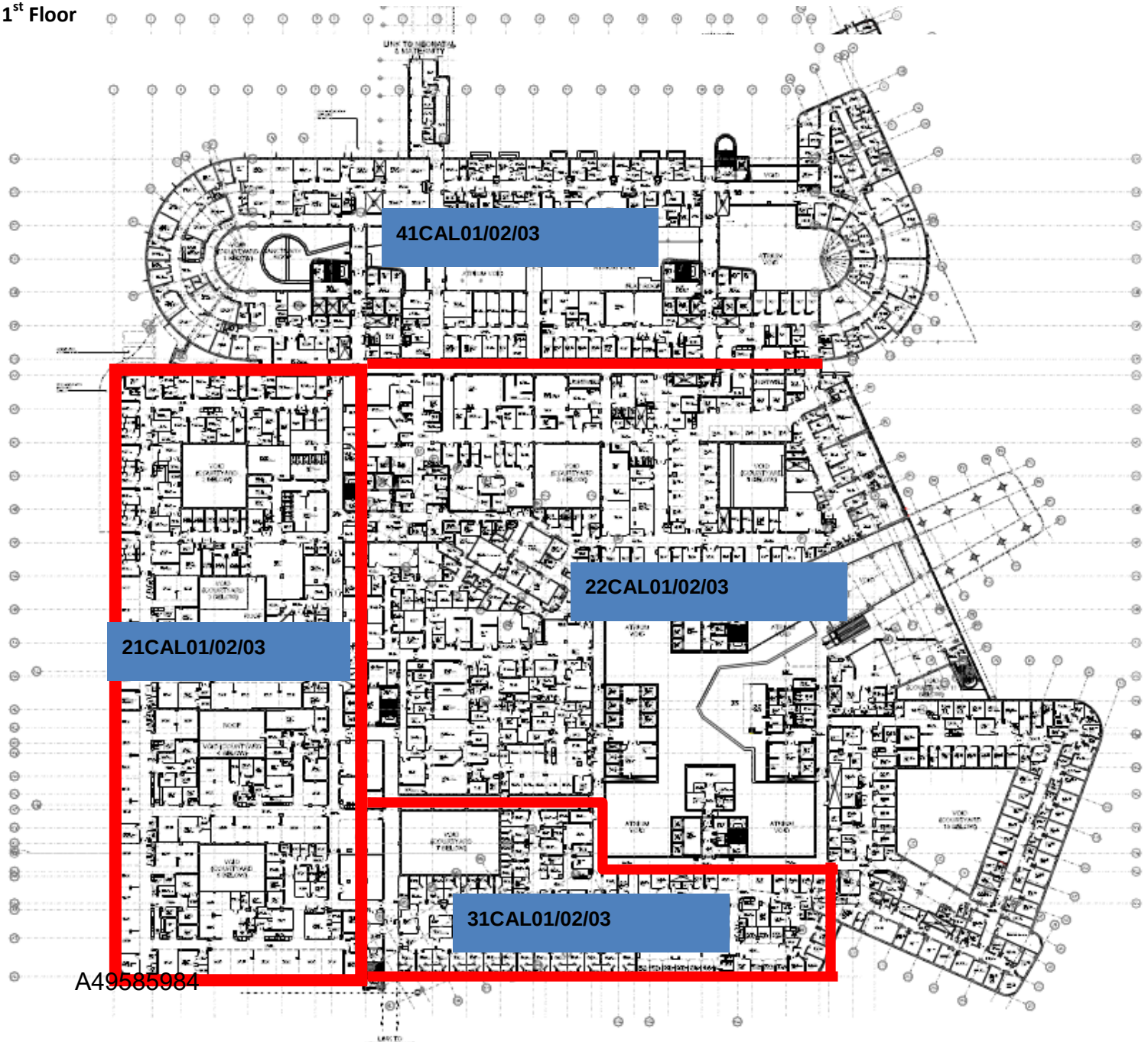
Plantroom 41 (Children's)

Calorifiers 01, 02, 03[1]	
Level	**Department**
Level 0	NSH Public Observation Ward
Level 0	RHSC Sanctuary/Child Protection Unit
Level 0	RHSC OPD
Level 0	RHSC Support
Level 0	Retail Unit and Snack Bar
Level 1	RHSC Critical Care (PICU)
Level 1	RHSC PICU Support
Level 1	RHSC MDU
Level 1	RHSC Theatres
Level 1	RHSC Special Feeds
Level 1	RHSC Cardiology Ward
Level 1	RHSC 23 Hours Unit
Level 2	RHSC Acute Receiving Ward
Level 2	Aseptic Suite
Level 2	RHSC Day Case Unit
Level 2	RHSC Schiehallion Ward
Level 2	RHSC Ward Support
Level 2	RHSC Teenage Cancer Trust
Level 3	RHSC Inpatient Ward
Level 3	RHSC Ward Support
Level 3	RHSC Generic Ward
Level 4	RHSC DCFP

[1] Information as to which zones/wards supplied by each calorifier set is as provided by Mercury/Brookfield and NHS GG&C.

Section 6 Appendix 2 - Distributions Zone Map

Ground Floor
1st Floor



PLantroom 41 Calorifiers 01, 02 & 03

Level	Department
Level 0	RHSC Public Observation Ward
Level 0	RHSC Sanctuary/Child Protection Unit
Level 0	RHSC OPD
Level 0	RHSC Support
Level 0	Retail Unit and Snack Bar

PLantroom 21 Calorifiers 01, 02 & 03

Level	Department
Level 0	RHSC Emergency Department
Level 0	Emergency Department
Level 0	Acute Assessment

PLantroom 22 Calorifiers 01, 02 & 03

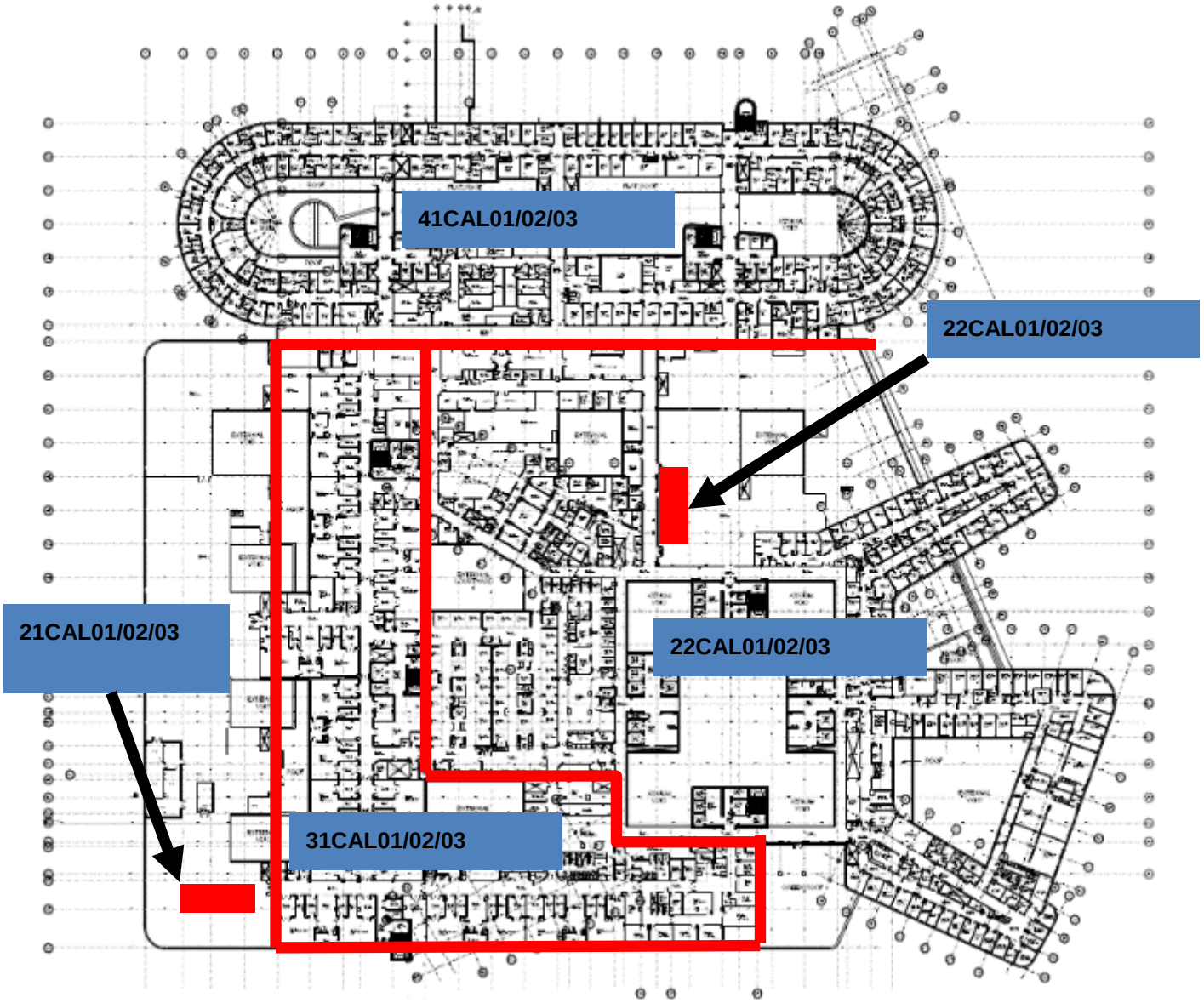
Level	Department
Level -1	FM and Kitchen
Level 0	Discharge Lounge
Level 0	OPD
Level 0	Rehab and Therapies
Level 0	Entrance
Level 0	Retail
Level 0	Snack Bar
Level 0	Radiology
Level 0	Pharmacy
Level 0	Medical Illustration

PLantroom 31 Calorifiers 01, 02 & 03

Level	Department
Level 0	Acute Assessment

Section 6 Appendix 2 - Distributions Zone Map

2nd Floor



PLantroom 41 Calorifiers 01, 02 & 03

Level	Department
Level 2	RHSC Acute Receiving Ward
Level 2	Aseptic Suite
Level 2	RHSC Day Case Unit
Level 2	RHSC Schiehallion Ward
Level 2	RHSC Ward Support

PLantroom 22 Calorifiers 01, 02 & 03

Level	Department
Level 2	Renal Dialysis OPD
Level 2	Renal Dermatology OPD
Level 2	Theatres
Level 2	Endoscopy
Level 2	Female Change (Core D)

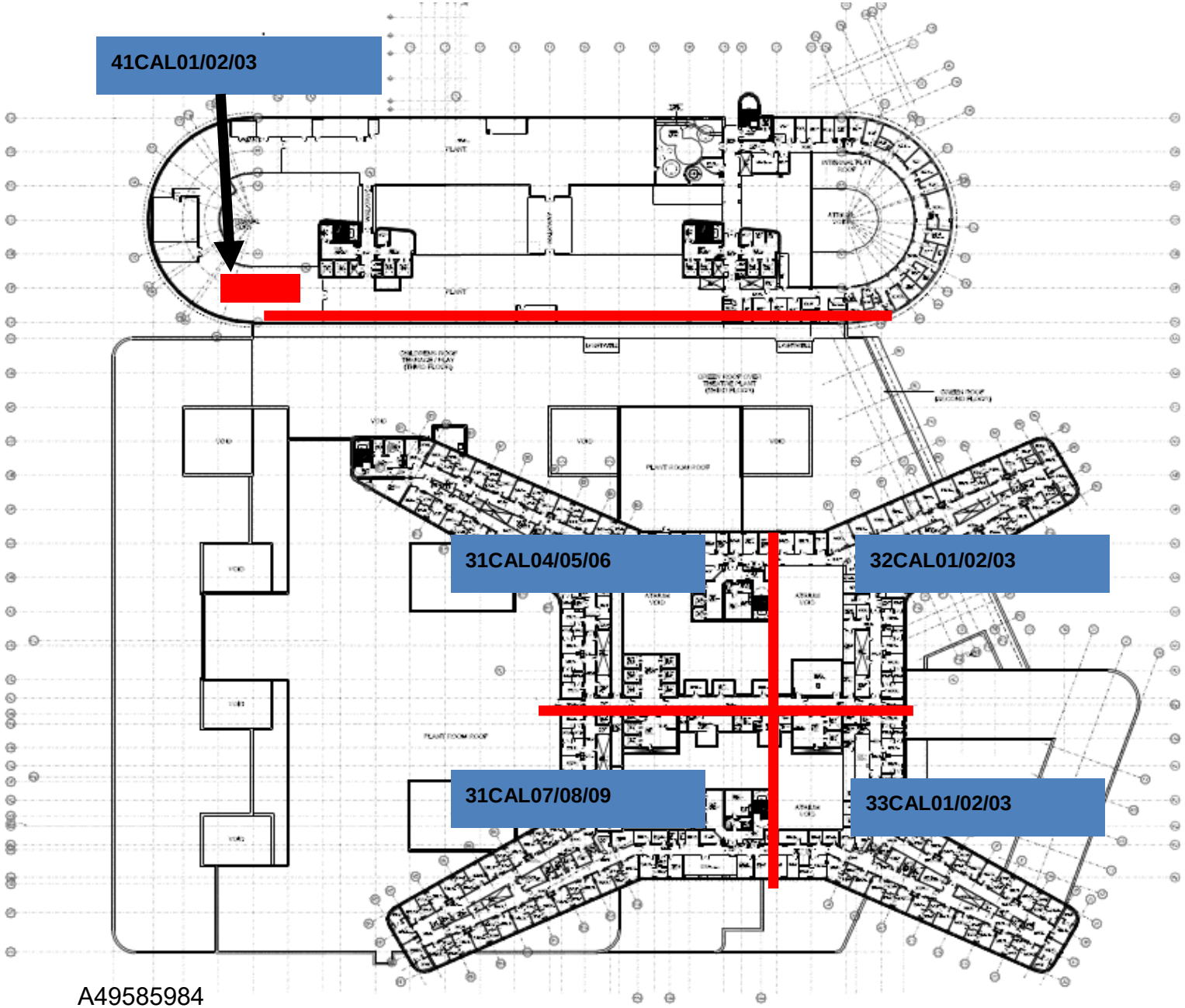
PLantroom 31 Calorifiers 01, 02 & 03

Level	Department
Level 2	ADULTS Theatres

A49585984

Section 6 Appendix 2 - Distributions Zone Map

3rd Floor



PLantroom 41 Calorifiers 01, 02 & 03

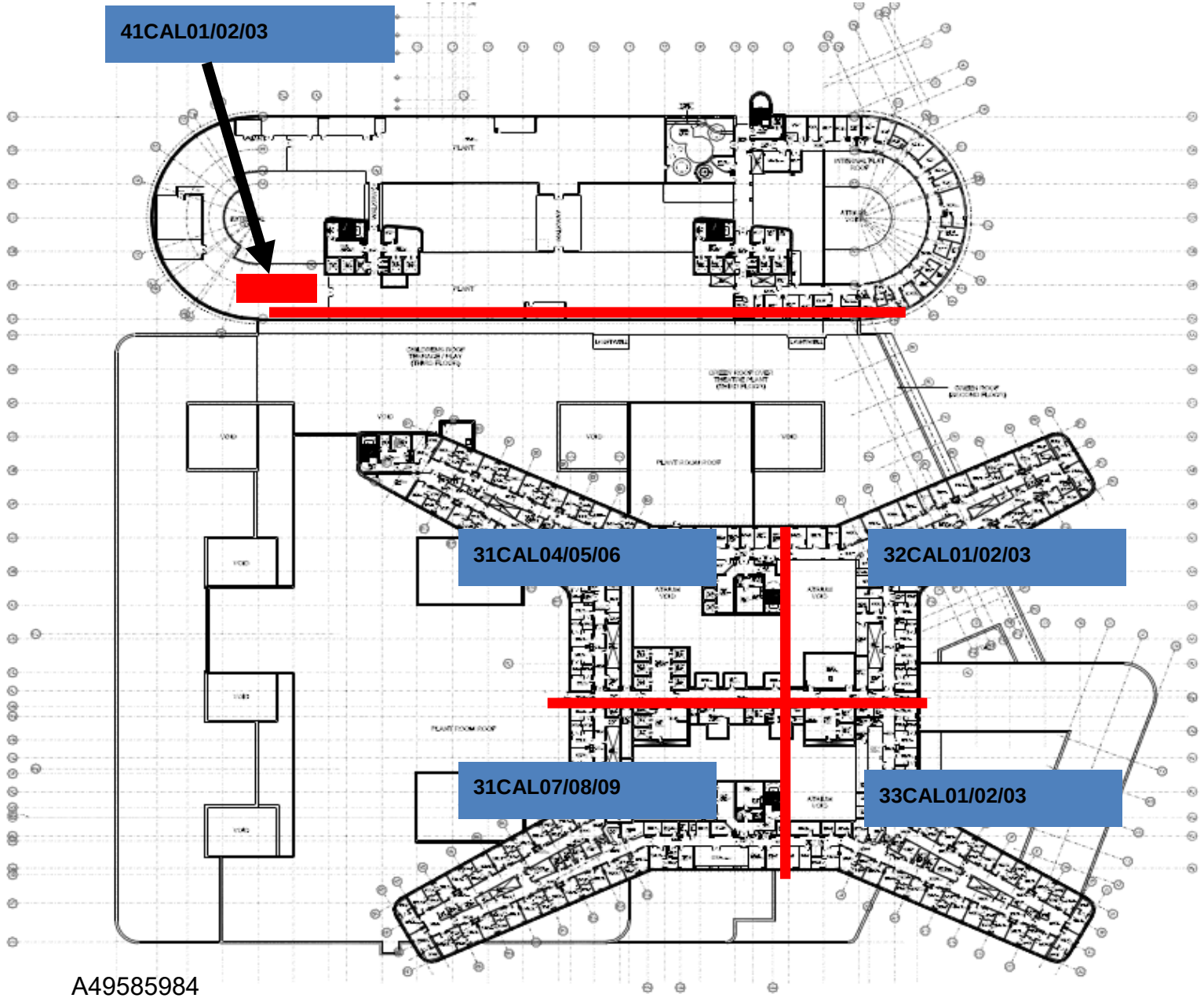
Level	Department
Level 3	RHSC Inpatient Ward
Level 3	RHSC Ward Support
Level 3	RHSC Generic Ward

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 3	Public Health Records

Section 6 Appendix 2 - Distributions Zone Map

4th Floor



troom 41 Calorifiers 01, 02 & 03

l	Department
4	RHSC DCFP

troom 32 Calorifiers 01, 02 & 03

l	Department
4	Higher Acute Renal Ward
4	ADULTS Dirty Core D

troom 31 Calorifiers 04, 05 & 06

l	Department
4	Haemo Oncology Ward
4	ADULTS Core C Regen Kitchen

troom 31 Calorifiers 07, 08 & 09

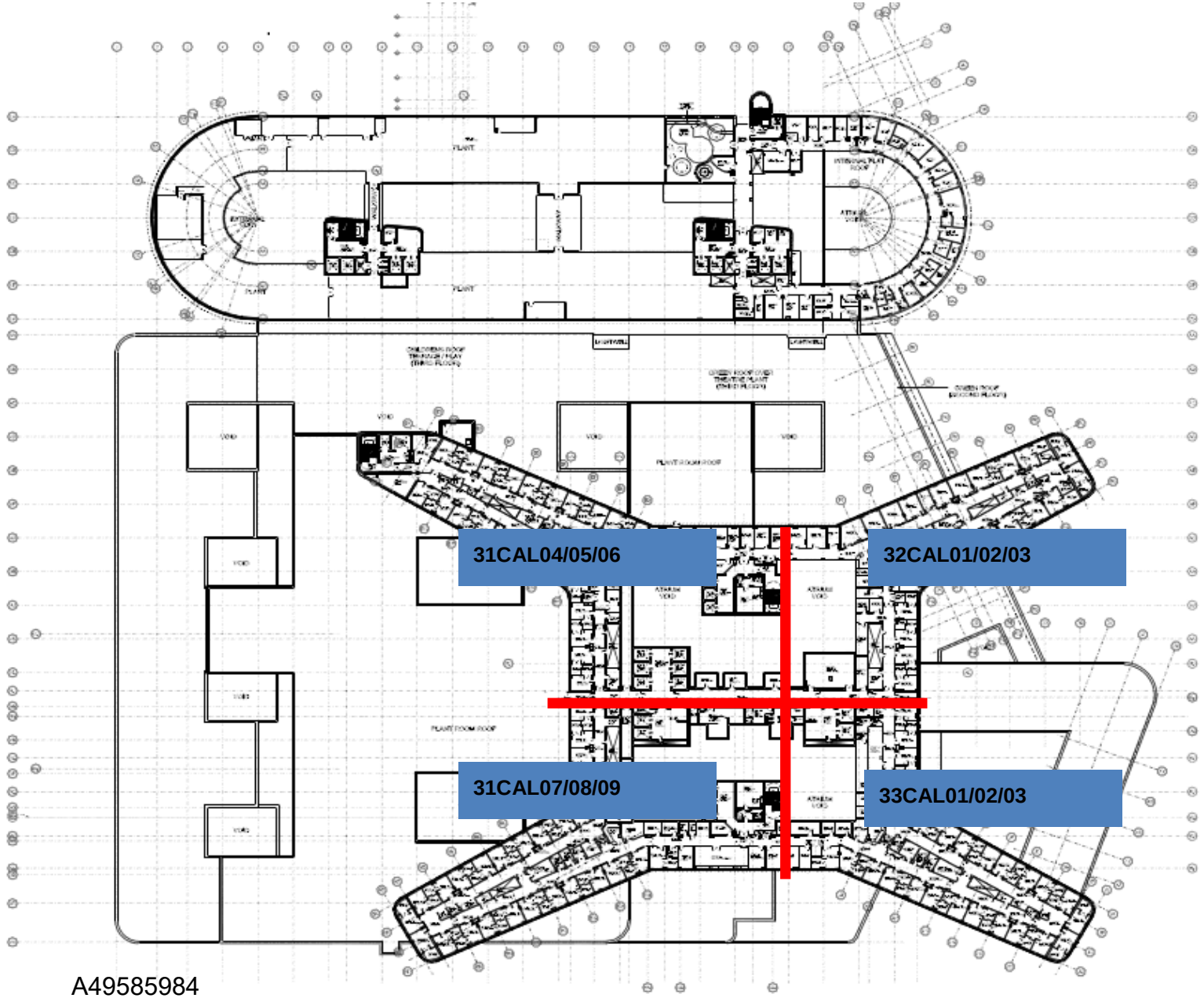
l	Department
4	Renal Ward

AL 01, 02 & 03

l	Department
4	Renal Ward

Section 6 Appendix 2 - Distributions Zone Map

5th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
5	Rheumatology Ward
5	Dirty Core D

troom 31 Calorifiers 04, 05 & 06

l	Department
5	ENT Ward
5	Core C Regen Kitchen

troom 31 Calorifiers 07, 08 & 09

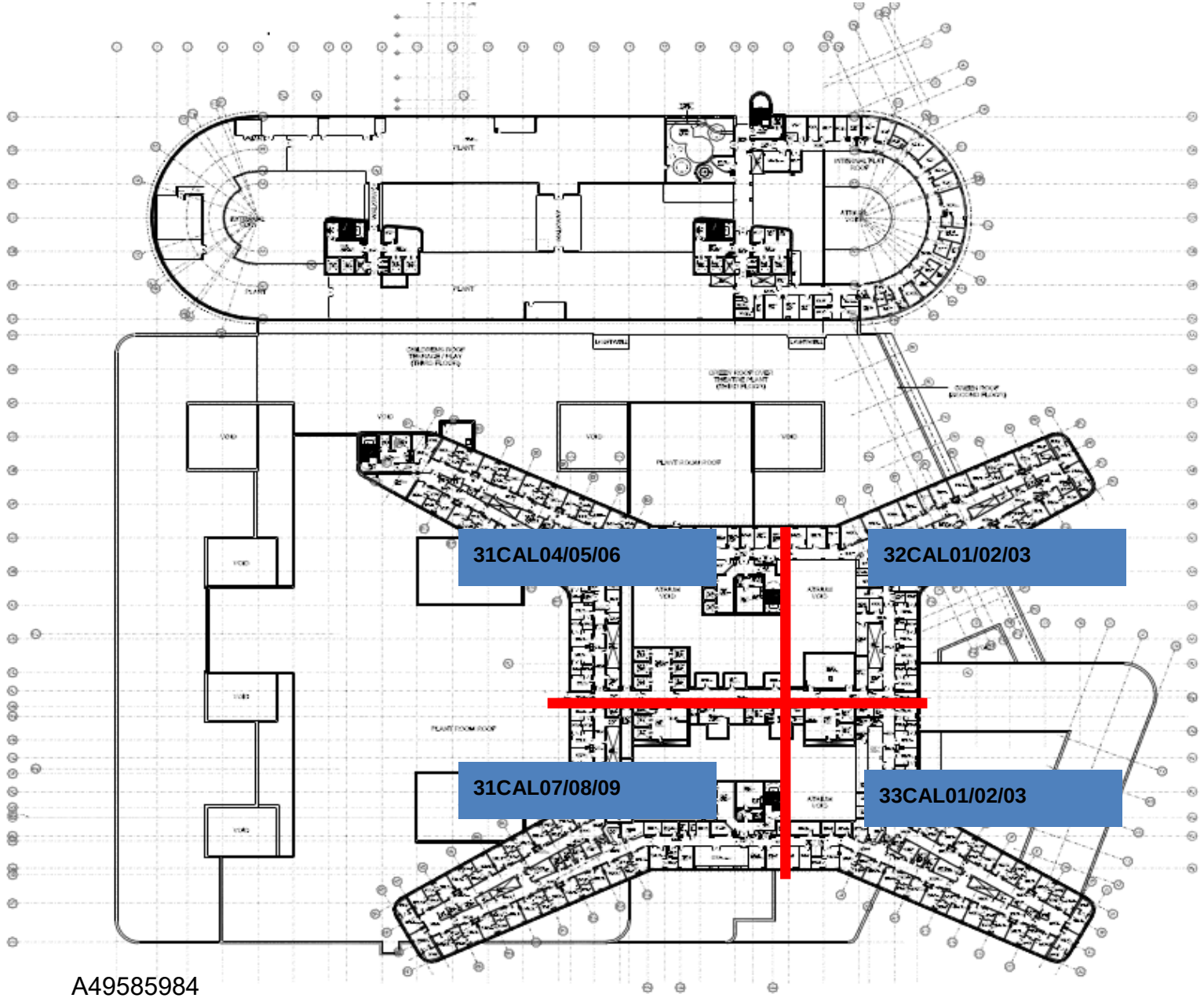
l	Department
5	ENT Ward
5	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
5	General Ward

Section 6 Appendix 2 - Distributions Zone Map

6th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
6	General Ward
6	Dirty Core D

troom 31 Calorifiers 04, 05 & 06

l	Department
6	Generic Ward
6	Core C Regen Kitchen

troom 31 Calorifiers 07, 08 & 09

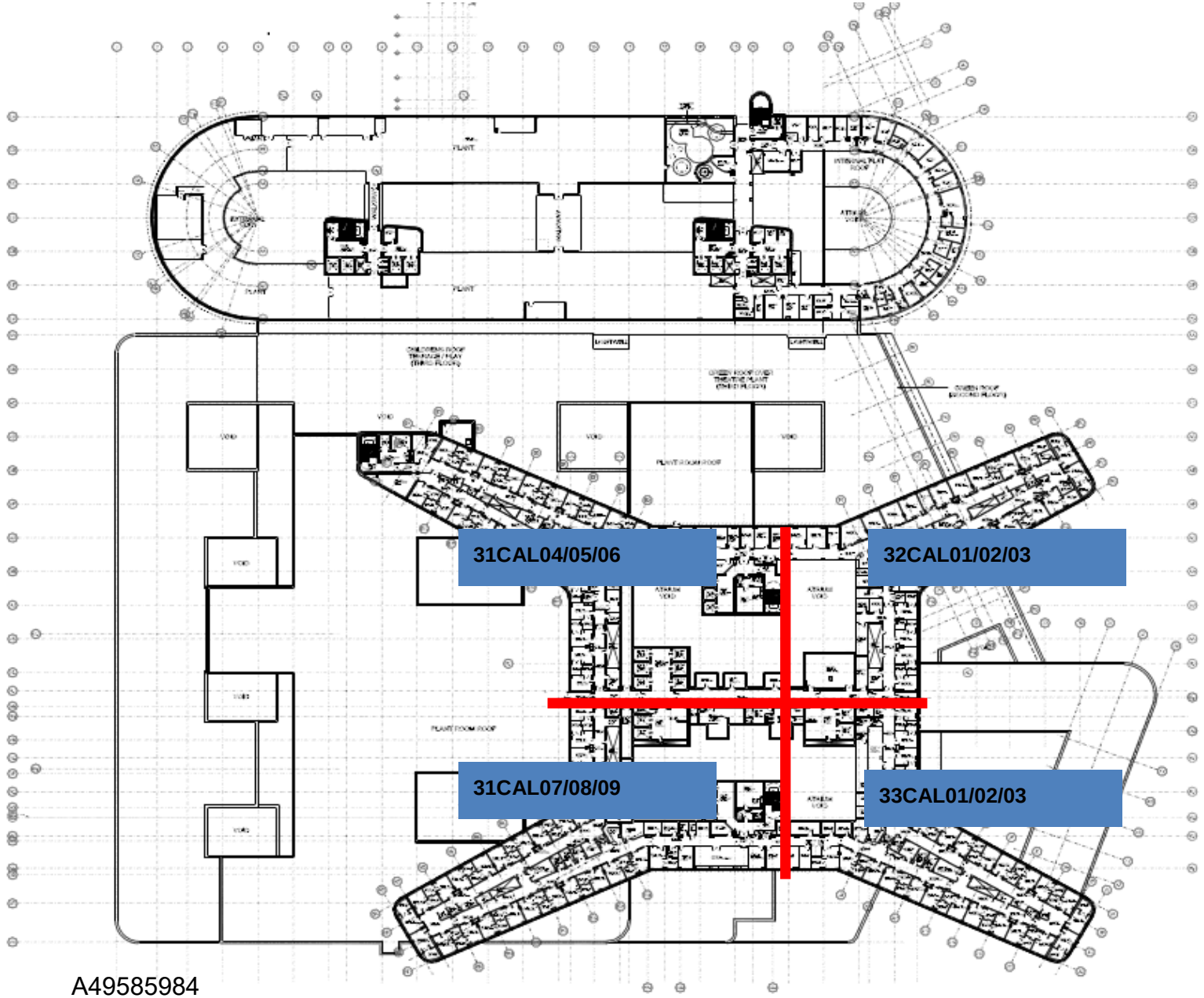
l	Department
6	Generic Ward
6	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
6	General Ward

Section 6 Appendix 2 - Distributions Zone Map

7th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
7	Generic Ward
7	Core C Regen Kitchen

troom 31 Calorifiers 04, 05 & 06

l	Department
7	General Ward
7	Dirty Core D

troom 31 Calorifiers 07, 08 & 09

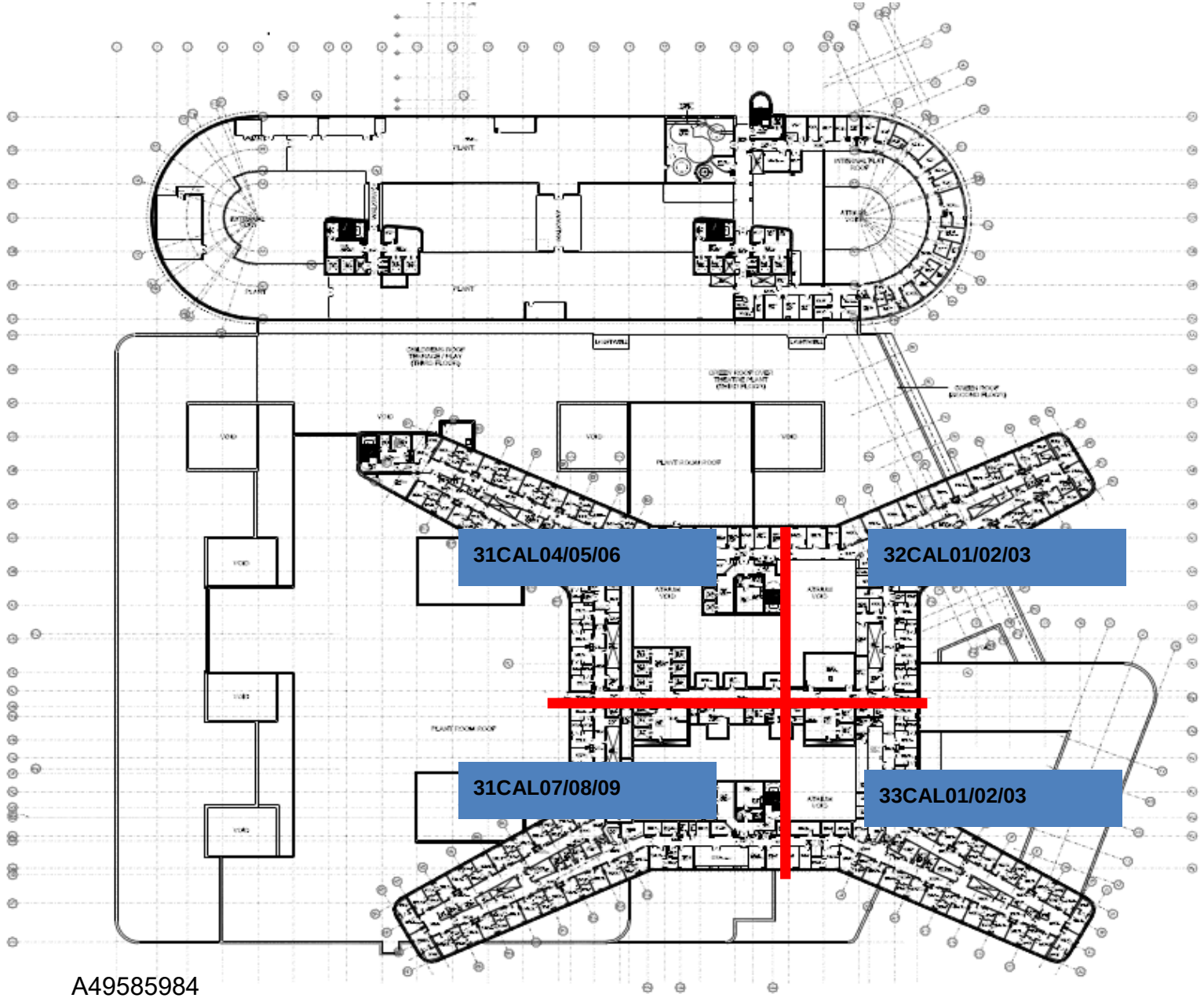
l	Department
7	Generic Ward
7	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
7	General Ward

Section 6 Appendix 2 - Distributions Zone Map

8th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
8	Generic Ward
8	Core C Regen Kitchen

troom 31 Calorifiers 04, 05 & 06

l	Department
8	General Ward
8	Dirty Core D

troom 31 Calorifiers 07, 08 & 09

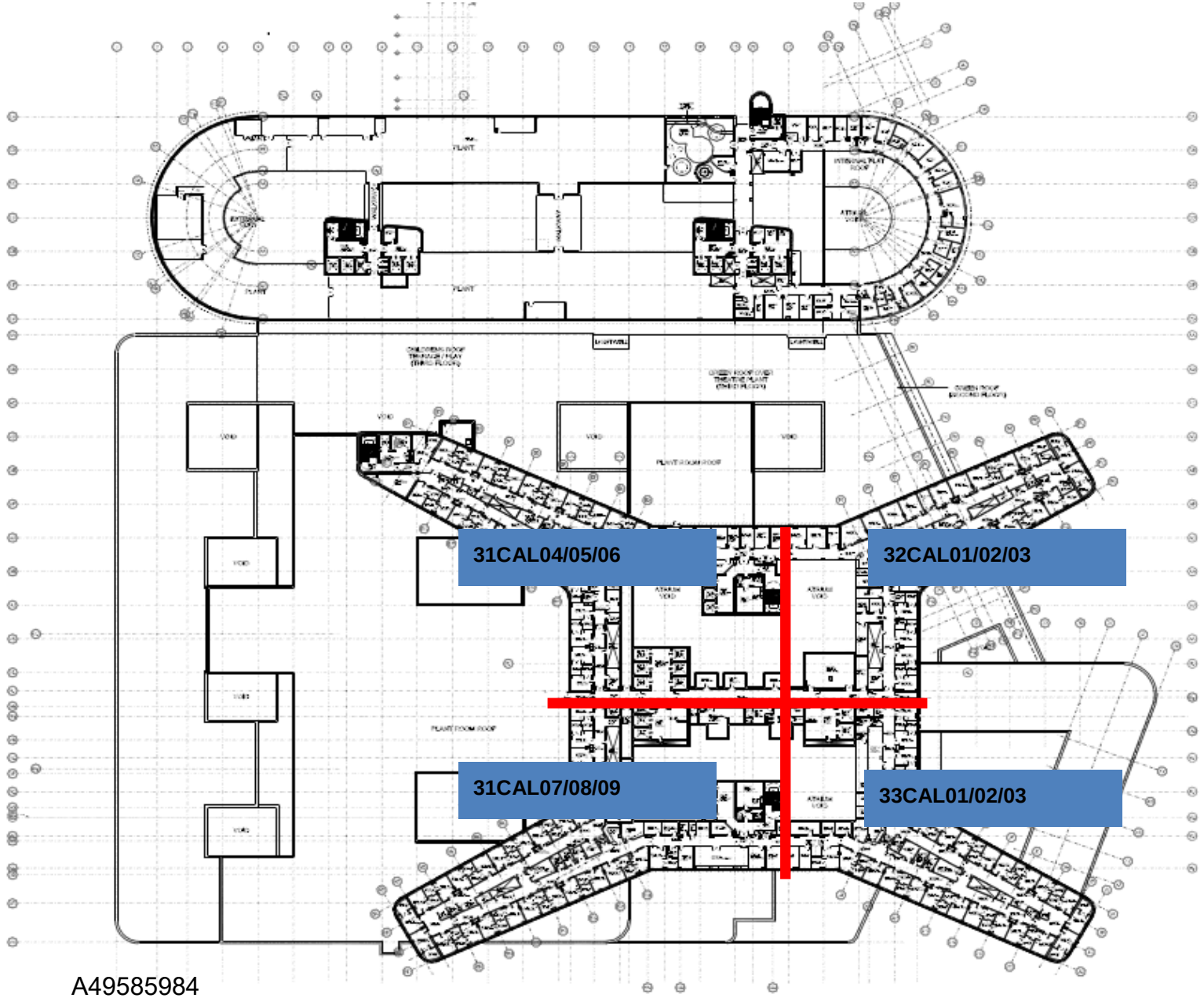
l	Department
8	Generic Ward
8	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
8	General Ward

Section 6 Appendix 2 - Distributions Zone Map

9th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
9	Generic Ward
9	Core C Regen Kitchen

troom 31 Calorifiers 04, 05 & 06

l	Department
9	General Ward
9	Dirty Core D

troom 31 Calorifiers 07, 08 & 09

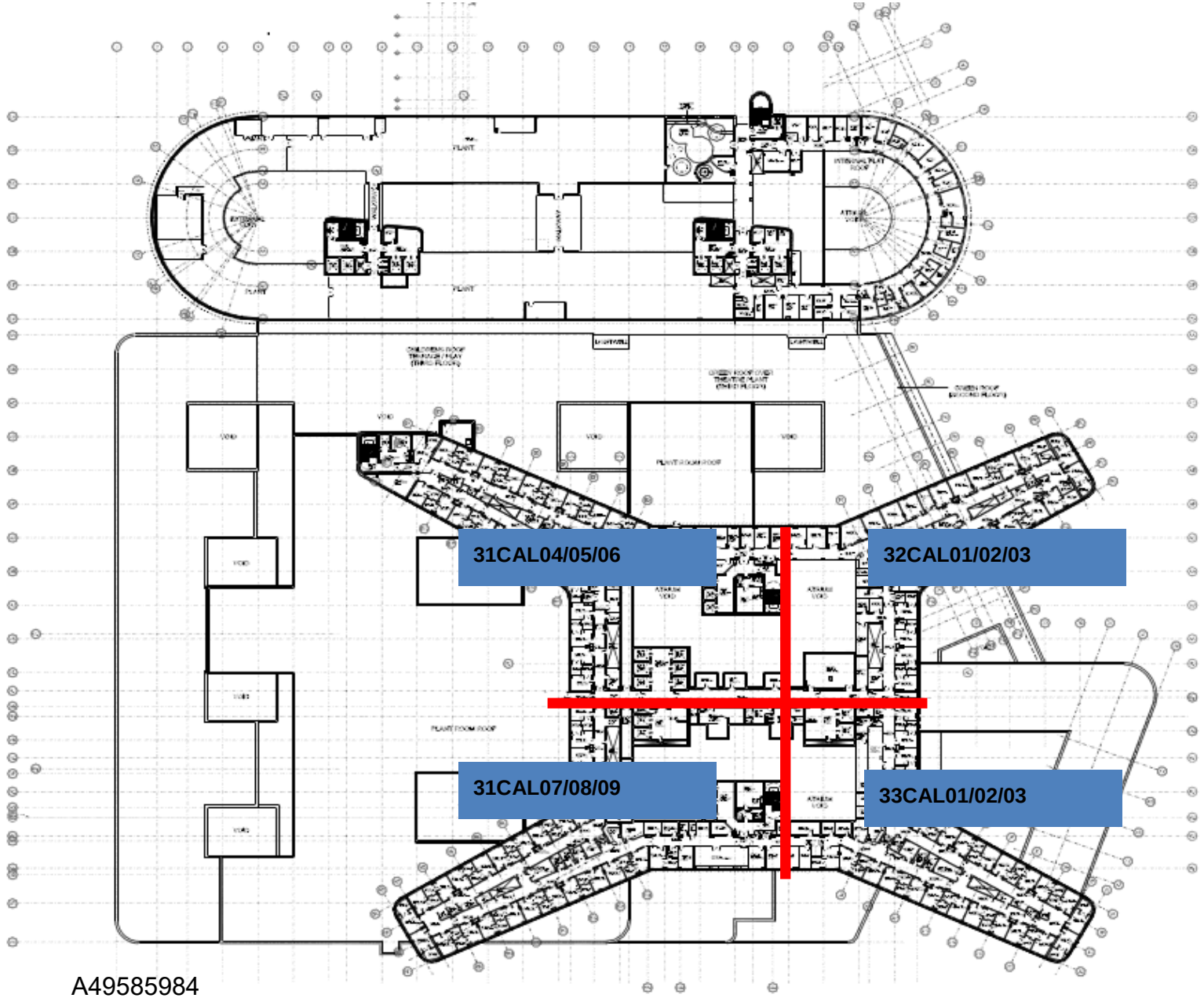
l	Department
9	Generic Ward
9	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
9	General Ward

Section 6 Appendix 2 - Distributions Zone Map

10th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
10	Generic Ward
10	Core C Regen Kitchen

troom 31 Calorifiers 04, 05 & 06

l	Department
10	General Ward
10	Dirty Core D

troom 31 Calorifiers 07, 08 & 09

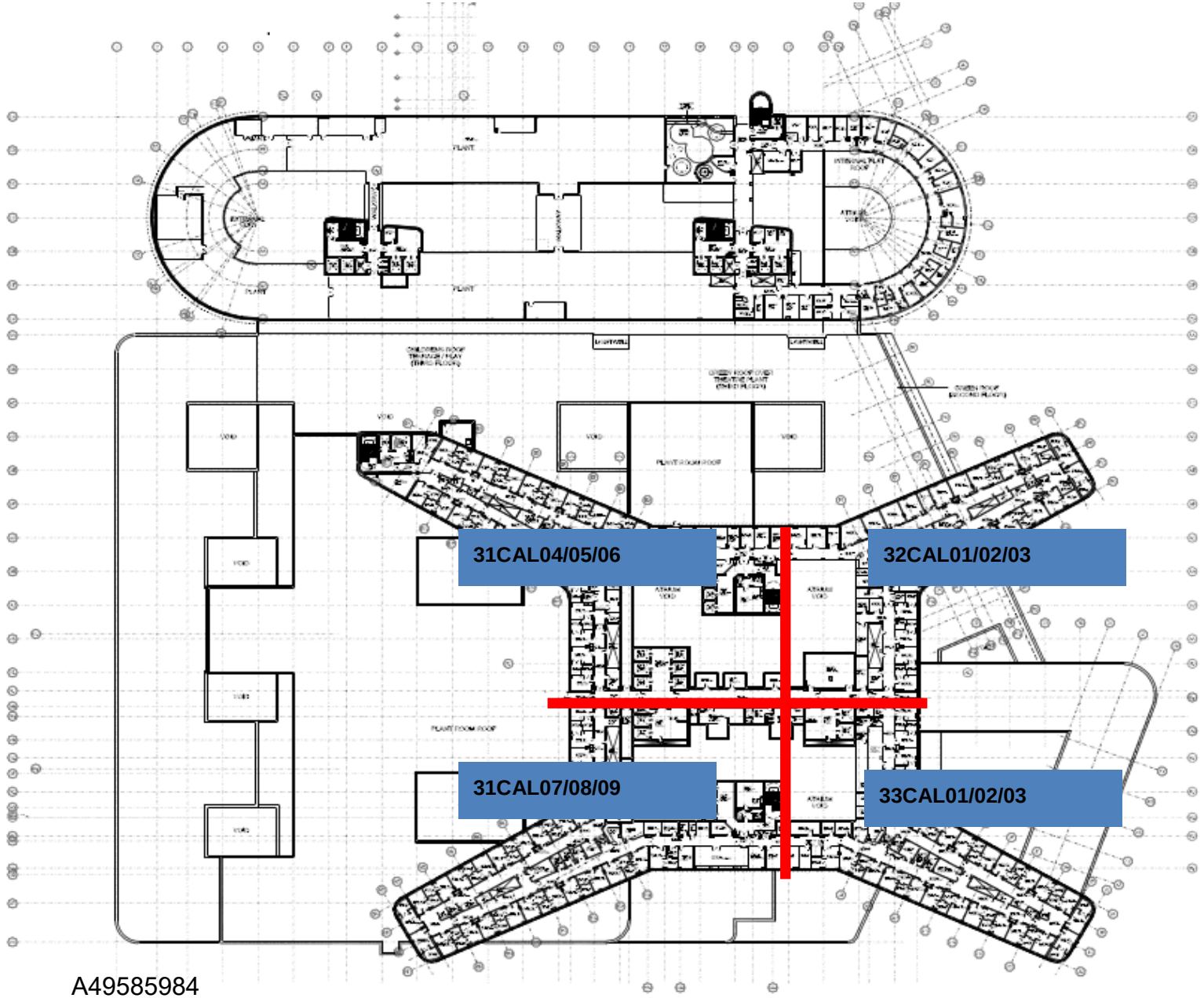
l	Department
10	Generic Ward
10	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
10	General Ward

Section 6 Appendix 2 - Distributions Zone Map

11th Floor



A49585984

troom 32 Calorifiers 01, 02 & 03

l	Department
11	Generic Ward
11	Core C Regen Kitchen

troom 31 Calorifiers 04, 05 & 06

l	Department
11	General Ward
11	Dirty Core D

troom 31 Calorifiers 07, 08 & 09

l	Department
11	Generic Ward
11	Core C Regen Kitchen

AL 01, 02 & 03

l	Department
11	General Ward

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
21	0	M1	Acute Assess	AAW-163 (Toilet)	Yes	Daily	51.9	17.6	Pipework	None visible	Not visible	None visible			Hot temperature too low - investigate and correct (including local flow and return working correctly).
21	0	M1	Acute Assess	AAW-193 (Toilet)	Yes	Daily	55.3	19.1	Pipework	None visible	Not visible	None visible			
21	0	M1	Acute Assess	AAW-208 (Dirty Utility)	Yes	Daily	49.6	16.4	Pipework	None visible	Not visible	None visible		Required 4 additional minutes to reach 55.6	Hot temperature too low - investigate and correct (including local flow and return working correctly).
21	0	M1	Acute Assess	AAW-226 (Lab)	Yes	Daily	58.1	12.6	Pipework	None visible	Not visible	None visible	Yes		
21	0	M1	Acute Assess	AAW-240 (Toilet)	Yes	Daily	56.6	13.3	Pipework	None visible	Not visible	None visible		Possible small leak at valve/strainer. Cold pipework insulation damp	potential leak should be investigated and repaired and insulation/duct area dried out and cleaned as required under infection control protocols.
21	0	M1	Acute Assess	AAW-265 (Bedroom)	Yes	Daily	58.7	13.1	Pipework	None visible	Not visible	None visible	Yes		
21	0	M1	Acute Assess	AAW-306 (Toilet)	Yes	Daily	56.1	16.9	Pipework	None visible	Not visible	None visible			
21	0	M1	Acute Assess	AAW-313 (Facilities)	Yes	Daily	62.3	14.2	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
21	0	M1	Acute Assess	AAW-334 (Bathroom)	Yes	Daily	55.4	19.1	Pipework	None visible	Not visible	None visible			
21	0	M1	Acute Assess	AAW-375 (Bedroom)	Yes	Daily	58.1	17.3	Pipework	None visible	Not visible	None visible	Yes		
21	0	M5	Decontam ination	DCU-003 (Wet Room)	Yes	Rarely	56.4	18.3	Pipework	None visible	Not visible	None visible		Area appears to be rarely used	Ensure outlet is added to a little used flushing regime
21	0	M5	A&E	EMC-037 (Toilet)	Yes	Daily	55.7	14.3	Pipework	None visible	Not visible	None visible		No insulation on 1m of hot and cold pipework. Tap cannot be fully opened due to position.	Pipework should be suitably insulated. Adjust position of tap to ensure tap can be fully opened during flushing.
21	0	M5	A&E	EMC-041 (Toilet)	Yes	Daily	58.5	11.9	Pipework	None visible	Not visible	None visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
21	0	M5	A&E	EMC-086 (Facilities)	Yes	Daily	57.3	13.5	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
21	0	M5	A&E	EMC-093 (Bed Bay 14)	Yes	Daily	55.3	14.1	Pipework	None visible	Not visible	None visible	Yes		
21	0	M5	A&E	EMC-100 (Service)	Yes	Daily	58.4	17.2	Pipework	None visible	Not visible	None visible			
21	0	M5	A&E	EMC-111 (Female Change)	Yes	Daily	56.1	14.1	Pipework	None visible	Not visible	None visible			
21	0	M5	A&E	EMC-135 (Store)	Yes	Daily	57.2	12.2	Pipework	None visible	Not visible	None visible			
21	0	M6	A&E	EMC-006 (Toilet)	Yes	Daily			Pipework	Yes	Not visible	None visible		Only a water cooler and a deadleg in this location. Deadleg is from a removed water cooler	Ensure deadleg pipework is included in a little used flushing schedule. If outlet is no longer required ensure it is removed along with all redundant pipework back to the branch point
21	0	M6	A&E	EMC-059 (Bed Bay 5)	Yes	Daily	56.4	12.4	Pipework	None visible	Not visible	None visible	Yes		
21	0	M6	A&E	EMC-060 (Bed Bay 6)	Yes	Daily	56.8	12.8	Pipework	None visible	Not visible	None visible	Yes		
21	0	M6	A&E	EMC-063 (Bed Bay 8)	Yes	Daily	58.1	14.9	Pipework	None visible	Not visible	None visible	Yes		
21	0	M6	A&E	EMC-076 (Bed Bay 12)	Yes	Daily	55.6	16.2	Pipework	None visible	Not visible	None visible	Yes	Sink backing up slightly	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
21	0		Children's A&E	EMC-056 (Bed Bay 9)		Daily	56.7	14.4	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel EMC-059 (Bed Bay 6) in use so adjacent outlet tested.	
21	0		Children's A&E	EMC-085 (Bed Bay 4)		Daily	54.0	16.1	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel EMC-060 (Bed Bay 5) in use so adjacent outlet tested.	Hot temperature too low - investigate and correct (including local flow and return working correctly).
21	0		Children's A&E	EMC-100 (Triage)	Yes	Daily	56.8	12.8	Pipework	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
21	0		Children's A&E	Prep Room EMC-067	Yes	Daily	51	14	Pipework	None Visible	Not Visible	None Visible	Yes		Hot temperature too low - investigate and correct (including local flow and return working correctly).
21	1	M1	Critical Care	CCW-017 (Facilities)	Yes	Daily	60.6	11.5	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
21	1	M1	Critical Care	CCW-029 (Toilet)	Yes	Daily	58.8	13.3	Pipework	None visible	Not visible	None visible			
21	1	M1	Critical Care	CCW-023 (Dirty Utility)	Yes	Daily	56.1	14.1	Pipework	None visible	Not visible	None visible		No access to CCW-048 (Bed Bay 1) temperatures taken from CCW-023 Dirty utility	
21	1	M1	Critical Care	CCW-100 (Clean Utility)	Yes	Daily	58.1	15.4	Direct Hot and Cold Taps	None visible	Not visible	None visible		No access to CCW-087, temperatures taken from Clean utility CCW-100	
21	1	M1	Critical Care	CCW-093 (Lab)	Yes	Daily	59.8	13.4	Pipework	None visible	Not visible	None visible		No access to CCW-089 (Bed Bay 38), temperatures taken from CCW-093 Lab	
21	1	M1	Critical Care	CCW-101 (Dirty Utility)	Yes	Daily	59.1	17.2	Pipework	None visible	Not visible	None visible		No access to CCW-092 (Bed Bay 40), temperatures taken from dirty utility CCW-101	
21	1	M1	Critical Care	CCW-017 (Facilities)	Yes	Daily	59.5	14.3	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink		No access to CCW-109 (Bed Bay 26), temperatures taken from Facilities CCW-017	EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
21	1	M1	Critical Care	CCW-126 (Dirty Utility)	Yes	Daily	50.4	15.8	Pipework	None visible	Not visible	None visible		No insulation on 0.5m of hot and cold pipework	Hot temperature too low - investigate and correct (including local flow and return working correctly). Fit suitable insulation to all sections of uninsulated pipework
21	1	M1	Critical Care	CCW-130 (Service)	Yes	Daily	50.1	15.1	Pipework	None visible	Not visible	None visible		No insulation on 0.5m of hot and cold pipework	Hot temperature too low - investigate and correct (including local flow and return working correctly). Fit suitable insulation to all sections of uninsulated pipework
21	1	M5	Critical Care	CCW-131 (Pharmacy Support)	Yes	Daily	55.6	14.4	Pipework	None visible	Not visible	None visible			
21	1	M5	Critical Care	CCW-149 (Pantry)	Yes	Daily	58.8	12.9	Direct Hot and Cold Taps	None visible	Not visible	None visible		No access to CCW-141, temperatures taken from CCW-149 Pantry	
21	1	M5	Critical Care	CCW-200 (Facilities)	Yes	Daily	63.5	10.3	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
21	1	M5	Critical Care	CCW-202 (Toilet)	Yes	Daily	58.7	14.5	Pipework	None visible	Not visible	None visible			
21	1	M5	Critical Care	CCW-214 (Male Change)	Yes	Daily	56.8	11.9	Pipework	None visible	Not visible	None visible			
21	1	M6	Critical Care	CCU-004 (Patients Pantry)	Yes	Daily	63.1	14.5	Direct Hot and Cold Taps	None visible	Not visible	Yes on dish washer		Copper tail to IR tap	EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
21	1	M6	Critical Care	CCU-036 (Bedroom) Room 65	Yes	Daily	56.1	18.7	Pipework	None visible	Not visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	-1		Stores	FMB 010	Yes	Daily	62.2	17.6	Direct Hot and Cold Taps	None visible	Not visible	None visible			
22	-1		Kitchen	Kit 006	Yes	Daily	61.8	16.2	Pipework	None visible	Not visible	None visible			
22	-1		Kitchen	Kit 014		Daily	62.9	13.3	Pipework	None visible	Not visible	Yes - Dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	-1		Kitchen	Kit 030		Daily	62.6	9.7	Direct Hot and Cold Taps	None visible	Not visible	None visible		WHB behind boxes and is potentially little-used	WHB appears rarely used - remove if no longer required or incorporate into site flushing regime.
22	-1		Kitchen	KIT-031		Rarely	58.9	14.1	Pipework	None visible	Not visible	None visible		WHB is very dirty and is possibly rarely used	WHB appears rarely used - remove if no longer required or incorporate into site flushing regime.
22	-1		Hydro-therapy Plantroom	A-1FMB-030	Yes	Flushed twice weekly	-	13.3	Pipework	Yes	Not visible	None visible		Taken from cold utility tap. Dead end pipe on cold pipework and hot flow and return pipework may also be a deadend	Ensure hot flow and return pipework is open to prevent a dead leg. If cold pipework is required for future expansion consider adding to a little-used flushing schedule or if it is not required remove the pipework back to the branch point
22	-1		Kitchen	Kit 002		Daily	63.8	13.3	Pipework	None visible	Not visible	None visible		Taken from direct hot and cold taps	
22	0	M26	Radiology	RAG-004 (Dirty utility)	Yes	Daily	58.8	10.7	Pipework	None visible	Not visible	None visible			
22	0	M26	Radiology	RAG-029 (X-Ray 6)	Yes	Daily	56.2	14.8	Pipework	None visible	Not visible	None visible	Yes		
22	0	M26	Radiology	RAG-054 (Toilet)	Yes	Daily	56.2	14.8	Pipework	None visible	Not visible	None visible			
22	0	M26	Radiology	RAG-068 (Toilet)	Yes	Daily	58.1	16.7	Pipework	None visible	Not visible	None visible		Cold water was above 20oC for over 1 minute	Investigate reason for heat gain on cold outlet
22	0	M26	Radiology	RAG-079 (Toilet)	Yes	Daily	59.4	12.3	Pipework	None visible	Not visible	None visible			
22	0	M26	Radiology	RAG-092 (Toilet)	Yes	Daily	58.9	17.3	Pipework	None visible	Not visible	None visible		IR Tap	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	0	M26	Radiology	RAG-103	Yes	Daily	58.6	16.7	Pipework	None visible	Not visible	None visible		No access to pipework in RAG 108 Anaesthetics. Hot temperature taken from RAG-103	
22	0	M26	Radiology	RAG-130 (Toilet)	Yes	Daily	58.2	19.6	Pipework	None visible	Not visible	None visible		Room temperature was very high which may be causing heat gain	Cold Temperature very slow to drop below 20°C - investigate and correct reason for heat gain on cold outlet.
22	0	M27	Concourse	FMA0-001 (Facilities)	Yes	Daily	60.1	13.8	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	0	M27	Medical Illustration	MIL-010 (Studio)	Yes	Daily	58.7	16.6	Pipework	None visible	Not visible	None visible			
22	0	M27	Pharmacy	PHA-002 (Facilities)	Yes	Weekly	63.1	13.2	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink		Staff have said that this room is not used regularly	WHB appears rarely used - remove if no longer required or incorporate into site flushing regime. EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	0	M27	Pharmacy	PHA-8 (Clinical Trial Prep)	Yes	Daily	59.1	18.7	Pipework	None visible	Not visible	None visible			
22	0	M30	Radiology	RCG-022 (Male Change)	Yes	Daily	59.1	12.2	Pipework	None visible	Not visible	None visible			
22	0	M30	Radiology	RCG-068 (Baby sleep)	Yes	Daily	55.4	13.1	Pipework	None visible	Not visible	None visible			
22	0	M30	Radiology	RCG-087 (Dirty Utility)	Yes	Daily / Rarely	56.1	15.2	Pipework	None visible	Not visible	None visible		Games table currently being stored in front of sink	WHB potentially rarely used - remove if no longer required or incorporate into site flushing regime.
22	0	M38A	Rehab	REH-006 (Toilet)	Yes	Daily	57.2	16.6	Pipework	None visible	Not visible	None visible			
22	0	M38A	Rehab	REH-013 (OT Room)	Yes	Daily	59.4	16.4	Pipework	None visible	Not visible	None visible		Insulation missing from last metre of pipework	Ensure all pipework is suitably insulated
22	0	M38A	Rehab	REH-026 (Toilet)	Yes	Daily	57.1	16.1	Pipework	None visible	Not visible	None visible			
22	0	M38A	Rehab	REH-035 (Casting)	Yes	Daily	56.9	13.5	Pipework	None visible	Not visible	None visible	Yes	Unable to remove panel to get to hot pipework in REH-033, temperatures taken from REH-035 Casting	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	0	M38A	Rehab	REH-048 (Hydrotherapy Toilet)	Yes	Daily	58.8	18.7	Pipework	None visible	Not visible	None visible			
22	0	T13	Discharge Lounge	DLO-006 (Toilet)	Yes	Daily	56.2	18.6	Pipework	None visible	Not visible	None visible		IR tap. Copper tail to IR Tap	
22	0	T13	Discharge Lounge	DLO-008	Yes	Daily	56.3	15.8	Pipework	None visible	Not visible	None visible			
22	0	T13	Concourse	ENT-038 (Baby Change)	Yes	Daily	60.1	14.6	Pipework	None visible	Not visible	None visible		No insulation on the last 0.5m of pipework	Ensure pipework is insulated
22	0	T13	Concourse	ENT-046	Yes	Daily	55.9	10.4	Pipework	None visible	Not visible	None visible			
22	0	T13	Concourse	ENT-048 (Gents Toilet)	Yes	Daily	50.8	19.2	Pipework	None visible	Not visible	None visible		IR tap.	Hot temperature too low - investigate and correct (including local flow and return working correctly). Cold Temperature very slow to drop below 20°C - investigate and correct reason for heat gain on cold outlet.
22	0	T13	Concourse	ENT-052 (Gents Toilet)	Yes	Daily	56.3	15.7	Pipework	None visible	Not visible	None visible		Copper tails to IR taps	
22	0	T13	Concourse	ENT-054 (Shower)	Yes	Daily	55.3	10.9	Pipework	None visible	Not visible	None visible		IR tap. No insulation on the last 0.5m of pipework	Hot temperature too low - investigate and correct (including local flow and return working correctly). Fit suitable insulation to all sections of uninsulated pipework
22	0	T13	Concourse	MIL-006	Yes	Daily	59.4	12.4	Pipework	None visible	Not visible	None visible		No code available for ENT-006 (Facilities), temperatures taken from MIL-006	
22	0	T13	OPD	OPDO-003 (Male Changing)	Yes	Daily	56.1	18.7	Pipework	None visible	Not visible	None visible			
22	0	T13	OPD	OPDO-012	Yes	Daily	58.8	16.7	Pipework	None visible	Not visible	None visible		No access to room OPDO-013 (Consulting) at time of visit. Temperatures taken from OPDO-012	
22	0	T13	OPD	OPDO-049 (Treatment Room)	Yes	Daily	56.4	13.9	Pipework	None visible	Not visible	None visible	Yes		
22	0	T13	OPD	OPDO-067 (Dirty Utility)	Yes	Daily	59.4	16.7	Pipework	None visible	Not visible	None visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	0	T13	OPD/ Concourse	OPDO-072 (Toilet)	Yes	Daily	57.4	17.7	Pipework	None visible	Not visible	None visible		Infrared Tap. Copper tails at tap	
22	0	T13	OPD/ Concourse	OPDO-073	Yes	Daily	58.1	14.3	Pipework	None visible	Not visible	None visible		Infrared Tap. Copper tails at tap. Shower is now disconnected.	
22	0	T13	OPD/ Concourse	OPDO-075 (Toilet)	Yes	Daily	58.2	14.3	Pipework	None visible	Not visible	None visible			
22	0	T13	Orthotics	ORT-015-2 (Staff Change)	Yes	Daily	55.7	14.3	Pipework	None visible	Not visible	None visible			
22	0	T13	Orthotics	ORT-017 (Disabled)	Yes	Daily	55.6	13.1	Pipework	None visible	Not visible	None visible			
22	0	T13	Orthotics	ORT-027 (Treatment Room)	Yes	Daily	53.9	12.6	Pipework	None visible	Not visible	None visible	Yes		Hot temperature too low - investigate and correct (including local flow and return working correctly).
22	0	T13	Orthotics	ORT-045 (Toilet)	Yes	Daily	57.4	12.8	Pipework	None visible	Not visible	None visible			
22	1	M26	FM Facilities	FMA1-001 (Facilities)	Yes	Daily	61.1	13.8	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	1	M26	Medical Unit	MDU-012 (Treatment Room)	Yes	Daily	55.2	11.8	Pipework	None visible	Not visible	None visible	Yes		
22	1	M26	Medical Unit	MDU-020 (Blood Test)	Yes	Daily	59.2	11.5	Pipework	None visible	Not visible	None visible	Yes		
22	1	M26	Medical Unit	MDU-046 (Facilities)	Yes	Daily	58.2	10.9	Direct Hot and Cold Taps	None visible	Not visible	None visible			
22	1	M26	Medical Unit	MDU-048 (Dirty Utility)	Yes	Daily	53.9	15.8	Pipework	None visible	Not visible	None visible			Hot temperature too low - investigate and correct (including local flow and return working correctly).
22	1	M26	Medical Unit	MDU-050 (Consulting Room)	Yes	Daily	58.4	10.5	Pipework	None visible	Not visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	1	M26	OPD	POA-006 (Consulting Room)	Yes	Daily	57.6	11.5	Pipework	None visible	Not visible	None visible	Yes		
22	1	M26	OPD	POA-019 (Clean Utility)	Yes	Daily	61.1	12.4	Direct Hot and Cold Taps	None visible	Not visible	None visible			
22	1	M26	Radiology	RAF-003 (Toilet)	Yes	Daily	59.6	11.3	Pipework	None visible	Not visible	None visible			
22	1	M26	Radiology	RAF-087 (Male Change)	Yes	Daily	56.1	11.6	Pipework	None visible	Not visible	None visible			
22	1	M26	Radiology	RAF-095 (Toilet)	Yes	Rarely	55.6	15.3	Pipework	None visible	Not visible	None visible		Room currently not in use as WC is out of order.	Ensure WHB is on a flushing schedule until room is returned to regular use.
22	1	M26	Radiology	RAF-115 (Toilet)	Yes	Daily	55.8	15.3	Pipework	None visible	Not visible	None visible			
22	1	M26	Radiology	RAF-127 (Dirty Utility)	Yes	Daily	55.3	12.3	Pipework	None visible	Not visible	None visible			
22	1	M26	Radiology	RNM-007 (Toilet)	Yes	Daily	57.3	16.5	Pipework	None visible	Not visible	None visible			
22	1	M26	Radiology	RNM-018 (Shower room)	Yes	Daily	56.8	15.3	Pipework	None visible	Not visible	None visible			
22	1	M26	Radiology	RNM-027 (Office)	Yes	Daily	57.1	22.3	Pipework	None visible	Not visible	None visible		Cold was flushed for over 3 minutes to get to 19.6. Corridor not in use at time of survey (19/12/18)	Outlet appears rarely used at times - remove if no longer required or incorporate into site flushing regime. Cold Temperature very slow to drop below 20°C - investigate and correct reason for heat gain on cold outlet.
22	1	M26	Radiology	RNM-036 (Image Room - Adult)	Yes	Daily	57.3	13.6	Pipework	None visible	Not visible	None visible	Yes		
22	1	M27	Children's Theatres	THE-070 (Kitchen)	Yes	Daily	61.7	12.8	Direct Hot and Cold Taps	None visible	Not visible	Yes, on dish washer	Yes	No access to THE-078 (Prep Room), temperatures taken from Staff Kitchen THE-070	EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	1	M27	Children's Theatres	THE-090 (Theatre Scrub)	Yes	Daily	58.7	16.3	Pipework	None visible	Not visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	1	M27	Children's Theatres	THE-102 (Facilities)	Yes	Daily	61.5	18.1	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	1	M30	Children's Theatres	THE-042 (Female Change)	Yes	Daily	58.9	13.2	Pipework	None visible	Not visible	None visible			
22	1	M30	Children's Theatres	THE-069 (Lab)	Yes	Daily	57.8	18.1	Pipework	None visible	Not visible	None visible			
22	1	M30	Radiology	RCF-003 (Facilities)	Yes	Daily	59.2	16.3	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	1	M38A	Children's Theatres	THE-106 (Anaesthetic room)	Yes	Daily	61.5	18.1	Pipework	None visible	Not visible	None visible	Yes		
22	1	M38A	Children's Theatres	THE-127 (Dirty Utility)	Yes	Daily	56.1	15.6	Pipework	None visible	Not visible	None visible		No access to THE-117 Theatre Scrub, temperatures taken from Dirty Utility THE-127	
22	1	M38A	Children's Theatres	THE-156 (Recovery room)	Yes	Daily	58.3	18.3	Pipework	None visible	Not visible	None visible	Yes	No access to THE-157 Recovery Room, temperatures taken from THE-156 Recovery Room	
22	1	T13	OPD	OPD1-006 (Toilet)	Yes	Daily	55.6	11.1	Pipework	None visible	Not visible	None visible			
22	1	T13	OPD	OPD1-008 (Toilet)	Yes	Daily	56.4	19.1	Pipework	None visible	Not visible	None visible		Infra red tap. Over 20oC for 1:30. Copper tail on tap	
22	1	T13	OPD	OPD1-037 (Toilet)	Yes	Daily	60.1	11.5	Pipework	None visible	Not visible	None visible			
22	1	T13	OPD	OPD1-047 (Dietician)	Yes	Daily	58.1	11.3	Pipework	None visible	Not visible	None visible		Sink backing up slightly	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
22	1	T13	OPD	OPD1-048 (Blood Lab)	Yes	Daily	59.9	11.9	Pipework	None visible	Not visible	None visible	Yes	Sink backing up slightly	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
22	1	T13	OPD	OPD1-063 (Dirty Utility)	Yes	Daily	56.1	12.7	Pipework	None visible	Not visible	None visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	1	T13	OPD	OPD1-070 (Podiatry Room)	Yes	Daily	59.6	14.1	Pipework	None visible	Not visible	None visible			
22	1	T13	OPD	OPD1-085 (Toilet)	Yes	Daily	57.1	12.3	Pipework	None visible	Not visible	None visible			
22	1	T13	OPD	OPD1-113 (Measurement Bay)	Yes	Daily	55.4	17.1	Pipework	None visible	Not visible	None visible	Yes		
22	1	T13	Restaurant	RES-019 (Toilet)	Yes	Daily	58.6	13.2	Pipework	None visible	Not visible	None visible		2 x infrared. Copper tails at tap. One WHB has very poor flow	Investigate reason for poor water flow at WHB.
22	1	T13	Restaurant	RES-034 (Toilet)	Yes	Rarely	24.6	11.8	Pipework	None visible	Not visible	None visible		Hot water reached 56.1oC after 4 minutes of flushing.	Hot temperature too low - investigate and correct (including local flow and return working correctly). **WHB appears rarely used - remove if no longer required or incorporate into site flushing regime.**
22	1	T13	OPD	OPD1-040		Daily	56.6	15.6	Pipework	None visible	Not visible	None visible			
22	1		OPD	POA-004 (Consulting Room)	Yes	Daily	59.3	12.5	Pipework	None visible	Not visible	None visible	Yes		
22	2	M26	Decon - tamination	DCT-015 (Wash Room DSR)	Yes	Daily	61.1	16.8	Pipework	None visible	Not visible	None visible			
22	2	M26	Endoscopy	END-013 (Facilities)	Yes	Daily	64.2	13.5	Direct Hot and Cold Taps	None visible	Not visible	None visible			
22	2	M26	Endoscopy	END-029 (Examination Area)	Yes	Daily	56.8	13.9	Pipework	None visible	Not visible	None visible	Yes		
22	2	M26	Adult Theatres	THE-280 (Disabled Toilet)	Yes	Daily	55.1	17.9	Pipework	None visible	Not visible	None visible		Last 1 metre of hot and cold pipework is uninsulated.	Fit suitable insulation to all sections of uninsulated pipework
22	2	M26	Adult Theatres	THE-287 (Bed Bay A9)	Yes	Daily	55.1	21.2	Pipework	None visible	Not visible	None visible	Yes	After an additional 2 minutes of flushing cold reached 17.8	Cold Temperature very slow to drop below 20°C - investigate and correct reason for heat gain on cold outlet.
22	2	M26	Adult Theatres	THE-289 (Bed Bay A1)	Yes	Daily	56.8	15.3	Pipework	None visible	Not visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	2	M26	Adult Theatres	THE-302 (Bed Bay A7)	Yes	Daily	59.6	16.7	Pipework	None visible	Not visible	None visible	Yes		
22	2	M26	Adult Theatres	THE-319 (Dirty Utility)	Yes	Daily	56.8	11.9	Pipework	None visible	Not visible	None visible		Hot and cold pipework has been labelled the wrong way around	Pipework appears incorrectly labelled - this should be corrected.
22	2	M26	Adult Theatres	THE-327 (Recovery)	Yes	Flushed twice weekly	56.4	11.2	Pipework	None visible	Not visible	None visible	Yes		
22	2	M30	Medical Physics	MP-020 (Devices-Adult)	Yes	Daily	61.1	11.3	Pipework	None visible	Not visible	None visible	Yes		
22	2	M30	Transport Base	TPB-002	Yes	Daily	60.7	9.3	Pipework	None visible	Not visible	None visible		Sinks now removed from this room TPB-001 (Clinical Workroom). Temperatures taken from TPB-002	
22	2	T13	Dermatology	DMW-004 (Photo Therapy)	Yes	Daily	59.2	16.3	Pipework	None visible	Not visible	None visible			
22	2	T13	Dermatology	DMW-025 (Bathroom)	Yes	Daily	58.3	14.5	Pipework	None visible	Not visible	None visible			
22	2	T13	Dermatology	DMW-031 (Bathroom)	Yes	Daily	58.5	18.2	Pipework	None visible	Not visible	None visible		Sink backing up slightly	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
22	2	T13	Dermatology	DMW-060 (Facilities)	Yes	Daily	62.4	12.7	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
22	2	T13	Dermatology	DOPD-004 (Toilet)	Yes	Daily	56.2	19.5	Pipework	None visible	Not visible	None visible		Infrared Tap. Copper tails at tap	
22	2	T13	Dermatology	DOPD-025 (Technician)	Yes	Daily	60.3	16.3	Pipework	None visible	Not visible	None visible	Yes		
22	2	T13		FMA2-014 (Changing)	Yes	Daily	56.7	16.2	Pipework	None visible	Not visible	None visible		FMA2-013 noted as sentinel but no outlets.	
22	2	T13	Renal	RENO-003 (CAPD Training)	Yes	Daily	60.2	13.7	Pipework	None visible	Not visible	None visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
22	2	T13	Renal	RENO-016 (Room 3)	Yes	Daily	55.8	12.8	Pipework	None visible	Not visible	None visible		Renal Connection.	
22	2	T13	Renal	RENO-033 (Clean Utility)	No	Daily	56.2	14.2	Direct Hot and Cold Taps	None visible	Not visible	None visible			
22	2	T13	Renal	RENO-046 (Female Toilet)	Yes	Daily	58.7	12.6	Pipework	None visible	Not visible	None visible			
22	2	T13	Renal	RENO-064 (Equipment Servicing)	Yes	Daily	60.5	15.1	Pipework	None visible	Not visible	None visible	Yes	Renal (x7).	
22	2		Decontamination	DCT-009 (Endoscopy Wash)	No	Daily	56.7	15.8	Pipework	None visible	Not visible	None visible		Suspect copper tails on Markwik taps	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
32	4	T12	Ward 4A	RENW-028		Daily	60.1	15.4	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	4	T12	Ward 4A	RENW-055 (Bedroom)	Yes	Daily	60.5	10.7	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	4	T12	Waed 4A	RENW-055 (Clean Utility)		Daily	60.2	15.5	Optitherm	None Visible	Not Visible	None Visible			
32	4	T12 T1	Ward 4A	RENW-007 (Toilet)	Yes	Daily	59.1	13.7	Pipework	None Visible	Not Visible	None Visible		No access to RENW-005 (Bedroom), temperatures taken from RENW-007 Toilet	
32	4	T12 T1	Ward 4A	RENW-024		Daily	58.3	14.5	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	5	T12	Ward 5A	GENWA-034 (Bathroom)	Yes	Daily	58.5	13.5	Pipework	None Visible	Not Visible	None Visible	Yes		
32	5	T12	Ward 5A	GENWA-041	Yes	Daily	58.8	11.9	Pipework	None Visible	Not Visible	None Visible	Yes		
32	5	T12	Ward 5A	GENWA-065 (Bedroom)	Yes	Daily	60.4	11.4	Pipework	None Visible	Not Visible	None Visible	Yes		
32	5	T12	Corridor	WS5-021 (Male Change)	Yes	Daily	57.1	18.2	Pipework	None Visible	Not Visible	None Visible	Yes		
32	5	T12	Ward A	GENWA - 077 Pantry		Daily	62.4	11.9	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
32	5	T12	Ward A	GENWA - 081 Clean utility		Daily	62.3	13.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	5	T12	Ward A	GENWA - 066 (Facilities)		Daily	63.3	10.1	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	5	T12 T1	Ward 5A	GENWA-029 (Bathroom)	Yes	Daily	56.2	19.3	Pipework	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
32	5	T12 T1	Ward 5A	GENWA-001	Yes	Daily	59.3	13.1	Pipework	None Visible	Not Visible	None Visible	Yes		
32	5	T12 T1	Ward 5A	GENWA-021	Yes	Daily	58.9	16.1	Pipework	None Visible	Not Visible	None Visible	Yes		
32	5	T12 T1	Waiting Room	WS5-005(Toilet)	Yes	Daily	58.7	10.9	Pipework	None Visible	Not Visible	None Visible	Yes		
32	6	T12	Ward A	GENW1-034 (Bathroom)	Yes		59.1	16.7	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	6	T12	Ward A	GENW1-065 (Bedroom)	Yes		61.3	11.1	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	6	T12	Corridor	WS6-019 (Toilet)	Yes	Daily	58.3	13.7	Pipework	None Visible	Not Visible	None Visible			
32	6	T12	Ward A	GENW1-066 (Facilities)		Daily	64.1	13.9	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	6	T12	Ward A	GENW2-077 (Pantry)		Daily	62.2	13.5	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
32	6	T12 T1	Ward A	GENW1-001 (Arjo Bathroom)	Yes	Rarely	56.4	13.1	Pipework	None Visible	Not Visible	None Visible		Equipment covering Arjo bath and WC. Room appears to be rarely used.	Ensure all outlets are added to a flushing schedule
32	6	T12 T1	Ward A	GENW1-029 (Bathroom)	Yes		56.3	17.3	Optitherm	None Visible	Not Visible	None Visible			
32	6	T12 T1	Waiting Room	WS6-006 (Staff Meeting)	Yes	Rarely	-	-	-	Yes	-	-			Supply to water cooler isolated. Please investigate and correct
32	7	T12	Ward A	GENW5-034 (Bathroom)	Yes	Daily	57.1	13.2	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	7	T12	Ward A	GENW5-065 (Bedroom)	Yes	Daily	60.9	10.4	Optitherm	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
32	7	T12	Ward A	WS7-019 (Toilet)	Yes	Daily	59.3	13.6	Pipework	None Visible	Not Visible	None Visible			
32	7	T12	Ward A	GENW5-077 (Pantry)		Daily	61.7	12.1	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible		Deadleg supply to removed dishwasher located behind cabinets	Remove deadleg pipework if no longer required or if dishwasher is to be reinstalled ensure pipework is regularly flushed.
32	7	T12	Ward A	GENW5-066 (Facilities)		Daily	61.4	10.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	7	T12 T1	Ward A	GENW5-001	Yes	Daily	60.7	11.5	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	7	T12 T1	Ward A	GENW5-029 (Bathroom)	Yes	Daily	58.6	18.1	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	7	T12 T1	Waiting Room	WS7-006 (Waiting room)	Yes	Daily	-	-	N/A	None Visible	Not Visible	None Visible		Water Cooler only	
32	8	T12	Ward A	GENW9-034 (Bathroom)	Yes	Daily	56.8	13.6	Pipework	None Visible	Not Visible	None Visible	Yes		
32	8	T12	Ward A	GENW9-065 (Bedroom)	Yes	Daily	57.1	12.8	Pipework	None Visible	Not Visible	None Visible	Yes		
32	8	T12	Corridor	WS8-019 (Toilet)	Yes	Daily	58.2	14.9	Pipework	None Visible	Not Visible	None Visible			
32	8	T12	Ward A	GENW9 - 066 (Facilities)		Daily	64.2	10.3	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	8	T12	Ward A	GENW9 -081 Clean Utility		Daily	61.2	12.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	8	T12	Ward A	GENW9 - 077 Pantry		Daily	63.2	12.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	8	T12 T1	Ward A	GENW9-001	Yes	Daily	58.7	10.8	Pipework	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
32	8	T12 T1	Ward A	GENW9-029 (Bathroom)	Yes	Daily	57.2	14.7	Pipework	None Visible	Not Visible	None Visible	Yes		
32	8	T12 T1	Waiting Room	WS8-006 (Waiting room)	Yes	Daily			N/A	None Visible	Not Visible	None Visible		Water Cooler only	
32	9	T12	Ward A	GENW13-034 (Bathroom)	Yes	Daily	58.7	15.8	Pipework	None Visible	Not Visible	None Visible			Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
32	9	T12	Ward A	GENW13-065 (Bedroom)	Yes	Daily	58.9	10.5	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel GENW13 - 065 in use so adjacent outlet tested.	
32	9	T12	Corridor	WS9-019	Yes	Daily	58.2	14.9	Pipework	None Visible	Not Visible	None Visible			
32	9	T12	Ward A	GENW13 - 077 Pantry		Daily	63.6	10.9	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
32	9	T12	Ward A	GENW13 - 081 Clean utility		Daily	62.7	13.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	9	T12	Ward A	GENW13 - 066 (Facilities)		Daily	64.2	9.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	9	T12 T1	Ward A	GENW13-001	Yes	Daily	58.9	10.3	Pipework	None Visible	Not Visible	None Visible		Sentinel GENW13 - 001 in use so adjacent outlet tested.	
32	9	T12 T1	Ward A	GENW13-029 (Bathroom)	Yes	Daily	58.5	15.9	Pipework	None Visible	Not Visible	None Visible		Sentinel GENW13 - 029 in use so adjacent outlet tested.	
32	9	T12 T1	Waiting Room	WS9-006	Yes				N/A					Water Cooler only	
32	10	T12	Ward A	GENW17-034 (Bathroom)	Yes		58.7	16.5	Optitherm	None Visible	Not Visible	None Visible			
32	10	T12	Ward A	GENW17-065 (Bedroom)	Yes		63.4	11.4	Optitherm	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
32	10	T12	Corridor	WS10-019	Yes	Daily	57.4	12.6	Pipework	None Visible	Not Visible	None Visible			
32	10	T12 T1	Ward A	GENW17-001	Yes		60.1	10.8	Optitherm	None Visible	Not Visible	None Visible	Yes		
32	10	T12 T1	Ward A	GENW17-029 (Bathroom)	Yes		60.2	18.4	Optitherm	None Visible	Not Visible	None Visible			
32	10	T12 T1	Waiting Room	WS10-006	Yes	Daily	-	-	N/A	-	-	-		Water Cooler only	
32	10	T12 T1	Waiting Room	WS10-003 (Toilet)		Daily	58.1	15.7	Pipework	None Visible	Not Visible	None Visible		Infrared tap	
32	11	T12	Ward A	Room 15 GENW21-033	Yes	Daily	57.8	19.9	Pipework	None Visible	Not Visible	None Visible	Yes		Cold very slow to drop below 20°C - Investigate and correct.
32	11	T12	Ward A	Room 28 GENW21-065	Yes	Daily	60.3	10.4	Pipework	None Visible	Not Visible	None Visible	Yes		
32	11	T12	Central Corridor	WS11-019 (Toilet)	Yes	Daily	59.1	12.7	Pipework	None Visible	Not Visible	None Visible			
32	11	T12	Ward A	Clean Utility GENW21-081		Daily	62.8	13.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	11	T12	Ward A	Facilities GENW21-066		Daily	63.7	10.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
32	11	T12 T1	Ward A	Room 1 GENW21-001	Yes	Daily	60.1	10.8	Pipework	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
32	11	T12 T1	Ward A	Room 14 GENW21-031	Yes	Daily	59.2	15.9	Pipework	None Visible	Not Visible	None Visible	Yes		
32	11	T12 T1	Ward A	Kitchen GENW21-021		Daily	63.4	10.7	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
32	11	T12 T1	Public Toilets	Toilet WS11-006	Yes	Daily	55.6	12.6	Pipework	None Visible	Not Visible	None Visible		Infrared Tap	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
33	4	T13	Ward 4D	RENW-068 (Bedroom)	Yes	Daily	58.9	13.6	Optitherm	None Visible	Not Visible	None Visible	Yes	No access to RENW-060 (Bedroom), temperatures taken from RENW-068 Bedroom	
33	4	T13	Ward 4D	RENW-092 (Bedroom)	Yes	Daily	56.8	16.9	Optitherm	None Visible	Not Visible	None Visible		No access to RENW-091 (Bathroom), temperatures taken from RENW-092 Bedroom	
33	4	T13 T2	Ward 4D	RENW-095 (Bathroom)	Yes	Daily	59.7	17.7	Optitherm	None Visible	Not Visible	None Visible		No access to RENW-094 (Bathroom), temperatures taken from RENW-095 Bedroom. Sink backing up slightly.	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
33	4	T13 T2	Ward 4D	RENW-122 (Consulting Room)	Yes	Daily	59.8	13.9	Optitherm	None Visible	Not Visible	None Visible	Yes	No access to RENW-124 (Consulting), temperatures taken from GENW-122 Consulting	
33	4		Ward 4D	RENW-243 (Facilities)		Daily	60.3	10.7	Optitherm	None Visible	Not Visible	None Visible			
33	4		Ward 4D	RENW-255 (Clean Utility)		D	60.6	14.2	Optitherm	None Visible	Not Visible	None Visible			
33	5	T13	Ward D	GENWB-034 (Bathroom)	Yes	Daily	59.1	16.4	Pipework	None Visible	Not Visible	None Visible			
33	5	T13	Ward D	GENWB-046 (Bedroom)	Yes	Daily	59.5	14.4	Pipework	None Visible	Not Visible	None Visible	Yes		
33	5	T13	Ward D	GENWB-057 (Bedroom)	Yes	Daily	60.4	10.7	Pipework	None Visible	Not Visible	None Visible	Yes		
33	5	T13	Ward D	GENWB-065 (Bedroom)	Yes	Daily	58.4	15.2	Pipework	None Visible	Not Visible	None Visible	Yes		
33	5	T13	Ward D	GENWB-081 (Clean Utility)	Yes	Daily	63.6	12.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
33	5	T13	Ward D	GENWB - 077 (Pantry)		Daily	64.4	11.4	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish Washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
33	5	T13	Ward D	GENWB - 066 (Facilities)		Daily	63.1	9.9	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
33	5	T13 T2	Ward D	GENWB-001 (Bedroom)	Yes	Daily	59.2	12.7	Pipework	None Visible	Not Visible	None Visible	Yes		
33	5	T13 T2	Ward D	GENWB-028 (Bedroom)	Yes	Daily	59.2	15.9	Pipework	None Visible	Not Visible	None Visible	Yes		
33	6	T13	Ward D	GENW2-034 (Bathroom)	Yes	Daily	57.8	17.2	Pipework	None Visible	Not Visible	None Visible			
33	6	T13	Ward D	GENW2-057 (Bedroom)	Yes	Daily	60.2	14.3	Pipework	None Visible	Not Visible	None Visible	Yes		
33	6	T13	Ward D	GENW2-065 (Bedroom)	Yes	Daily	59.8	11.4	Pipework	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
33	6	T13	Ward D	GENW2 - 077 Pantry		Daily	62.8	11.7	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish Washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
33	6	T13	Ward D	GENW2 - 081 Clean utility		Daily	63.4	12.2	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
33	6	T13	Ward D	GENW2 - 066 (Facilities)		Daily	63.4	12.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
33	6	T13 T2	Ward D	GENW2-001 (Bedroom)	Yes	Daily	59.8	11.4	Pipework	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
33	6	T13 T2	Ward D	GENW2-028 (Bedroom)	Yes	Daily	58.1	12.9	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel GENW2-028 in use so adjacent outlet tested.	
33	6	T13 T2	Waiting Room	WS6-011 (Toilet)	Yes	Daily	57.2	16.4	Pipework	None Visible	Not Visible	None Visible			
33	7	T13	Ward D	GENW6-034 (Bathroom)	Yes	Daily	60.2	11.6	Optitherm	None Visible	Not Visible	None Visible			
33	7	T13	Ward D	GENW6-057 (Bedroom)	Yes	Daily	59.7	14.6	Optitherm	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
33	7	T13	Ward D	GENW6-065 (Bedroom)	Yes	Daily	58.5	12.4	Optitherm	None Visible	Not Visible	None Visible	Yes		
33	7	T13	Ward D	GENW6-066 (Facilities)		Daily	62.7	11.9	Optitherm	None Visible	Not Visible	None Visible			
33	7	T13	Ward D	GENW6-077 (Pantry)		Daily	62.8	12.2	Optitherm	Yes	Not Visible	None Visible		Deadleg behind cabinets from supply to removed dishwasher	Deadleg should be removed or incorporated into site flushing regime.
33	7	T13 T2	Ward D	GENW6-001 (Bedroom)	Yes	Daily	60.3	10.2	Optitherm	None Visible	Not Visible	None Visible	Yes		
33	7	T13 T2	Ward D	GENW6-028 (Bedroom)	Yes	Daily	56.8	16.8	Optitherm	None Visible	Not Visible	None Visible	Yes		
33	7	T13 T2	Corridor	WS7-011 (Toilet)	Yes	Daily	57.1	15.3	Optitherm	None Visible	Not Visible	None Visible			
33	8	T13	Ward D	GENW10-034 (Bathroom)	Yes	Daily	59.2	15.8	Pipework	None Visible	Not Visible	None Visible			
33	8	T13	Ward D	GENW10-057 (Bedroom)	Yes	Daily	56.5	10.3	Pipework	None Visible	Not Visible	None Visible	Yes		
33	8	T13	Ward D	GENW10-065 (Bedroom)	Yes	Daily	58.7	10.8	Pipework	None Visible	Not Visible	None Visible	Yes		
33	8	T13	Ward D	GENW10 - 081 (Clean utility)		Daily	63.6	12.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
33	8	T13	Ward D	GENW10 - 066 (Facilities)		Daily	62.8	9.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
33	8	T13 T2	Ward D	GENW10-001 (Bedroom)	Yes	Daily	59.1	10.3	Pipework	None Visible	Not Visible	None Visible	Yes		
33	8	T13 T2	Ward D	GENW10-028 (Bedroom)	Yes	Daily	58.1	15.6	Pipework	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
33	8	T13 T2		WS8-011 (Toilet)	Yes	Daily	59.1	12.8	Pipework	None Visible	Not Visible	None Visible			
33	9	T13	Ward D	GENW14-034 (Bathroom)	Yes	Daily	59.7	14.7	Optitherm	None Visible	Not Visible	None Visible			
33	9	T13	Ward D	GENW14-057 (Bedroom)	Yes	Daily	60.2	13.2	Optitherm	None Visible	Not Visible	None Visible	Yes		
33	9	T13	Ward D	GENW14-065 (Bedroom)	Yes	Daily	59.7	12.8	Optitherm	None Visible	Not Visible	None Visible	Yes		
33	9	T13	Ward D	GENW14-077 (Pantry)		Daily	63.5	11.6	Direct Hot and Cold outlets	None Visible	Not Visible	Yes on dishwasher			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
33	9	T13	Ward D	GENW14-066 (Facilities)		Daily	63.4	10.8	Direct Hot and Cold outlets	None Visible	Not Visible	None Visible			
33	9	T13 T2	Ward D	GENW14-004 (Bedroom)	Yes	Daily	58.8	10.5	Optitherm	None Visible	Not Visible	None Visible	Yes	No access to GENW14-001 (Bedroom), temperatures taken from GENW14-004 Bedroom	
33	9	T13 T2	Ward D	GENW14-026 (Bedroom)	Yes	Daily	58.4	13.7	Optitherm	None Visible	Not Visible	None Visible	Yes	No access to GENW14-028 (Bedroom), temperatures taken from GENW14-026 Bedroom	
33	9	T13 T2	Waiting Room	Toilet (WS9-011)	Yes	Daily	59.1	10.6	Pipework	None Visible	Not Visible	None Visible			
33	10	T13	Ward D	GENW18-034 (Bathroom)	Yes	Daily	57.8	15.7	Pipework	None Visible	Not Visible	None Visible			
33	10	T13	Ward D	GENW18-060 (Bedroom)		Daily	59.5	12.6	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel EGENW18-057 in use so adjacent outlet tested.	
33	10	T13	Ward D	GENW18-065 (Bedroom)	Yes	Daily	59.8	13.5	Pipework	None Visible	Not Visible	None Visible	Yes		
33	10	T13	Ward D	GENW18-081 (Clean Utility)		Daily	63.1	13.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
33	10	T13	Ward D	GENW18-077 (Kitchen)		Daily	63.9	10.2	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish Washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
33	10	T13 T2	Ward D	GENW18-001 (Bedroom)	Yes	Daily	59.5	10.7	Pipework	None Visible	Not Visible	None Visible	Yes		
33	10	T13 T2	Ward D	GENW18-028 (Bedroom)	Yes	Daily	57.5	15.8	Pipework	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
33	10	T13 T2	Ward D	GENW18-031 (Bedroom)		Daily	57.5	15.8	Pipework	None Visible	Not Visible	None Visible	Yes		
33	10	T13 T2	Waiting Room	WS10-011 (Toilet)	Yes	Daily	58.6	12.9	Pipework	None Visible	Not Visible	None Visible			
33	11	T13	Ward D	GENW22-033 (Room 42)	Yes	Daily	Unable to Run	13.8	Pipework	None Visible	Not Visible	None Visible	Yes	Unable to run hot tap due to sink backing up.	Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
33	11	T13	Ward D	GENW22-057 (Room 32)		Daily	59.2	11.2	Pipework	None Visible	Not Visible	None Visible	Yes		
33	11	T13	Ward D	GENW22-065 (Room 29)	Yes	Daily	60.1	11.4	Pipework	None Visible	Not Visible	None Visible	Yes		
33	11	T13	Ward D	GENW22-066 (Facilities)		Daily	63	9.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
33	11	T13 T2	Ward D	GENW22-001 (Room 56)	Yes	Daily	59.6	11.8	Pipework	None Visible	Not Visible	None Visible	Yes		
33	11	T13 T2	Ward D	GENW22-028 (Room 44)	Yes	Daily	58.5	17.3	Pipework	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
33	11	T13 T2	Public Toilets	WS11-011 (Toilet)	Yes	Daily	58.1	11.5	Pipework	None Visible	Not Visible	None Visible			
33	11	T13 T2	Ward D	GENW22-022 (Clean Utility)		Daily	63.9	10.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 1/2/ 3	0	M10	Acute Assess	AAW-007 (Facilities)	Yes	Daily	61.7	9.6	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 1/2/ 3	0	M10	Acute Assess	AAW-017 (Bedroom)	Yes	Daily	58.6	17.7	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/ 3	0	M10	Acute Assess	AAW-156 (Kitchen)	Yes	Daily	60.6	10.9	Direct Hot & Cold outlets	None visible	Not visible	Yes, dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 1/2/ 3	0	M10	Acute Assess	AAW-173 (Clinical Support)	Yes	Rarely	57.7	17.1	Pipework	None visible	Not visible	None visible	Yes	According to staff the sinks in this area are rarely used	WHB rarely used - remove if no longer required or incorporate into site lfushing regime.
31 1/2/ 3	0	M21	Acute Assess	AAW-038 (Toilet)	Yes	Daily	60.1	14.6	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	0	M21	Acute Assess	AAW-045 (Treatment Room)	Yes	Daily	58.9	12.9	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/ 3	0	M21	Acute Assess	AAW-060 (Toilet)	Yes	Daily	58.2	14.3	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	0	M21	Acute Assess	AAW-088 (Bathroom)	Yes	Daily	57.5	14.2	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	0	M21	Acute Assess	AAW-096 (Bathroom)	Yes	Daily	58.7	16.5	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	0	M21	Acute Assess	AAW-108 (Bathroom)	Yes	Daily	55.8	15.2	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	0	M7	Acute Assess	AAW-032 (Bathroom)	Yes	Daily	55.6	15.9	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	0	M7	Acute Assess	AAW-125 (Facilities)	Yes	Daily	63.3	12.2	Direct Hot and Cold Taps	Not visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 1/2/ 3	0	M7	Acute Assess	AAW-247 (Kitchen)	Yes	Daily	63.5	14.6	Direct Hot and Cold Taps	None visible	Not visible	Yes, on dish washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 1/2/3	1	M21	Medical Unit	MDU-051 (Consulting Room)	Yes	Daily	56.2	11.7	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/3	1	M21	OPD	POA-015 (Consulting Room)	Yes	Daily	57.1	14.1	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/3	1	M21	Medical Unit	MDU-005 (Beverage)	No	Daily	62.1	10.7	Pipework	None visible	Not visible	None visible			
31 1/2/3	1	M21	Medical Unit	MDU-012		Daily	56.5	12.5	Pipework	None visible	Not visible	None visible			
31 1/2/3	1	M21	Medical Unit	MDU-020		Daily	58.3	11.8	Pipework	None visible	Not visible	None visible			
31 1/2/3	1	M21	Medical Unit	MDU-046 Facilities		Daily	57.3	16.6	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 1/2/3	1	M21	Medical Unit	MDU-048		Daily	55.2	11.5	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/3	1	M21	Medical Unit	POA-019					Pipework	-	-	None visible		Same room number used for plantroom 23 and riser M26	
31 1/2/3	1	M7	Stroke	STW-082 (Bath)	Yes	Daily	57.9	17.5	Pipework	None visible	Not visible	None visible		Cold water was over 20°C for 1:30 before reaching correct temperature range	Cold Temperature very slow to drop below 20°C - investigate and correct reason for heat gain on cold outlet.
31 1/2/3	1	M7	Stroke	STW-079 (Arjo Bathroom)	No	Daily	57.4	13.6	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/3	1	M7	Stroke	STW-014 (Bedroom)	Yes	Daily	59.9	11.9	Pipework	None visible	Not visible	None visible	Yes		
31 1/2/3	1	M7	Stroke	STW-038 (Bathroom)	Yes	Daily	57.8	14.6	Pipework	None visible	Not visible	None visible		Sentinel STW - 036 in use so adjacent outlet in STW-038 tested.	
31 1/2/3	1	M7	Stroke	STW-047 (Bathroom)	Yes	Daily	57.2	17.1	Pipework	None visible	Not visible	None visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 1/2/ 3	1	M7	Stroke	STW-070 (Bathroom)	Yes	Daily	57.2	17.1	Pipework	None visible	Not visible	None visible		Room STW-072 in use. Temperatures taken from STW-070	
31 1/2/ 3	2	M7	Adult Theatres	THE-026 (Female Toilet)	Yes	Daily	57.6	16.7	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	2	M7	Adult Theatres	THE-033 (Female Changing)	Yes	Daily	56.6	16.8	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	2	M7	Adult Theatres	THE-044 (Male Changing)	Yes	Daily	56.2	17.1	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	2	M7	Adult Theatres	THE-060 (Facilities)	Yes	Daily	57.1	15.7	Direct Hot and Cold Taps	None visible	Not visible	Yes on High / Low level sink			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 1/2/ 3	2	M7	Adult Theatres	THE-079 (On Call)	Yes	Daily	55.6	17.9	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	2	M7	Adult Theatres	THE-091 (Dirty Utility)	Yes	Daily	57.6	17.8	Pipework	None visible	Not visible	None visible			
31 1/2/ 3	2	M7	Adult Theatres	THE-105 (Dirty Utility)	Yes	Daily	59.9	23.7	Pipework	None visible	Not visible	None visible		Flushed for over three minutes without dropping below 20	Cold Temperature very slow to drop below 20°C - investigate and correct reason for heat gain on cold outlet.
31 1/2/ 3	2	M7	Adult Theatres	THE-106 (Scrub Room)	Yes				Pipework	-	-	-	Yes	No access as Theatre was in use	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 4/5/ 6	4	T4	Ward 4B	HOW-039 (CDC)		Daily	61.2	10.7	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	4	T4	Ward 4B	HOW-064 (Bedroom)	Yes	Daily	56.1	19.8	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	4	T4	Ward 4B	HOW-065		Daily	57.5	17.9	Optitherm	None Visible	Not Visible	None Visible	-		
31 4/5/ 6	4	T4	Ward 4B	HOW-193 (Bedroom)	Yes	Daily	60.3	9.7	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	4	T4	Waiting room	WS4-004 (Toilet)	Yes	Daily	58.4	13.2	Pipework	None Visible	Not Visible	None Visible			
31 4/5/ 6	4	T4	Corridor	WS4-014 (Facilities Regen)	Yes	Daily	60.5	18.5	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dishwash er			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 4/5/ 6	4	T4 T1	Ward 4B	HOW-009	Yes	Daily	57.9	12.7	Optitherm	None Visible	Not Visible	None Visible	-		
31 4/5/ 6	4	T4 T1	Ward 4B	HOW-030 (Bathroom)	Yes	Daily	55.8	15.6	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	5	T4	Ward B	GENWD-036 (Bathroom)	Yes	Daily	59.1	16.6	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	5	T4	Ward B	GENWD-065 (Bedroom)	Yes	Daily	58.8	15.3	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	5	T4	Corridor	WS5-027 (Facilities)	Yes	Daily	62.1	16.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	5	T4	Ward B	GENWD - 066 DSR		Daily	64.7	10.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	5	T4	Ward B	GENWD - 081 Clean utility		Daily	63.4	11.2	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 4/5/ 6	5	T4 T1	Ward B	GENWD-032 (Bathroom)	Yes	Daily	56.6	16.4	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	5	T4 T1	Ward B	GENWD-001	Yes	Daily	57.8	15.4	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	6	T4	Ward B	GENW4-036 (Bathroom)	Yes	Daily	58.6	18.4	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	6	T4	Ward B	GENW4-065 (Bedroom)	Yes	Daily	59.2	11.9	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	6	T4	Ward B	GENW4 - 066 DSR		Daily	64.1	15.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	6	T4	Ward B	GENW4 - 081 Clean utility		Daily	63.2	15	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	6	T4	Ward B	GENW - 077 Pantry		Daily	63.6	12.9	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dishwash er			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 4/5/ 6	6	T4 T1	Ward B	GENW4-001	Yes	Daily	57.6	13.1	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	6	T4 T1	Ward B	GENW4-032 (Bathroom)	Yes	Daily	57.8	20.4	Pipework	None Visible	Not Visible	None Visible	Yes		Cold Temperature very slow to drop below 20°C (>120 seconds) - investigate and correct reason for heat gain on cold outlet.
31 4/5/ 6	7	T4	Ward B	GENW8-036 (Bathroom)	Yes	Daily	59.2	13.9	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	7	T4	Ward B	GENW8-065 (Bedroom)	Yes	Daily	60.1	12.4	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	7	T4	Ward B	GENW-066 (Facilities)		Daily	61.2	11.2	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	-		
31 4/5/ 6	7	T4	Ward B	GENW8-077 (Pantry)		Daily	62.5	13.9	Direct Hot and Cold Taps	None Visible	Not Visible	Yes on dishwash er	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 4/5/ 6	7	T4 T1	Ward B	GENW8-001	Yes	Daily	59.6	13.9	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	7	T4 T1	Ward B	GENW8-032 (Bathroom)	Yes	Daily	59.1	17.8	Optitherm	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	8	T4	Ward B	GENW12-036 (Bathroom)	Yes	Daily	58.1	15.6	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	8	T4	Ward B	GENW12-065 (Bedroom)	Yes	Daily	61.4	15.3	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	8	T4	Ward B	GENW12 - 077 Pantry		Daily	64	12.4	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dishwash er			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 4/5/ 6	8	T4	Ward B	GENW12 - 066 DSR		Daily	64.4	11.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	8	T4 T1	Ward B	GENW12-001	Yes	Daily	58.2	13.1	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	8	T4 T1	Ward B	GENW12-032 (Bathroom)	Yes	Daily	57.6	18.9	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	9	T4	Ward B	GENW16-036 (Bathroom)	Yes	Daily	58.3	13.7	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	9	T4	Ward B	GENW16-065 (Bedroom)	Yes	Daily	60.1	10.6	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	9	T4	Ward B	GENW16 - 066 DSR		Daily	63.5	11.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	9	T4	Ward B	GENW16 - 081 Clean utility		Rarely			Direct Hot and Cold Taps	Yes	Not Visible	None Visible		Taps currently tied together and sink is being used for storage	Investigate reason for taps being offline and correct to allow regular flushing of outlets
31 4/5/ 6	9	T4 T1	Ward B	GENW16-001	Yes	Daily	60.8	10.9	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel GENW16 - 001 in use so adjacent outlet in GENW16-004 tested.	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 4/5/ 6	9	T4 T1	Ward B	GENW16-032 (Bathroom)	Yes	Daily	58.1	15.5	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	10	T4	Ward B	GENW20-036 (Bathroom)	Yes	Daily	58.4	15.8	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	10	T4	Ward B	GENW20-065 (Bedroom)	Yes	Daily	58.7	11.4	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	10	T4	Ward B	Kitchen GENW20-077		Daily	63.5	14.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	-		
31 4/5/ 6	10	T4	Ward B	Clean Utility GENW20-081		Daily	62.7	15.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	-		
31 4/5/ 6	10	T4	Ward B	Facilities GENW20-066		Daily	64.4	11.3	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	-		
31 4/5/ 6	10	T4 T1	Ward B	GENW20-001	Yes	Daily	56.3	10.8	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	10	T4 T1	Ward B	GENW20-032 (Bathroom)	Yes	Daily	57.7	16.7	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	11	T4	Ward B	GENW24-035 (Room 97)	Yes	Daily	58.3	14.9	Pipework	None Visible	Not Visible	None Visible	Yes	Hot water aerating when initially run - Possibly due to air being introduced to system when works being carried out earlier in week.	
31 4/5/ 6	11	T4	Ward B	GENW24-065 (Room 85)	Yes	Daily	59.5	12	Pipework	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	11	T4	Ward B	GENW24-066 (Facilities)		Daily	63.2	11.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
31 4/5/ 6	11	T4	Ward B	GENW24-081 (Clean Utility)		Daily	62.8	12.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
31 4/5/ 6	11	T4 T1	Ward B	GENW24-004 (Room 111 Treatment 2)		Daily	59.1	11.2	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel GENW24-001 in use so adjacent outlet in GENW20-004 tested. Trough Sink in room.	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 4/5/ 6	11	T4 T1	Ward B	GENW24-033 (Room 98)	Yes	Daily	57.3	14.7	Pipework	None Visible	Not Visible	None Visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 7/8/ 9	4	T5	Ward 4C	RENW-156 (Bathroom)	Yes	Daily	58.6	16.8	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	4	T5	Ward 4C	RENW-180 (Bedroom)	Yes	Daily	57.4	15.4	Optitherm	None visible	Not Visible	None visible	Yes	Sentinel RENW - 188 in use so adjacent outlet in RENW - 180 tested.	
31 7/8/ 9	4	T5	Ward 4C	RENW-193										Unable to locate room	
31 7/8/ 9	4	T5	Waiting room	WS4-007 (Toilet)	Yes	Daily	57.4	12.5	Pipework	None visible	Not Visible	None visible	-	IR Tap	
31 7/8/ 9	4	T5	Ward 4C	RENW - 210		Daily	64.1	10.2	Direct Hot & Cold outlets	None visible	Not Visible	None visible	-		
31 7/8/ 9	4	T5 T2	Ward 4C	RENW-127 (Consulting Room)	Yes	Daily	57.6	10.9	Optitherm	None visible	Not Visible	None visible	Yes	-	
31 7/8/ 9	4	T5 T2	Ward 4C	RENW-153 (Bathroom)	Yes	Daily	59.1	17.5	Optitherm	None visible	Not Visible	None visible	Yes	Sentinel RENW - 153 in use so adjacent outlet in RENW-152 Bedroom tested	
31 7/8/ 9	5	T5	Ward C	GENWC-034 (Bathroom)	Yes	Daily	57.1	16.8	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	5	T5	Ward C	GENWC-062 (Bedroom)	Yes	Daily	60.9	15.2	Pipework	None visible	Not Visible	None visible	Yes	Sentinel RGENWC-065 in use so adjacent outlet in GENWC-062 Bedroom tested	
31 7/8/ 9	5	T5	Ward C	GENWC-066 (Facilities)		Daily	64.1	11.3	Pipework	None visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	5	T5	Ward C	GENWC - 077 Pantry		Daily	63.2	11.4	Direct Hot and Cold Taps	None visible	Not Visible	None visible	-		
31 7/8/ 9	5	T5 T2	Ward C	GENWC-001	Yes	Daily	59.5	10.8	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	5	T5 T2	Ward C	GENWC-028 (Bedroom)	Yes	Daily	58.4	15.4	Pipework	None visible	Not Visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 7/8/ 9	5	T5 T2	Waiting room	WS5-011 (Toilet)	Yes	Daily	58.6	10.7	Pipework	None visible	Not Visible	None visible	-		
31 7/8/ 9	6	T5	Ward C	GENW3-034 (Bathroom)	Yes	Daily	58.3	14.5	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	6	T5	Ward C	GENW3-065 (Bedroom)	Yes	Daily	58.7	11.9	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	6	T5	Corridor	WS6-027 (Facilities)	Yes	Daily	63.4	13.7	Pipework	None visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	6	T5	Ward C	GENW3-077 Pantry		Daily	62.4	10.3	Direct Hot and Cold Taps	None visible	Not Visible	None visible	-		
31 7/8/ 9	6	T5 T2	Ward C	GENW3-004		Daily	58.2	11.3	Pipework	None visible	Not Visible	None visible	Yes	Sentinel GENW3 - 001 in use so adjacent outlet in GENW3-004 tested.	
31 7/8/ 9	6	T5 T2	Ward C	GENW3-028 (Bedroom)	Yes	Daily	57.2	13.9	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	7	T5	Corridor	WS7-027 (Facilities)	Yes	Daily	58.5	12.4	Direct hot and cold outlets	None visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	7	T5	Ward C	GENW7-077 (Pantry)	-	Daily	61.8	10.5	Direct hot and cold outlets	None visible	Not Visible	None visible	-		
31 7/8/ 9	7	T5	Ward C	GENW7-081 Clean utility		Daily	62.4	11.2	Direct Hot and Cold Taps	None visible	Not Visible	None visible	-		
31 7/8/ 9	7	T5	Ward C	GENW7-066 (Facilities)		Daily	63.2	10.4	Direct Hot and Cold Taps	None visible	Not Visible	None visible	-		
31 7/8/ 9	7	T5	Ward C	GENW7-034 (Bathroom)	Yes	Daily	57.9	16.7	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	7	T5	Ward C	GENW7-065 (Bedroom)	Yes	Daily	58.3	11.1	Optitherm	None visible	Not Visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 7/8/ 9	7	T5 T2	Ward C	GENW7-026 (Facilities)	-	Daily	62.6	11.6	Direct hot and cold outlets	None visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	7	T5 T2	Ward C	GENW7-001		Daily	59.4	11.6	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	7	T5 T2	Ward C	GENW7-028 (Bedroom)	Yes	Daily	58.1	17.2	Optitherm	None visible	Not Visible	None visible	Yes	Sentinel GENW7-028 in use so adjacent outlet in GENW7-031 Bedroom tested	
31 7/8/ 9	8	T5	Ward C	GENW11-034 (Bathroom)	Yes	Daily	58.7	15.5	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	8	T5	Ward C	GENW11-065 (Bedroom)	Yes	Daily	61.3	13.2	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	8	T5	Corridor	WS8-027 (Facilities)	Yes	Daily	61.6	13.2	Direct Hot and Cold Taps	None visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	8	T5	Ward C	GENW11-077 (Pantry)	-	Daily	61.1	12.5	Direct hot and cold taps	None visible	Not Visible	None visible	-		
31 7/8/ 9	8	T5	Ward C	GENW11-066 (Facilities)	-	Daily	61.1	12.5	Direct hot and cold taps	None visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	8	T5 T2	Ward C	GENW11-001	Yes	Daily	57.8	12.1	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	8	T5 T2	Ward C	GENW11-028 (Bedroom)	Yes	Daily	57.3	12.9	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	9	T5	Ward C	GENW15-034 (Bathroom)	Yes	Daily	59.9	14.2	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	9	T5	Ward C	GENW15-065 (Bedroom)	Yes	Daily	58.9	13.5	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	9	T5	Corridor	Facilities WS9-027	Yes	Daily	62.5	11.6	Direct Hot and Cold Taps	None Visible	Not Visible	Yes on High / Low level sink	-		Cold temperature slow to drop (≈60 secs to drop below 20°C) - This should be monitored and if necessary a flushing regime implemented. EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 7/8/ 9	9	T5	Ward C	Facilities GENW15-066		Daily	64.7	11.5	Direct Hot and Cold Taps	None Visible	Not Visible	Yes on High / Low level sink	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	9	T5	Ward C	GENW15 - 081 Clean utility		Daily	63	11.3	Direct Hot and Cold Taps	None visible	Not Visible	None visible	-		
31 7/8/ 9	9	T5 T2	Ward C	GENW15-001		Daily	58.9	12.1	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	9	T5 T2	Ward C	GENW15-028 (Bedroom)	Yes	Daily	58	13.3	Pipework	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	10	T5	Ward C	GENW19-034 (Bathroom)	Yes	Daily	59.2	21.5	Pipework	None Visible	Not Visible	None Visible	Yes		Cold Temperature very slow to drop below 20°C (>120 seconds) - investigate and correct.
31 7/8/ 9	10	T5	Ward C	GENW19-065 (Bedroom)	Yes	Daily	58.6	12.4	Pipework	None Visible	Not Visible	None Visible	Yes		
31 7/8/ 9	10	T5	Corridor	Facilities WS10-027	Yes	Daily	60.8	14.9	Pipework	None Visible	Not Visible	Yes on High / Low level sink	-		Hot tap is loose and spinning round, resulting in poor water flow. Tap should be tightened/repaired. EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	10	T5	Ward C	Kitchen GENW19-077		Daily	63.6	10.7	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish Washer	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	10	T5	Ward C	Clean Utility GENW19-081		Daily	63.7	11.65	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	-		
31 7/8/ 9	10	T5 T2	Ward C	GENW19-001		Daily	59.6	13.8	Pipework	None visible	Not Visible	None visible	Yes	Sentinel GENW19-001 in use so adjacent outlet in GENW19-004 Bedroom tested	
31 7/8/ 9	10	T5 T2	Ward C	GENW19-028 (Bedroom)	Yes	Daily	59.2	12.5	Pipework	None Visible	Not Visible	None Visible	Yes		
31 7/8/ 9	11	T5	Ward C	GENW23-034 (Bathroom)	Yes	Daily	60.1	19.3	Optitherm	None visible	Not Visible	None visible	Yes	Sentinel GENW23-034 in use so adjacent outlet in GENW23-035 Bedroom tested	
31 7/8/ 9	11	T5	Ward C	GENW23-065 (Bedroom)	Yes	Daily	61.1	16.4	Optitherm	None visible	Not Visible	None visible	Yes		

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
31 7/8/ 9	11	T5	Central Corridor	WS10-027 (Facilities)	Yes	Daily	63.1	11.5	Direct hot and cold pipework	None visible	Not Visible	None visible	-		
31 7/8/ 9	11	T5	Central Corridor	Kitchen WS11-018	Yes	Daily	61.6	17.9	Pipework	None Visible	Not Visible	Yes - Dish Washer	-		EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
31 7/8/ 9	11	T5 T2	Ward C	GENW23-001 (Bedroom)		Daily	60.4	10.7	Optitherm	None visible	Not Visible	None visible	Yes		
31 7/8/ 9	11	T5 T2	Ward C	GENW23-028 (Bedroom)	Yes	Daily	59.3	17.9	Optitherm	None visible	Not Visible	None visible	Yes	Sentinel GENW23-028 in use so adjacent outlet in GENW23-031 Bedroom tested	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	0	M18	Clinic 14	CPS-003 (Consulting Room)	Yes		-	-	-	-	-	-		No access	
41	0	M18	OPD Clinic 3	OPD-120 (Toilet)	Yes	Daily	56.3	14.1	Pipework	None Visible	Not Visible	None Visible	Yes		
41	0	M18	OPD Next to Clinic 14	OPD-125 (Changing)	Yes	Daily	58.7	14.1	Pipework	None Visible	Not Visible	None Visible	Yes		
41	0	M18	OPD Clinic 2	Consulting Room 6 OPD-175	Yes	Daily	58.4	11.7	Pipework	None Visible	Not Visible	None Visible	Yes		
41	0	M18	Clinic 14	CPS-006 (Toilet)	Yes		-	-	-	-	-	-		No access	
41	0	M18	children's A&E (Next to Courtyard 2)	Toilet EMC-018	Yes	Daily	56.3	13.8	Pipework	None Visible	Not Visible	None Visible			
41	0	M18	Concourse	ENT-014 (Children's Club)	Yes	Daily	60.4	10.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	0	M18	Concourse	ENT-036 (Facilities)	Yes	Daily	61.1	9.9	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	0	M18	Concourse	Baby Feed ENT-048	Yes	Daily	59.7	10.1	Pipework	None Visible	Not Visible	None Visible			
41	0	M18	Observation	Room 10 OBW-020	Yes	Daily	58.4	12.4	Pipework	None Visible	Not Visible	None Visible	Yes		Bathroom used as store and outlet appear unused. Outlet should be removed if no longer required or incorporated into site lfushing regime.
41	0	M18	Observation	Room 19 OBW-060	Yes	Daily	51.0	14.0	Pipework	None Visible	Not Visible	None Visible	Yes	Sentinel OBW-061 in use so adjacent outlet tested.	Hot temperature too low - investigate and correct (including local flow and return working correctly).
41	0	M18	OPD Clinic 4	OPD-103 (Toilet)	Yes	Daily	57.8	12.0	Pipework	None Visible	Not Visible	None Visible	Yes		
41	0	M38	OPD	OPD-073 (Plaster Room)	Yes	Daily	60.2	15.2	Pipework	None Visible	Not Visible	None Visible	Yes		Cold temperature slow to drop (≈60 secs to drop below 20°C) - staff advised no patients in room that monring prior to testing. This should be monitored and if necessary a flushing regime implemented

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	0	M38	OPD	OPD-087-B (Toilet)	Yes	Daily	60.2	10.8	Pipework	None Visible	Not Visible	None Visible		No door ID. Labelled in room as sentinel outlet.	
41	0	M38	Observation	Kitchen OBW-042	Yes	Daily	61.5	11.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
41	0	M39	OPD	OPD-009 (Toilet)	Yes	Daily	60.0	13.1	Pipework	None Visible	Not Visible	None Visible			
41	0	M39	OPD	OPD-026 (Facilities)	Yes	Daily	62.6	10.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	0	M39	OPD	OPD-060 (Toilet)	Yes	Daily	60.1	12.1	Pipework	None Visible	Not Visible	None Visible			
41	0	M39	OPD	OPD-075 (Toilet)	Yes	Daily	59.3	14.4	Pipework	None Visible	Not Visible	None Visible			
41	1	M18	Critical Care	CCW-082 (Critical Care Bed)	Yes	Daily	-	-	Optitherm	None Visible	Not Visible	None Visible	Yes	Unable to isolate hot water supply to Optitherm to allow testing of hot water temperatures	Ensure Optitherm is serviced to allow valves to be isolated
41	1	M18	Critical Care	CCW-084 (Gowning Room)	Yes	Daily	57.3	13.1	Optitherm	None Visible	Not Visible	None Visible	Yes	Optitherm kit used to take hot water temperatures. No access to CCW-084, temperatures taken from CCW-066 Surgical Scrub Area. Heavy sediment found in hot pipework strainer	Service Optitherm and clean strainers to remove build up of sediment
41	1	M18	Critical Care	CCW-092 (Dirty utility)	Yes	Daily	59.8	12.7	Optitherm	None Visible	Not Visible	None Visible		Optitherm kit used to take hot water temperatures	
41	1	M36	Cardiology	CAR-036 (Bedroom 5)	Yes	Daily	59.8	19.7	Optitherm	None Visible	Not Visible	None Visible	Yes	Optitherm kit used to take hot water temperatures	
41	1	M36	Children's Theatres	23HU-015 (Waiting Room)	C	-	-	-	-	-	-	-		Water cooler connection in this area - included in flushing regime.	
41	1	M36	Children's Theatres	23HU-040 (Bathroom)	Yes	Daily	55.7	14.1	Pipework	None Visible	Not Visible	None Visible		No access to 23HU-040, temperatures taken from 23HU-041 Shower room	
41	1	M36	Children's Theatres	23HU-051 (Toilet)	Yes	Daily	56.2	13.3	Pipework	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	1	M36	Children's Theatres	23HU-011 (Office)	Yes	Daily	60.8	13.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	1	M36	Children's Theatres	23HU-008 (Toilet)	Yes	Daily	59.7	13.1	Pipework	None Visible	Not Visible	None Visible			
41	1	M36	Special Feeds	SPF-007 (Facilities)	Yes	-	-	-	-	-	-	-		No longer fed from A & C	
41	1	M38	Critical Care	CCW-014 (Clinical Physics)	Yes	Daily	62.9	16.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
41	1	M38	Critical Care	CCW-027 (Shower)	Yes	Daily	59.4	13.1	Pipework	None Visible	Not Visible	None Visible		Temperatures taken from CCW-025 Female changing	
41	1	M38	Critical Care	CCW-098 (Critical Care Bed)	Yes	Daily	56.2	14.3	Optitherm	None Visible	Not Visible	None Visible	Yes	Optitherm kit used to check hot water temperatures. No access to CCW-098, temperatures taken from CCW-067 Bedroom. Heavy sediment found in hot pipework strainer.	Service Optitherm and clean strainers to remove build up of sediment
41	1	M38	Critical Care	CCW-118 (Facilities)	Yes	Daily	60.2	11.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	1	M39	Children's Theatres	THE-009 (Toilet)	Yes	Daily	55.4	13.6	Pipework	None Visible	Not Visible	None Visible			
41	1	M39	Children's Theatres	THE-011		Daily	55.6	11.9	Optitherm	None Visible	Not Visible	None Visible		Optitherm kit used to check hot water temperatures	
41	1	M39	Children's Theatres	THE-025 (Public Toilet)	Yes	Daily	56.8	14.2	Pipework	None Visible	Not Visible	None Visible			
41	1	M39	Critical Care	CCW-021 (Bathroom)	Yes	Rarely	44.7	18.4	Pipework	None Visible	Not Visible	None Visible		Continued to flush outlet for an additional 5 minutes with hot water temperature reaching 49.8.	Hot temperature too low - investigate and correct (including local flow and return working correctly). Investigate outlet usage and if rarely used add to flushing regime
41	1	M39	Medical Day Unit	MDU-008 (Beverage Prep)	Yes	Daily	57.9	10.7	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dishwasher			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
41	1	M39	Childrens Theatres	THE-010 (Facilities)	N	Daily	58.4	12.3	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	2	M18	AFD Corridor	AFD-022 (Staff Toilet)	Yes	Daily	59.4	11.2	Pipework	None Visible	Not Visible	None Visible		Last 1 metre of pipework is uninsulated	Ensure all pipework is suitably insulated
41	2	M18	Children's Corridor	ARU-001 (Kitchen)	Yes	Daily	59.7	12.7	Pipework	None Visible	Not Visible	Yes - Dish Washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
41	2	M18	Ward 2C	ARU-003 (Office)		Daily	55.7	16.2	Pipework	None Visible	Not Visible	None Visible		Temperatures taken from ARU-116 (Toilet) next door	
41	2	M18	Ward 2C	ARU-046 (Bedroom)	Yes	Daily	60.4	11.5	Optitherm	None Visible	Not Visible	None Visible	Yes	Optitherm kit used to check hot water temperatures	
41	2	M18	Ward 2C	ARU-050 (Bedroom)		Daily	55.1	12.8	Optitherm	None Visible	Not Visible	None Visible	Yes	Optitherm kit used to check hot water temperatures	
41	2	M18	Ward 2C	ARU-085 (Bedroom)	Yes	Daily	59.7	11.7	Optitherm	None Visible	Not Visible	None Visible	Yes	Optitherm kit used to check hot water temperatures	
41	2	M18	Ward 2C	Clean Utility ARU-094		Daily	62.3	11.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
41	2	M18	Ward 2C	Kitchen ARU-096		Daily	62.6	11.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	2	M18	Ward 2C	ARU-065 (Facilities)		Daily	62.3	10.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	2	M36	Ward 2A	SCH-022 (Bathroom)	Yes	Daily	57.8	19.7	Pipework	None Visible	Not Visible	None Visible		Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet. Temperatures recorded after ward returned to use.	
41	2	M36	Ward 2A	SCH-040 (Toilet)	Yes	Daily	57.2	12.1	Pipework	None Visible	Not Visible	None Visible		Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet. Temperatures recorded after ward returned to use.	
41	2	M36	Ward 2A	SCH-061 (Bedroom)	Yes	Daily	57.8	17.1	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible		Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet. Temperatures recorded after ward returned to use.	
41	2	M36	Ward 2A	SCH-092 (Hospital Night Team)	Yes	Daily	60.7	15.1	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible		Water cooler disconnected but is part of a flushing regime	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	2	M38	Ward 2C	ARU-015 (Bedroom 10)		Daily	56.1	13.9	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		Sink backing up. Ensure sink drains are clear and allowing water to run freely away from the WHB.
41	2	M38	Ward 2C	ARU-002 (Facilities)		Daily	60.3	13.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	2	M38	Ward 2C	ARU-115 (Toilet)		Daily	56.7	12.9	Pipework	None Visible	Not Visible	None Visible			
41	2	M38	Asceptic Unit	ASU-036 (Changing Room)		Daily	58.9	11.5	Pipework	None Visible	Not Visible	None Visible			Outlets appear to have been removed from Changing Room (ASU-039) - ensure all dealdegs removed behind panel.
41	2	M38	Asceptic Unit	ASU-042 (Corridor)	Yes	Daily	58.6	12.1	Pipework	None Visible	Not Visible	None Visible	Yes		
41	2	M39	Ward 2B	DCU-005 (Toilet)	Yes	Daily	55.7	24.3	Pipework	None Visible	Not Visible	None Visible		Continued to flush outlet for an additional 2 minutes with cold water temperature reaching 14.3. Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet.	Investigate heat gain at this outlet. **N.B.** Temperature recorded prior to flushing commenced within ward area for the day - heat gain from being unused overnight.
41	2	M39	Ward 2B	DCU-011 (Room B)	Yes	Daily	56.7	12.4	Pipework	None Visible	Not Visible	None Visible	Yes	Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet.	
41	2	M39	Ward 2A	SCH-064 (Bedroom)	Yes	Daily	56.6	9.8	Pipework	None Visible	Not Visible	None Visible	Yes	Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet. Temperatures recorded after ward returned to use.	
41	2	M39	Ward 2A	SCH-063 (Treatment Room)	Yes	Daily	56.2	19.6	Pipework	None Visible	Not Visible	None Visible		Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet. Temperatures recorded after ward returned to use.	
41	2	M39	Ward 2A	SCH-087 (Store)	Yes	Daily	61.3	13.3	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible		Water system on ward upgraded in late 2018 with hot flow and return taken down within 0.5m of outlet. Temperatures recorded after ward returned to use.	
41	3	M18	Ward 3C	GW1-002 (Renal Day Unit)	Yes	Daily	56.3	10.1	Optitherm	None Visible	Not Visible	None Visible		Optithern kit used to take hot water temperatures	
41	3	M18	Ward 3C	GW1-048 (Toilet)	Yes	Daily	57.9	13.3	Pipework	None Visible	Not Visible	None Visible			
41	3	M18	3A - 3C Corridor	Kitchen GW3-024	Yes	Daily	62.2	13.3	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	3	M18	3A - 3C Corridor	Kitchen GWS-030	Yes	Daily	63.1	9.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M18	3A - 3C Corridor	Regen Kitchen GWS-011		Daily	62.6	11.3	Direct Hot and Cold Taps	None Visible	Not Visible	Yes - Dish Washer			EPDM flexible hoses should be removed and services hard piped. Where not practical inspect and replace regularly
41	3	M18	3A - 3C Corridor	Kitchen GWS-027		Daily	61.5	11.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M18	3A - 3C Corridor	Patient Room GWS-026		Daily	60.1	10.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
41	3	M18	3A - 3C Corridor	GWS-014 (Renal Technician)	Yes	Daily	60.8	15.6	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M36	Ward 3A	Lab GW3-068	Yes	Daily	59.6	16.0	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
41	3	M36	Ward 3A	Clean Utility GW3-066		Daily	60.5	14.0	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M36	3A - 3C Corridor	GWS-004 (Staff Kitchen)	Yes	Daily	59.6	16.0	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M36	3A - 3C Corridor	Toilet GWS-033	Yes	Daily	48.5	13.8	Pipework	None Visible	See recs	None Visible			Hot temperature slow to rise (>60 secs to reach 50°C) - Investigate and correct
41	3	M38	Ward 3C	Play Room GW1-046		Daily	60.6	12.8	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			Sign up at sink advising not to use for washing hands as water very hot. Ensure outlets are run every day or included within site flushing regime
41	3	M38	Ward 3C	Facilities GW1-059		Daily	62.4	11.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M38	Ward 3C	Kitchen GW1-027		Daily	61.5	11.7	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M38	Ward 3B	GW2-036 (Play Room)	Yes	Daily	60.1	14.1	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			Cold temperature slow to drop (≈40 secs to drop below 20°C) - This should be monitored and if necessary a flushing regime implemented
41	3	M38	Ward 3B	GW2-054 (Bathroom)	Yes	Daily	62.8	11.1	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible		No access to GW2-054, temperatures taken from GW2-057 (Facilities).	

Plantroom	Level	Riser	Dept	Room ID/Name	Sentinel	Outlet Usage	Direct Hot Temp (°C)	Direct Cold Temp (°C)	Outlet Temps Recorded From	Deadlegs Present	Hot F&R Working	Flexi Hoses	Dispensers Above Sink	Comments	Recommendations
41	3	M38	Ward 3B	Kitchen GW2-003		Daily	63.0	11.5	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			
41	3	M38	Ward 3B	Room 4 GW2-058		Daily	59.9	10.8	Pipework	None Visible	Not Visible	None Visible	Yes		
41	3	M39	Ward 3B	GW2-025 (Bedroom)	Yes	Daily	58.4	13.9	Pipework	None Visible	Not Visible	None Visible		No access to GW2-025, temperatures taken from GW2-018 (Toilet). IR tap with copper tail	
41	3	M39	Ward 3B	GW2-035 (Bedroom)	Yes	Daily	58.5	13.1	Optitherm	None Visible	Not Visible	None Visible	Yes		
41	3	M39	Ward 3B	Toilet GW2-015		Daily	60.2	13.0	Pipework	None Visible	Not Visible	None Visible			
41	3	M39	Ward 3A	GW3-057		Daily	63.3	11.4	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible	Yes		
41	3	M39	Ward 3A	GW3-005 (Bathroom)	Yes	Daily	55.4	13.7	Pipework	None Visible	Not Visible	None Visible		Optitherm kit used to take hot water temperatures	
41	3	M39	Ward 3A	GW3-043 (Play Room)	Yes	Daily	64.0	10.0	Direct Hot and Cold Taps	None Visible	Not Visible	None Visible			Sign up at sink advising not to use for washing hands as water very hot. Ensure outlets are run every day or included within site flushing regime
41	4	M36	Child Forensic Psychology	DCFP-044		Daily	60.1	16.8	Direct Hot and Cold Taps	None Visible	See recs	None Visible			
41	4	M39	Child Forensic Psychology	Toilet DCFP-013	Yes	Daily	No flow	10.5	Pipework	None Visible	See recs	None Visible			No flow through tap on hot setting -investigate and correct.
41	4	M39	Child Forensic Psychology	Kitchen DCFP-049		Unused									No Access - Sign on door preventing access to all staff. Outlets should be included in site flushing regime until kitchen put back into use.
41	4	M39	Child Forensic Psychology	DCFP-010		Daily	61.5	10.3	Direct Hot and Cold Taps	None Visible	See recs	None Visible		N.B. Bottle water coolers in DCFP area	

Section 7

Hot and Cold Water Outlets

WATER SYSTEM RISK ASSESSMENT

Showers and other spray outlets

Since showers produce fine water droplets or spray they present a significantly higher risk for the development of Legionnaires ' disease than other types of hot and cold outlets.

Water temperature, system design/installation, showerhead design, frequency of use and cleanliness of the outlet are the most significant factors in determining the risk potential.

Hot and cold water outlets

Hot and cold-water outlets do not normally present a risk for the development of Legionnaires' disease unless the outlets create fine droplets or spray. Outlets that do create sprays/droplets significantly increase the risk.

Water temperature, system design/installation, frequency of use, tap design and cleanliness of the outlet are the most significant factors in determining the risk potential.

Basic principles being looked at in this section are the physical condition, and the design of the water services pipework and outlets, and the temperature profile of the water being distributed to the outlets. There should be no unused outlets or deadlegs (blank-ends) on any parts of the systems. Hot water should be delivered to all outlets at a minimum of 55°C within 1 minute of outlet being run and cold water below 20°C within 2 minutes of being run. Cold water should be no more than 2°C higher at the outlet then the water source for this outlet (e.g. CWST). This section also incorporates details of spray outlets/aerosol generators (showers etc.), low use outlets and unused outlets.

Please refer to outlet sheets for specific recommendations & risk ratings.

Risk factors incorporated within this section of the document are classified as "additional localised risk rating". This refers only to the condition of the localised pipework distribution and services and the risk rating applied is in addition to risk rating of the plant items feeding the services.

All outlets fed from CWSTs or calorifiers etc. Inherently carry the risk associated to these plant items, and these risk factors must be taken into account in determining the actual risk posed by the system as a whole.

Please refer to appropriate sections on legionella management, CWSTs, calorifiers and water source to determine the inherent risk factors of water being supplied to the outlets being assessed in this section.

WATER SYSTEM RISK ASSESSMENT

Hot and Cold Water Outlet General Notes

1. DMA have not noted any spray outlets, other than showers and dish wash rinsers and have been advised no other spray outlets fitted. However should any have been fitted then wherever possible, DMA would recommend that spray taps are removed and replaced with taps which do not create an aerosol. Tap diffusers should also be removed where possible to minimise aerosol creation and the build-up of dirt/scale etc. on the diffusers wherever possible.

2. Very few drain cocks have been noted on piperuns, though there are some flushing points – see site specific notes following regarding these. Drain cocks fitted at the end of pipe runs should be removed if not required for operational reasons or periodically flushed and checks carried out to ensure that inserts/washers etc. are WRAS approved.

3. Adequate backflow protection as per Water Regulations Guide & Water Byelaws (Scotland) – section 6, should be incorporated into the water services within the building. See comments and recommendations regarding "non-domestic" outlets. Before fitting any double check valves or other forms of backflow protection ensure that adequate pressure relief valves/expansion vessels are fitted and working in the event of excessive pressure or temperature build up within system.

4. Water coolers and drinks machines should have regular servicing carried out (generally six monthly) as per manufacturers recommendations.

5. All low use outlets, and all associated pipework, should be removed leaving no deadlegs if outlets no longer required, or incorporated into low use flushing regime.

6. All deadlegs should be removed wherever possible. Where deadlegs are unable to be removed provision to allow flushing of the deadlegs as part of the site flushing regime should be made. (i.e. Valves fitted at end of deadlegs to allow flushing to be carried out).

7. Cold water should be delivered to outlets (and cold feed to thermostatic mixing valves) at less than 20°C within 2 minutes of outlet being run, and not more than 2°C above outlet water source temperature (i.e. CWST)

8. Hot water should be delivered to outlets (and hot feed to thermostatic mixing valves) at more than 55°C, within 1 minute of outlet being run

Section 7A

WATER BYELAWS SURVEY

WATER SYSTEM RISK ASSESSMENT

Town Mains Water Supply (Govan Road)

The town mains enters this plantroom in large diameter stainless steel, which then has a 15mm branch directly after the isolation lever valve terminating at a "washing machine" valve.

As this valve is threaded and therefore could facilitate the connection of a hose directly to the town mains supply, this would be identified as a potential category 5 back contamination risk.

Recommendation

- Strip out and remove this section of pipework ensuring all deadleg creation is removed or alternatively if this supply is required reconfigure pipework to include Category 5 protection, via a purpose made Cat 5 tank & pump.

Basement Plant Room Trades Tank

The trades tank supplies the majority of bib taps and some other services within the various plantrooms throughout the hospital.

The tank is a 2x2x1 sectional GRP tank with 50:50 internal maintenance division, externally flanged base and externally flanged walls albeit that one side of the tank has been drained and left empty.

One side of the tank division has been drained down with the inlet pipework disconnected thus leaving only one side of the tank online and in operation. Manufactures of GRP sectional tanks advise against leaving one side of a tank with a 50:50 maintenance division off line as these tanks are only designed to leave one side of the division off line for short durations during maintenance procedures, leaving one side of a divisional tank empty for long duration, could lead to the integral wall eventually being compromised.

Recommendations

- The spill over weir to offer Category 5 protection is of the wrong size and materials requires to be upgraded to the correct diameter weir and constructed of a suitable WRAS approved material.
- Due to one side of the tank being off line, the outlets from the empty side of the tank are still connected which are causing sizable deadlegs. These should be included within site flushing regime.
- Consideration should be given to placing both sides of this tank back on line and lowering the stored capacity of each tank (**N.B.** This is not a legionella or backflow risk, only recommended good practice from tank manufacturers).

Basement RAW Water and Bulk/Post Filter CWST(s)

The RAW water tanks store cold water supplied direct from both the Govan Road and Hardgate Road town mains which in turn then supply the Bulk/Post Filter water tanks via a filtration system.

The Bulk/Post Filter water tanks in turn supply all domestic water systems on site, along with other systems, via booster pumps, including renal dialysis plant, renal dialysis emergency connection points, endoscopy wash plant and heating/chilled water pressurisation units and fast fills. The connection to these other systems would suggest that Category 5 protection would be required for the domestic water tanks.

Recommendations

- The existing spill slots or weirs are not of the correct size for these tanks and are required to be upgraded to a correctly sized spill over weir(s) in order to provide adequate Category 5 protection.
- It was noted during this survey that these tanks have stainless-steel flange supports which may permit water ingress similar to hollow tank lid supports. Hollow tank supports are recommended to be replaced with solid support beams within HSG 274 and SHTM 04-04. Hollow flange supports are a much less common support structure and it is recommended that these supports are checked to ensure that they are not permitting water ingress, and if found that they are, should be removed and replaced with solid alternatives.

WATER SYSTEM RISK ASSESSMENT

Hardgate Road Fire Main

Although the fire main could be identified as a separate line from the "domestic" water main as it enters the building no backflow prevention devices were identified on the line.

Recommendations

As this mains line is likely to have a low turnover of water DMA would recommend the NHS confirms that this main is separated from domestic water mains by a double check valve or similar (possibly external to building) to prevent potentially stagnant water from contaminating the domestic mains.

Basement Sump – Drainage Pipework

All drainage/backwash pipework from the filtration system(s) and drains from the ClO_2 terminal testing points system located within the basement plantroom terminate at this sump, below the height of the sump top.

DMA have been advised previously that options for sealing the sump tops, with drain lines sealed into the new lids is being investigated currently. This could potentially create a backflow risk should submersible pumps fail and sumps fill completely to the level of the drain terminations.

Recommendation

- Consideration should be given to installing inline non-return devices to each drainage pipework to minimise potential for back-flow should submersible pumps fail, and sumps fill completely. Filter manufacturer/installer should be consulted to ensure any restriction caused by backflow prevention devices do not impact on the filter unit operation.

Basement Plantroom Booster Pump Sets

Ensure both booster pump sets have adequate back flow/check valve devices integral to the booster sets. If found not to have integral check valves, consider installing suitable back flow devices to tank supplied inlet pipework to pump sets.

Heating and Chilled Water Pressurisation Unit and Fast Fill Supplies (Within Plantrooms 21, 22, 31, 32, 33 & 41)

Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast to fill connections - See calorifier/plantroom sections for details of locations (DMA unable to verify if Trades water within Plantroom 41).

Plantroom 41 AHU 24 – Deadleg/15mm Connection with Valve

This line generally appears to be unused though on occasion DMA have witnessed contractors utilising the line to fill up buckets by means of connecting a hose and jubilee clip to the pipework, thus creating a potential back contamination risk to the cold-water supply.

Recommendations

- Strip out and remove this section of pipework ensuring all deadleg creation is removed or alternatively if this supply is required reconfigure pipework to include Category 5 protection, via a purpose made Category 5 tank & pump.

- Alternatively if Trades Water System runs in this plantroom reconfigure connection to be connection onto Trades Water system ensuring no deadlegs remain on domestic water system (DMA unable to verify if Trades water within Plantroom 41).

WATER SYSTEM RISK ASSESSMENT

Plantroom 41 AHU27A – Connection to Pressurisation Unit and Disconnected Condair Unit

Make up to pressurisation unit for Run-around coils and disconnected Condair Unit lines creating deadlegs.

Recommendations

- Remove deadleg supply pipework to disconnected Condair units.
- Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted to fast fill connection.

Children's Renal System Plant Room/Plantroom 21

Supply to the Children's Renal System Plant is fed from boosted domestic cold water within Plantroom 21. This line was reconfigured in late 2018 to branch prior to the top up ClO_2 dosing unit on the cold line with PR21. This has created a deadleg from Plantroom 21 into the Renal Plantroom (approx. 3m) which has a hose attached to it and run into the floor drain.

Recommendations

- The renal tank and/or pipework should be reconfigured to accommodate the installation of a suitably sized spill slot/weir to provide Category 5 protection to the hospitals boosted cold water supply.
- The deadleg created when supply to Renal plant was reconfigured should be removed. If deadleg cannot be removed then line should be included in site flushing regime, with hose running into (and being left in) the floor drain being removed when not in use.

Reduced Pressure Zone Valves (RPZ) (Plantrooms 22 & 31)

Ensure that all RPZ valves are installed and registered in accordance with water bylaws and are serviced annually with all reports forwarded on to the water authority in accordance with the water bylaws requirements. This will also apply to any additional RPZs fitted to the water system(s) on site.

Endoscopy Wash Plant – LV Sub Station 2B (Plantroom 31)

The Endoscopy Wash Plant is fed from the domestic cold water line within Plantroom 31, on line to Riser M12.

Recommendations

- Category 4 protection should be fitted to the domestic cold water line to the Endoscopy Wash Plant (E.g. PRZ Valve).

Adults Renal System Plant Room/Plantroom 32

Supply to the Adults Renal System Plant is fed from boosted domestic cold water within Plantroom 32.

Recommendations

- The renal tank and/or pipework should be reconfigured to accommodate the installation of a suitably sized spill slot/weir to provide Category 5 protection to the hospitals boosted cold water supply.

WATER SYSTEM RISK ASSESSMENT

Plantrooms 21, 22, 31, 32, 33 & 41

54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems.

It was noted the majority of these had hoses attached to end points to facilitate flushing of the lines as part of the site flushing regime.

Recommendations

- The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime with hose running into (and being left in) the floor drain being removed when not in use.

Sluice Masters

Ensure all sluice masters located throughout the hospital are checked to ensure they have suitable integral backflow protection installed.

Showers

It has been noted that some showers are able to reach into adjacent sanitaryware (e.g. Wash Hand Basins) which could create a potential backflow contamination risk.

Recommendations

- All showers should have suitable retaining rings on the shower riser pole to prevent the showers from being able to reach, and potentially be submerged into adjacent sanitaryware.

Basement Tank Room

It was noted that some flanges on domestic cold water pipework which have been exposed during recent system alteration works is showing signs of corrosion.

Recommendation

- It should be confirmed that these flanges are not in contact with the system water, replacing any non WRAs approved materials which are in contact with the system water.

Chlorine Dioxide Dosing Systems

Water Utility company should be notified that domestic water system is being dosed with Chlorine Dioxide (ClO_2). DMA understands this was undertaken by NHS Estates prior to the ClO_2 installation works commencing. Should this be incorrect then Water Utility company should be notified.

General Deadleg Flushing

Where deadlegs have been identified and are being incorporated into a site flushing regime prior to removal, hoses should not be run from deadleg and left in floor drain, or other receptacle which could create a potential backflow contamination risk. Hoses should be removed between flushing or coiled and tied up off the floor. Should there be concerns regarding hoses being used by contractors or other personnel in a way which could create a backflow risk suitable signage and additional backflow protection should be considered at terminal points (e.g. double check valves).

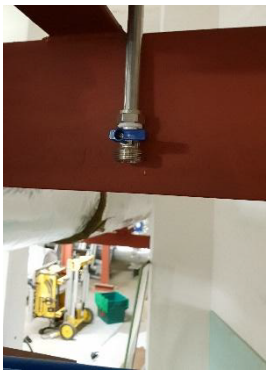
WATER SYSTEM RISK ASSESSMENT

Basement Fire Tank FMB 022

This fire tank has been installed directly on to a concrete base and therefore has an internally flanged base. It is recommended that where possible all tanks should be externally flanged and built on suitable level tank piers and steel supports 500mm from ground to base of the tank. This tank appears to be leaking at present (Water on floor around tank) which may be due to it being built on a potentially uneven surface, although further investigation would be required to establish. (**N.B.** This is not a legionella or backflow risk, only recommended good practice from tank manufacturers).

WATER SYSTEM RISK ASSESSMENT

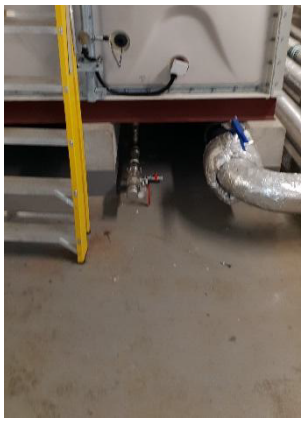
Govan Road Mains



Govan Road Mains Hose Connection
(Basement MTHW Plantroom)

Trade CWST

Raw Water Tank Spill Over Slot / Weir

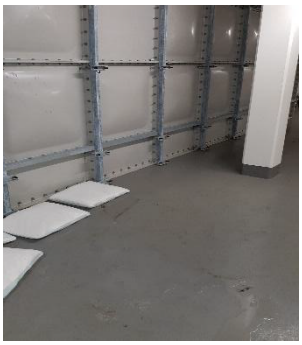


Raw Water Tank Drain

Raw Water Tank – Hollow S/S flange Support

WATER SYSTEM RISK ASSESSMENT

Basement Sump

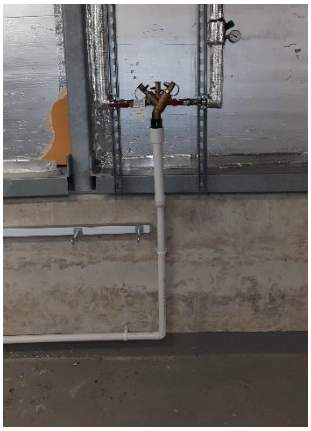


Basement Fire Tank

Deadleg/Connection Point PR41

Children's Renal Tank

Example Pressurisation Unit and Fast Fill



RPZ on line to MRI Chiller

WATER SYSTEM RISK ASSESSMENT

Adult Renal Tank

Example – non galvanised CWST steel supports

Example incorrectly sized weir on CWSTs

Possible Non WRAS flange basement RAW CWST pipework

WATER SYSTEM RISK ASSESSMENT

Sluicemaster

Example Pressurisation Unit and Fast Fill

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's 4th Floor CC4-021	M39	PR 41 01/02/03	27.3	57.5	55.2	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold temperature too high - investigate and correct. (2)							
Children's 3rd Floor CC3-021	M39	PR 41 01/02/03	19.1	57.7	55.6	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	65	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Children's 2nd Floor CC2-021	M39	PR 41 01/02/03	18.5	57.9	55.2	N/A	N/A	N/A	None visible	Cold line branches from this riser to supply Plantroom 22. A branch from the line to PR 22 supplies Ward 2B and part of Ward 2A.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Children's 1st Floor CC1-021	M39	PR 41 01/02/03	18.3	57.3	51.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	52	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
Children's Ground Floor CC0-021	M39	PR 41 01/02/03	18	58.2	56.5	N/A	N/A	N/A	Yes - deadlegs/flushing points at bottom of hot flow and hot return lines (Approx. 300mm in length)	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	65	N/A	N/A	N/A		
Recommendations:			Deadlegs on hot flow and hot return lines should be removed if no longer required or incorporated into site flushing regime. (2)							
Children's Basement CCB-021	M39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Only cold pipework rising through building - main riser supplying Childrens hospital (and branching on level 2 to supply Plantroom 22).
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's 4th Floor Across from DCFP-050	M36	PR 41 01/02/03	19.4	58.6	53.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	53	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
Children's 3rd Floor Across from GWS-035	M36	PR 41 01/02/03	18.9	56.8	50.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	50	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
Children's 2nd Floor SCH-038	M36	PR 41 01/02/03	18.8	57.3	55.2	N/A	N/A	N/A	None visible	No commissioning valves evident on hot flow and return
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Children's 1st Floor CC1-051	M36	PR 41 01/02/03	18	55.2	57.9	N/A	N/A	N/A	None visible	Pipework drops thorugh floor to ground floor - no corresponding riser on ground floor - assumed pipework turns and runs above ceiling in ground floor to supply ground floor services.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	52	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's 4th Floor CC4-008	M38	PR 41 01/02/03	19.8	57.8	55.7	N/A	N/A	N/A	54mm connection point on cold line (Approx. 200mm long)	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
			Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							
Children's 3rd Floor CC3-008	M38	PR 41 01/02/03	19.8	57.5	55.6	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Small section of insulation missing on cold pipework (Approx. 1m) - this should be replaced. (3)							
Children's 2nd Floor CC2-008	M38	PR 41 01/02/03	19.5	56.9	55.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Children's 1st Floor CC1-008	M38	PR 41 01/02/03	18.7	57.5	55.6	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Children's Ground Floor CC0-008	M38	PR 41 01/02/03	18.3	58.6	57.4	N/A	N/A	N/A	Yes - deadlegs/flushing points at bottom of hot flow, hot return and cold lines (Approx. 1m in length)	No commissioning valves evident on hot flow and return
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Deadlegs on hot flow, hot return and cold lines should be removed if no longer required or incorporated into site flushing regime. (2)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's 3rd Floor CC3-013	M18	PR 41 01/02/03	19.5	57.4	52.7	N/A	N/A	N/A	None visible	No commissioning valves evident on hot flow and return
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
Children's 2nd Floor ARU-121	M18	PR 41 01/02/03	18	57.8	55.2	N/A	N/A	N/A	None visible	No commissioning valves evident on hot flow and return. Cold valve not fully open (Approx. $^{4}/_{5}^{ths}$ open)
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Children's 1st Floor CCW-076	M18	PR 41 01/02/03				N/A	N/A	N/A		Different key required for this riser (not standard plantroom key). Pipework drops thorugh floor to ground floor - no corresponding riser on ground floor - assumed pipework turns and runs above ceiling in ground floor to supply ground floor services.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A		N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 11th Floor Ward A CA11-006	T1	N/A	16.9	N/A	N/A	N/A	N/A	N/A	2 small deadlegs on cold line.	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
Adults 10th Floor Ward A CA10-006	T1	N/A	17.6	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 9th Floor Ward A CA9-006	T1	N/A	16.6	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 8th Floor Ward A CA8-006	T1	N/A	16.4	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser. $^{1}/_{2}$" connection open but capped - no leaks present. DMA closed valve.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 7th Floor Ward A CA7-006	T1	N/A	16.6	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward A CA6-006	T1	N/A	16.8	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Small section of insulation missing - this should be replaced. (3)							
Adults 5th Floor Ward A CA5-006	T1	N/A	16.6	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							
Adults 4th Floor Ward A CA4-006	T1	N/A	16.9	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 11th Floor Ward A GENW21-068	T12	PR32 01/02/03	18.5	58.7	54.5	N/A	57.4	54.5	Small deadleg on cold line, and lines to air vents on top of hot flow and hot return lines	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	54	N/A	N/A	54		
Recommendations:			Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
			Hot return temperatures too low - investigate and correct. (2)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water. (2)							
Adults 10th Floor Ward A GENW17-068	T12	PR32 01/02/03	16.5	62.1	55.8	N/A	61.8	56.4	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	55		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 9th Floor Ward A Next to GENW13-068	T12	PR32 01/02/03	17.8	61.5	56.1	N/A	61.1	55.8	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	54		
Recommendations:			Hot return temperature gauges reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 8th Floor Ward A GENW9-068	T12	PR32 01/02/03	16.9	61.8	58.1	N/A	60.9	57.7	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	56		
Recommendations:										
Adults 7th Floor Ward A GENW5-068	T12	PR32 01/02/03	16.8	61.7	59.6	N/A	60.9	59.4	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	60		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward A GENW1-068	T12	PR32 01/02/03				N/A				Different key required for this riser (not standard plantroom key).
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A		N/A	N/A			
Recommendations:										
Adults 5th Floor Ward A GENWA-068	T12	PR32 01/02/03	16.4	62.8	60.9	N/A	62.1	60.6	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	60		
Recommendations:										
Adults 4th Floor Ward A	T12	PR32 01/02/03	17.6	61.6	59.6	N/A	61.3	59.6	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
RENW-278			N/A	N/A	60	N/A	N/A	60		
Recommendations:			No labelling on cold pipework labelling should be fitted. (3)							
Adults 11th Floor Ward B GENW24-068	T4	PR31 04/05/06	16.8	60.1	59.3	N/A	N/A	N/A	Small deadleg on cold line, and lines to air vents on top of hot flow and hot return lines	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	N/A		
Recommendations:			Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water. (2)							
Adults 10th Floor Ward B GENW20-068	T4	PR31 04/05/06	17.1	61.5	59.7	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	N/A		
Recommendations:										
Adults 9th Floor Ward B GENW16-068	T4	PR31 04/05/06	17.5	60.6	57.7	N/A	N/A	N/A	None visible	Evidence of damage to insulation and corrosion etc. from leak on hot connection.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	N/A		
Recommendations:			Evidence of damage to insulation and corrosion etc. from leak on hot pipework. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
Adults 8th Floor Ward B GENW12-068	T4	PR31 04/05/06	16.6	63.6	62.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	61	N/A	N/A	N/A		
Recommendations:										
Adults 7th Floor Ward B GENW8-068	T4	PR31 04/05/06	16.4	61.9	59.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward B GENW8-068	T4	PR31 04/05/06	16.3	63.1	60.9	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	61	N/A	N/A	N/A		
Recommendations:										
Adults 5th Floor Ward B GENWD-068	T4	PR31 04/05/06	16.1	61.9	59.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	N/A		
Recommendations:			Cold, Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							
Adults 4th Floor Ward B HOW-207	T4	PR31 04/05/06	16.6	61.9	60.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 11th Floor Ward C GENW23-068	T5	PR31 07/08/09	18.9	59.3	56.6	N/A	59.7	56.4	Small deadleg on cold line, and lines to air vents on top of hot flow and hot return lines	Leak on cold line
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	61	N/A	N/A	61		
Recommendations:			Deadlegs on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water. (2)							
			There is a leak from the cold line (Possibly at ½" valved connection) which is dripping/running down pipework to floors below leaving a white residue and corroding components on pipework and in risers below. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 10th Floor Ward C GENW19-068	T5	PR31 07/08/09	16.6	61.7	59.4	N/A	61.4	59.8	None visible	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	61	N/A	N/A	61		
Recommendations:			Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
Adults 9th Floor Ward C GENW15-068	T5	PR31 07/08/09	16.4	62.7	60.5	N/A	62.2	60.3	None visible	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	60		
Recommendations:			Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
Adults 8th Floor Ward C GENW11-068	T5	PR31 07/08/09	16.8	62.9	61.4	N/A	62.6	59.8	None visible	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	61	N/A	N/A	61		
Recommendations:			Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
			Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 7th Floor Ward C GENW7-068	T5	PR31 07/08/09	16	62.7	60.8	N/A	62.1	61.1	None visible	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	60		
Recommendations:			Evidence of damage to insulation and corrosion etc. from leak on 11th Floor. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
			Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							
Adults 6th Floor Ward C GENW3-068	T5	PR31 07/08/09	16.9	63.9	61.7	N/A	63.5	61.4	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62	N/A	N/A	62		
Recommendations:										
Adults 5th Floor Ward C GENWC-068	T5	PR31 07/08/09	16.3	61.9	61.1	N/A	62.6	60.2	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	72	N/A	N/A	65		
Recommendations:			Hot return temperature gauges reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 4th Floor Ward C RENW-212	T5	PR31 07/08/09	16.9	62.4	59.7	N/A	62.3	55.4	None visible	Evidence of damage to insulation and corrosion etc. from leak on hot connection.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	63	N/A	N/A	60		
Recommendations:			Hot return temperature gauges reading incorrectly – these should be recalibrated or replaced. (3)							
			Evidence of damage to insulation and corrosion etc. from leaks on hot pipework. This should be repaired and along with any damage caused by leak (e.g. to insulation, valves corroded etc.). (2)							
			No labelling on cold pipework (main riser) labelling should be fitted. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 11th Floor Ward D GENW22-068	T13	PR33 01/02/03	18.3	59.3	55.7	N/A	N/A	N/A	Small deadleg on cold line.	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	56	N/A	N/A	N/A		
Recommendations:			Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are operating correctly and not trapping stagnant water. (2)							
Adults 10th Floor Ward D GENW18-068	T13	PR33 01/02/03	17.1	60.4	58.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 9th Floor Ward D GENW14-068	T13	PR33 01/02/03				N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A		N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 8th Floor Ward D GENW10-068	T13	PR33 01/02/03	16.5	63.3	62.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	61	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 7th Floor Ward D GENW6-068	T13	PR33 01/02/03	17.2	61.4	59.6	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	40	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward D GENW2-068	T13	PR33 01/02/03	17.5	62.7	61.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	59	N/A	N/A	N/A		
Recommendations:										
Adults 5th Floor Ward D GENWB-068	T13	PR33 01/02/03	15.9	63.8	61.5	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	59	N/A	N/A	N/A		
Recommendations:			Cold, Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							
Adults 4th Floor Ward D RENW-270	T13	PR33 01/02/03	17.4	60.6	59.1	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 11th Floor Ward D Next to CA11-014	T2	N/A	No Access	N/A	N/A	N/A	N/A	N/A	Small deadleg on cold line.	No hot water services in this riser No access to pipework in riser due to ducting
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible. (3)							
			Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime. (2)							
Adults 10th Floor Ward D CA10-014	T2	N/A	No Access	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser No access to pipework in riser due to ducting
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible. (3)							
Adults 9th Floor Ward D CA9-014	T2	N/A	No Access	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser No access to pipework in riser due to ducting
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible. (3)							
Adults 8th Floor Ward D CA8-014	T2	N/A	No Access	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser No access to pipework in riser due to ducting
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible. (3)							
Adults 7th Floor Ward D CA7-014	T2	N/A	No Access	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser No access to pipework in riser due to ducting
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward D CA6-014	T2	N/A	No Access	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser No access to pipework in riser due to ducting
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is no access to the pipework (Cold only) in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible. (3)							
Adults 5th Floor Ward D CA5-014	T2	N/A	16.2	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							
Adults 4th Floor Ward D CA4-014	T2	N/A	15.7	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold pipework appears labelled incorrectly (wrong way round) - labelling should be corrected. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults Basement CAB-037		N/A	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Only cold pipework rising thorugh building
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults Basement CAB-038		N/A	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Only cold pipework rising thorugh building, with a 15mm line coming from above which appears to supply the Estates Workshop (FMB-003 and M&S(?) Store (Locked - no access)
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 2nd Floor Dialysis Centre RENO-0861	T13	PR22 01/02/03	16.4	58.2	52.3	N/A	N/A	N/A	None visible	No local branches to outlets
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
Adults Atrium OPD1 OPD1-059	T13	PR22 01/02/03	18.2	56.8	52.2	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A		N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
Adults 1st Floor Atrium RNM-004	M26	PR22 01/02/03	17.4	58.7	55.2	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	N/A		
Recommendations:										
Adults 2nd Floor Atrium END-020	M26	PR22 01/02/03	17.4	57.5	56	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Childrens 1st Floor Theatre Corridor THE-027	M30	PR22 01/02/03	17.4	59.2	58.1	N/A	N/A	N/A	None visible	Temp Gauge Missing
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold, Hot flow and return pipework unlabelled - labelling should be fitted. (3)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Childrens Ground Floor X-Ray/Imaging Corridor RCG-008	M30	PR22 01/02/03	17.2	59.4	56	N/A	N/A	N/A	None visible	Temp Gauge Missing
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold, Hot flow and return pipework unlabelled - labelling should be fitted. (3)							
			Sections of insulation missing on cold, hot flow and hot return pipework (Approx. 1m) as it drops through floor - this should be replaced. (3)							
Childrens 1st Floor Theatre THE-143	M27	PR22 01/02/03	18.5	57.5	55.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	66	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Childrens 1st Floor Theatre THE-132	M38A	PR22 01/02/03	18.4	57.4	56.2	N/A	N/A	N/A		Temp Gauge Missing
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor HDU Unit 1 CCW-046	M1	PR21 01/02/03	17.3	57.8	55.2	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
Adults 1st Floor Critical Care Offices CCW-230	M5	PR21 01/02/03	17.5	56.4	54.7	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	56	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 1st Floor Coronary Care CCU-069	M6	PR21 01/02/03	17.4	56.8	53.7	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
			Hot return temperature too low - investigate and correct. (2)							
Adults 1st Floor Atrium STW-012	M10	PR31 01/02/03	17.7	58.1	55.2	N/A	N/A	N/A	None visible	Insulation missing
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	59	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
			Sections of insulation missing on cold, hot flow and hot return pipework (Approx. 1m) as it runs to supply services - this should be replaced. (3)							
Adults 1st Floor Atrium MDU-052	M21	PR31 01/02/03	17.5	57.5	56	N/A	N/A	N/A	None Visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 2nd Floor Theatres THE-359	M7	PR31 01/02/03	N/A	N/A	N/A	N/A	N/A	N/A	Still to visit	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor Corridor (at 1C) STW-012	M7	PR31 01/02/03	N/A	N/A	N/A	N/A	N/A	N/A		No connection to local services - pipework runs straight through riser with no branches
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 3rd Floor Plantroom 31 at 31AHU29	M7	PR31 01/02/03	N/A	N/A	N/A	N/A	N/A	N/A		15mm line to open end (Valved off)
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			15mm line to open end (Valved off) - this should be removed. (2)							
Adults 2nd Floor Theatres	M12	PR31 01/02/03	N/A	N/A	N/A	N/A	N/A	N/A	Still to visit	Cold supply from calorifier 31 04/05/06 supply line.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 3rd Floor Plantroom 31 at 31AHU19		PR31 01/02/03	17.9	56.9	52.9	N/A	N/A	N/A		Appears to supply 3rd Floor Facilites offices and changing rooms
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	47	N/A	N/A	N/A		
Recommendations:			Hot return temperature too low - investigate and correct. (2)							
			Hot return temperature gauge reading incorrectly – these should be recalibrated or replaced. (3)							
			Cold pipework appears labelled incorrectly (wrong way round) abiove 31AHU19 - labelling should be corrected. (3)							

Section 8

Other 'At Risk Systems'

WATER SYSTEM RISK ASSESSMENT

Other Risk Systems

All other "at risk" systems should have a suitable L8 risk assessment carried out with an appropriate L8 monitoring regime implemented.

HSG 274 Legionnaire's disease: Technical guidance Part 3: The control of legionella bacteria in other risk systems provides guidance on identification and frequency of inspections for these systems.

Please also refer to outlets (section 7 for information and section 2 for recommendation) relating to supplies from domestic water system to process systems described below.

Other systems identified to DMA as being present on site:

- Hydrotherapy Pool (completed under separate assessment)
- Whirlpool/Arjo Baths
- Dental equipment
- Emergency showers
- Irrigation systems
- Sprinkler/Wet firefighting systems
- Renal dialysis (x2 systems) with additional 'Emergency Dialysis Points' which are directly supply from bulk domestic cold water system. NHS Estates should confirm location of all Emergency Dialysis Points.
- Endoscopy Wash
- Water softeners
- Medical Gases/Medical Equipment (e.g. Nebulisers, incubators, etc.)
- Emergency Cooling (MRI chiller)
- Closed heating systems
- Closed chilled water systems
- Steam Humidification
- Air Conditioning

This assessment provides a brief description of each system and an initial assessment however we would advise specialists in each field are consulted to confirm this initial assessment is reflective of the function of the system and would present these findings as draft only until this is confirmed.

N.B. DMA were advise no Ice making machines or machines with "open" cooling system (e.g. lathes) are used on site

WATER SYSTEM RISK ASSESSMENT

System	**Hydrotherapy Pool**
Location(s)	Ground floor - Children's Hospital
Responsibility	Estates/Clinical staff
Description	Hydrotherapy pool
Water Source	Bulk Water supplies CWST in basement Hydrotherapy plantroom
Filtration Present	Pool filtration plant in hydrotherapy plantroom in basement
Running Temperature	Typically 35-40°C
Use	Advised daily
Aerosol Created	Potential for some aerosol release
Comments	This has been assessed under separate cover by Brio Group in February 2018.
Recommendations	Refer to risk assessment.

System	**Arjo Baths**
Location(s)	Various locations throughout the hospital (Wards)
Responsibility	Estates/Clinical staff
Description	Medical bath (Baths seen by DMA do not appear to have any obvious air or water jet facility)
Water Source	Bulk Water
Filtration Present	None
Running Temperature	Typically 35-45°C
Use	Clinical staff to advise if not routinely used daily.
Aerosol Created	Shower attachment
Comments	Flexible hoses on connection to hot/cold water system in addition to internal flexible connections. Estates unable to confirm maintenance instructions.
Recommendations	Maintain in accordance with manufacturers/installers instructions. Where flexible hoses (i.e. internal to bath unit) cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered. Consider shortening shower hoses as it was noted that these can in some areas reach into adjacent WCs and WHBs. DMA advised these are maintained by a sub-contractor, though no details of the maintenance contract provided at time of survey. Contractual obligation should be confirmed in written scheme.

WATER SYSTEM RISK ASSESSMENT

System	**Dental Equipment**
Location(s)	Ground floor Children's Hospital
Responsibility	Estates/Clinical staff
Description	Water supply to 2 x dental chairs
Water Source	Bulk Water feeds CWST and booster pump. Also bottled water within chair. Confirmation as to what equipment is fed from CWST/booster and bottled water not provided to DMA.
Filtration Present	None
Running Temperature	CWST system temperature – though potential for heat gain in break tank and associated system if water turnover low.
Use	TBC
Aerosol Created	Potential aerosol release from dental tools
Comments	
Recommendations	HSG 274 Part 3 states *"Drain down, clean, flush and disinfect all system components, pipework and bottles twice daily. Disinfectant contact time as recommended by manufacturer. Take microbiological measurements (Refer to Decontamination HTM 01-05)* SHTM 04-01 Part G states *"Drain down and clean at the end of each working day".* It should be confirmed what equipment is fed from CWST/booster and bottled water. HTM 01-05 provides advice and recommendations for on-going maintenance and this should be followed in addition to manufacturers and installers instructions. Clarify governance and maintenance responsibilities within the written scheme.

WATER SYSTEM RISK ASSESSMENT

System	**Emergency Showers**
Location(s)	Hydrotherapy Plantroom and A&E Decontamination Room
Responsibility	Estates
Description	Emergency drench system
Water Source	Bulk Water
Filtration Present	None
Running Temperature	TBC though 'Bulk water system'
Use	Estates advised these are included in a flushing regime though no records available at time of assessment.
Aerosol Created	Shower
Comments	Estates advised flushing regime is intermittent.
Recommendations	HSG 274 Part 3 recommends minimum six-monthly flushing of emergency/deluge shower, though Risk Control Notice 11/advises "flush through and purge to drain twice per week– source SHTM 04-01 Part G. NHS Estates should formulate an appropriate flushing regime and maintain in accordance with manufacturers/installers instructions. Showerheads should be incporated into site showerhead disinfection and/or replacement regime.

System	**Irrigation System**
Location(s)	Various courtyards/roof gardens
Responsibility	Estates
Description	Soak away irrigation (Advised by Estates – DMA did not see system running)
Water Source	Trades Water
Filtration Present	None
Running Temperature	TBC though 'Trades water system'
Use	DMA advised in January 2018 by NHS Estates that these systems had been disconnected and were no longer in use.
Aerosol Created	N/A
Comments	Very long runs to outlets through the building.
Recommendations	Ensure former connection points are included in site flushing regime or removed leaving no deadlegs.

WATER SYSTEM RISK ASSESSMENT

System	**Renal Dialysis (Adult)**
Location(s)	Plantroom 32 then runs to renal ward areas
Responsibility	Estates/Specialist
Description	A constantly circulating purified water system supplying renal dialysis outlets in the Adult hospital
Water Source	Bulk Water
Filtration Present	Various
Running Temperature	TBC though 'Bulk water system'
Use	Daily
Aerosol Created	Unlikely during normal operation
Comments	As supplied by Bulk Water this makes domestic water system disinfections problematic. New line fitted from entrance to plantroom 32 to bypass the chlorine dioxide "top-up" unit installed within this plantroom. **N.B.** There is still potential for ClO_2 to enter the system from the basement supply, though DMA advised suitable filters installed by Scotmas and test protocols implemented by Renal specialists.
Recommendations	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained.

WATER SYSTEM RISK ASSESSMENT

System	**Renal Dialysis (Adult – Emergency Points)**
Location(s)	To be confirmed by NHS Estates
Responsibility	Estates/Specialist
Description	Emergency connection points have been installed in rooms which were not in the proximity of the dedicated renal dialysis systems.
Water Source	Bulk Water (Domestic Cold Water)
Filtration Present	On renal dialysis machines
Running Temperature	See section 7 for description of cold water conditions.
Use	Points are for emergency use only and are likely to be creating deadlegs on the system.
Aerosol Created	Typically, Low
Comments	As supplied by Bulk Water this makes domestic water system disinfections problematic. System is now dosed with ClO_2 from the basement supply.
Recommendations	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Include in twice weekly flushing regime. Ensure suitable backflow prevention in placed Due cognisance of ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained.
Risk (Legionella)	Low

WATER SYSTEM RISK ASSESSMENT

System	**Renal Dialysis (Children)**
Location(s)	Plantroom 22 then runs to renal ward areas
Responsibility	Estates/Specialist
Description	A constantly circulating purified water system supplying renal dialysis outlets in the Adult hospital
Water Source	Bulk Water
Filtration Present	Various
Running Temperature	TBC though 'Bulk water system'
Use	Daily
Aerosol Created	Typically Low
Comments	As supplied by Bulk Water this makes domestic water system disinfections problematic. New line fitted from entrance to plantroom 22 to bypass the chlorine dioxide "top-up" unit installed within this plantroom. **N.B.** There is still potential for ClO_2 to enter the system from the basement supply, though DMA advised suitable filters installed by Scotmas and test protocols implemented by Renal specialists.
Recommendations	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained.

WATER SYSTEM RISK ASSESSMENT

System	**Endoscopy Wash Filtration Unit**
Location(s)	Plantroom 31
Responsibility	Estates/Specialist
Description	A constantly circulating purified water system supplying endoscopy wash machines in the Adult hospital
Water Source	Bulk Water
Filtration Present	Various
Running Temperature	TBC though 'Bulk water system'
Use	Daily (TBC)
Aerosol Created	Advised aerosol contained within the endoscopy wash units during normal operation.
Comments	DMA advised this is a clinical responsibility with no input from estates.
Recommendations	Maintain in accordance with manufacturers/installers instructions and current NHS (SHTM) protocols. Ensure aerosol creation is minimised during maintenance and testing procedures.

System	**Water Softeners**
Location(s)	Various
Responsibility	Estates/Specialist
Description	Softeners form part of various medical (e.g. Renal/Endoscopy) and other processes (e.g. steam ovens)
Water Source	Bulk Water
Filtration Present	N/A
Running Temperature	TBC though 'Bulk water system'
Use	See relevant process/equipment
Aerosol Created	N/A (Contained systems)
Comments	Estates unable to confirm servicing history or local responsibilities (Estates/Medical Physics/Clinical)
Recommendations	Maintain in accordance with manufacturers/installers instructions (including cleaning and disinfection of resin and brine tanks). Confirm responsibilities. Ensure aerosol creation is minimised during maintenance and testing procedures.

WATER SYSTEM RISK ASSESSMENT

System	**Medical Gases/Medical Equipment** (e.g. Nebulisers, incubators, etc.)
Location(s)	Throughout Hospital
Responsibility	Estates/Clinical Staff/Infection Control/Specialist
Recommendations	Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system and Infection Control/Clinical staff where appropriate. Control procedures within appropriate SHTM (or other relevant guidance) for system being assessed should be taken in to account during assessment(s). Any water softeners or other filtration equipment connected to these systems should be assessed at this time. Devise a control scheme based on the risk assessment. See also section 8B of this document.

System	**Emergency Cooling (MRI chiller)**
Location(s)	3rd Floor Roof adjacent to Plantroom 31 at Calorifiers 31-04/05/06.
Responsibility	Estates/Specialist
Description	DMA were advised by NHS Estates that the water supply to these units (via an RPZ valve) is for emergency use in the event the chillers fail. The water would be used in a once through loop flowing through the unit and direct to drain.
Water Source	Bulk Water
Filtration Present	None noted (Fed via RPZ valve)
Running Temperature	TBC though 'Bulk water system'
Use	Emergency use only
Aerosol Created	TBC – DMA have not witnessed this system in use, though likely to be minimal.
Comments	
Recommendations	Connection point to MRI unit(s) should be included in site flushing regime. A check valve has been fitted approx. 1m from the tee off to the MRI unit, with an RPZ fitted just prior to line running through wall to the units. Ensure aerosol creation minimised when running to drain in emergency use and during flushing.

WATER SYSTEM RISK ASSESSMENT

System	**Closed Heating Systems**
Location(s)	Throughout hospital
Responsibility	Estates
Description	Closed heating systems
Water Source	Top up by Bulk Water system
Filtration Present	None
Running Temperature	70 – 105°C (approx.)
Use	Constantly circulating systems
Aerosol Created	Enclosed system.
Comments	
Recommendations	Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturers/installers instructions.

System	**Closed Chilled Systems**
Location(s)	Throughout hospital
Responsibility	Estates
Description	Closed chilled systems
Water Source	Top up by Bulk Water system
Filtration Present	None
Running Temperature	6 - 20°C (approx.)
Use	Constantly circulating systems
Aerosol Created	Enclosed system.
Comments	
Recommendations	Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturers/installers instructions.

WATER SYSTEM RISK ASSESSMENT

System	**Steam Humidification**
Location(s)	Plantrooms (Air Handling Units)
Responsibility	Estates
Description	Steam humidifiers for air conditioning plant
Water Source	Formerly Bulk Water
Filtration Present	N/A
Running Temperature	N/A
Use	DMA advised all units now disconnected.
Aerosol Created	N/A
Comments	DMA advised all units now disconnected. DMA to confirm during plantroom re-survey after ClO_2 installation complete.
Recommendations	

System	**Air Conditioning/Ventilation**
Location(s)	Plantrooms (Air Handling Units)
Responsibility	Estates
Description	Air handling units
Water Source	N/A
Filtration Present	N/A - Water
Running Temperature	N/A
Use	Variable depending on building and department requirements
Aerosol Created	N/A - unless under fault conditions, where water pools in the condensate tray of the unit and does not drain freely away. DMA to survey a inspect a sample number of the units and report on their internal and drain trap condition.
Comments	Inspections to be carried out by DMA.
Recommendations	Maintain in accordance with manufacturers/installers instructions and as required under SHTM 03-01 and SHTM 04-01 Part G.

WATER SYSTEM RISK ASSESSMENT

System	**Decorative Bubble Lamps**
Location(s)	Children's Hospital Atrium
Responsibility	Estates/Contractor (TBC)
Description	Decorative water and air bubble lamps
Water Source	N/A (Sealed System)
Filtration Present	N/A (Sealed System)
Running Temperature	Ambient
Use	Variable (Multiple times daily) - Bubbles released into water tubes at base when button pressed on unit
Aerosol Created	Unit appears to be completely sealed so aerosols would be contained.
Comments	
Recommendations	DMA advised these are sealed units and no further actions required.

Section 8B

Medical Uses of Water

WATER SYSTEMS RISK ASSESSMENT

Information following below provided by Andy Wilson on 30/08/18.

Where "Further Review Required" is stated as "Yes" or "No" this is a response provided by NHS GG&C. DMA are unable to comment on the clinical uses and effectiveness of the infection control methodology and any further reviews/actions should be conducted by Infection Control/Clinical Technicians or other suitably qualified personnel. It should be noted however that where cleaning practices are noted as e.g. "rinsed with sterile water" this may not provide decontamination if the equipment or environment has prior contamination. If requested DMA can contribute to any review as requested to by the specialists.

Current Status of "Other Equipment" Using Water

1. REQUEST FOR INFORMATION

Susie Dodd Sent out the following request for information in an email:

> *I met with estates colleagues yesterday who are working on a water safety risk assessment of each system coming under medical gas / medical equipment categories where water safety is a factor. What this essentially means is that where we are using medical equipment that requires water then we need to ensure that is as safe as it can be for patients. Examples of equipment include nebulisers, humidified oxygen, incubators etc. My immediate thought is that the majority of equipment uses sterile bottled water rather than the mains domestic water supply but I wanted to clarify this with yourselves? Would it be possible for you to find out the following within each of your areas;*
>
> a) *If there are any pieces of equipment that require a water supply and if so what is it?*
>
> b) *Of those pieces of equipment, where is the water supply obtained from? Sterile bottled water or domestic mains supply?*

This was sent out to the following people:

- *Thomson, Kathleen*
- *Johnston, Elaine*
- *Friel, Patricia*
- *Meechan, Mandy*
- *Robertson, Lynne*
- *Hutton, Melanie*
- *Devine, Sandra*
- *Barmanroy, Jackie*
- *Pritchard, Lynn*

The request was further distributed to other members of staff, responses contained in the table below.

WATER SYSTEMS RISK ASSESSMENT

2. RESPONSES:

NAME	DEPARTMENT / CLINIC	SYSTEM	DESCRIPTION OF WATER USE	FURTHER REVIEW REQUIRED (YES/NO)
Jim Harrigan	*Paediatric Audiology, Clinic 6, Outpatients, RHC*	*Ear irrigator*	*Bottled Sterile Water*	*NO*
Pamela McQuarrie	*General Surgery, Vascular, Breast*	*Nebulisers* *Humid Oxygen*	*Bottled Sterile Water*	*NO*
Michele Paterson	*Spinal Injuries Unit*	*Nebulisers* *Humidified Oxygen* *Optiflow* *Humification for Mechanical Ventilators* *Flushing NG Tubes*	*All use sterile water*	*NO*
Karen McGugan	*Imaging*	*Nebulisers* *Humid Oxygen*	*Bottled Sterile Water*	*NO*
Alastair Hunter	*Podiatry*	*N/A*	*N/A*	*NO*
Karen Wallace	*Anaesthetics & Recovery, Adult Theatres, QEUH*	*Humidified Oxygen* *Optiflow* *Level 1 Rapid Infusor*	*All use sterile water*	*NO*
Audrey Anderson	*General and Orthopaedic OPD or POA South*	*N/A*	*N/A*	*NO*
Mhairi Lloyd	*ED & MIUs, QEUH*	*Nebulisers*	*Sterile Water*	*NO*
Andrea Boslem	*Ward 5A, QEUH*	*Nebulisers* *Humid Oxygen*	*Bottled Sterile Water*	*NO*
Agnes O'Brien	*Medical Specialties, QEUH*	*Nebulisers* *Humid Oxygen*	*Bottled Sterile Water*	*NO*
Valerie Anderson	*Ward 8B, QEUH*	*Not specified*	*Bottled Sterile Water used for any medical equipment*	*NO*
Gus McKillop	*Regional Services, QEUH on behalf of 5 off renal clinical areas*	*Nebulisers* *Humidified Oxygen*	*Sterile Water*	*NO*
Liz Hughes	*Ward 5A, QEUH*	*Nebulisers*	*Sterile Water*	*NO*
Helen Reid	*Older People Services*	*Nebulisers* *Humid Oxygen*	*Bottled Sterile Water*	*NO*
Graham Christie	*Neurology, Neurosurgery, OMFS, Theatres, Neuro & OMFS Outpatients*	*Nebulisers* *Humid Oxygen*	*Bottled Sterile Water*	*NO*

A49585984

WATER SYSTEMS RISK ASSESSMENT

AME	DEPARTMENT / CLINIC	SYSTEM	DESCRIPTION OF WATER USE	FURTHER REVIEW REQUIRED (YES/NO)
Morag Busby	*Level 10, QEUH*	*Nebulisers*	*Bottled Sterile Water*	*NO*
Kathleen Thomson	*Vent Service, RHC*	*Not specified*	*Bottled Sterile Water*	*NO*
Kathleen Thomson	*POONS*	*Home suction machine for palliative care*	*normally use sterile bottled*	*NO*
Kathleen Thomson	*Haemodialysis*	*Haemodialysis equipment*	*Mains water*	*YES* **DMA Comment** – *in relation to the use in patient homes.*
Kathleen Thomson	*Stoma CNS*	*The water we use for gastrostomy water/ACE device water changes comes from the 5/10ml ampoules of water for injection or the C&G sterile water bottles.* *For Rectal Irrigation we use tap water but in light of recent water concern service has been using the bottled water as a precaution for some time.* *I had been advising parents of this due to it being in the media and assuring them tap water is safe to use at home as before.*	*Mains water / Sterile bottled water*	*YES* **DMA Comment** – *in relation to the use in patient homes.*
Kathleen Thomson	*Ward 2A*	*Humidified oxygen is used on the unit, the water used for this is sterile water for inhalation.* *Nebulisers are also used at times to provide inhalation medications. Water is not used in relation to these and I can confirm that the nebuliser pots are rinsed after each use with sterile water*	*Bottled Sterile Water*	*NO*
Kathleen Thomson	*Respiratory*	*In the wards - Nebulisers are cleaned with Bottled water and at home parents are advised to use hot soapy water to clean after use and once a week to sterile*	*Mains water at home / Sterile bottled water in wards*	*YES* **DMA Comment** – *in relation to the use in patient homes.*
Kathleen Thomson	*CF*	*In the wards - Nebulisers are cleaned with Bottled water and at home parents are advised to use hot soapy water to clean after use and once a week to sterile*	*Mains water at home / Sterile bottled water in wards*	*YES* **DMA Comment** – *in relation to the use in patient homes.*
Kathleen Thomson	*Tracheostomy*	*We use a continual nebuliser – ULTRANEB which used sterile water for irrigation to nebulise, both in hospital and out hospital.* *The suction tubing can be cleared with bottled sterile water.* *The intermittent nebulised solution is diluted with sterile normal saline.*	*Bottled Sterile Water / Saline*	*NO*

WATER SYSTEMS RISK ASSESSMENT

NAME	DEPARTMENT / CLINIC	SYSTEM	DESCRIPTION OF WATER USE	FURTHER REVIEW REQUIRED (YES/NO)
Kalsoom Mohammed	*Ward 2C*	*Nebulisers are also used at times to provide inhalation medications. Water is not used in relation to these and I can confirm that the nebuliser pots are rinsed after use with sterile water if required. I will reinforce this practice via safety brief.*	*Sterile water*	*NO*
Andrew Morley	*TBC*	*Nebuliser - Sterile water* *Humidified Oxygen - Sterile water (very rare, would always be an inpatient and not set up by lab).* *Humidifier for NIV - Sterile water as inpatient (Sterile water or boiled & cooled tap water as outpatient).* *Sweat test - Sterile water* *Pneumotach - washed in hot soapy water (Hospec or Bactosol) made up using tap water / rinsed using tap water/ soaked in Actichlor / rinsed in sterile water* *Pneumotach screens - Washed as above for Pneumotachs and then placed in an ultra sonic bath for one use of the ultra sound before being rinsed with sterile water and left to dry.* *pH monitor bands & sleep bands - soaked in soapy water (Hospec or Bactosol) made up using tap water / soaked in actichlor / rinsed off using tap water.* *pH studies - probe would be pre-soaked for use in test in Tap water* *Test tubes that hold pH probes - rinsed clean with Tap water*	*Tap water / sterile water*	*YES*
Ida Torrence	*TBC*	*All staff are fully aware that only filtered tap water is used for the Liva Nova heater coolers.* *We use bottled sterile water for the ECMO heaters as per manufacturers recommendations*	*Filtered Tap Water / Sterile Water* *Email from Teresa Inkster confirmed use of tap water in heater coolers acceptable provided they are only filled from filtered taps. Further review required to confirm this is the case in all areas using this equipment.*	*YES*

Section 8C

Fire Suppression Systems

WATER SYSTEMS RISK ASSESSMENT

12TH FLOOR HELI-PAD FIRE SUPPRESSION SYSTEM

Name/number of CWST		12th Floor Fire Suppression Tank		
Location of CWST		12 Floor Plant Room		
Labelled		**CWST**	**Pipework**	**Valves**
		No	No	No
Type		Sectional		
Materials		GRP		
Lined		No		
Dimensions (m)		3 x 2 x 2		
Volume (litres)		12,000 (actual approx. 9,000)		
Linked/single		Single		
M/U opposite draw off		Diagonal		
Make up source		Trades Water		
Services supplied		Fire Suppression		
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**
		18.5	18.6	18.8
Internal condition	Internal	Difficult to confirm internal condition due to water condition		
	Waterline	Medium		
	Dirt & silt	Heavy		
Water condition		Cloudy/Dirty		
Stagnation		Yes		
Deadlegs around CWST		On fire system		
Close fitting lid/screened vent		Yes	Yes	
Warning Pipe Screen		No		
Overflow Screen		Weir overflow screened, no screens visible on overflow and warning pipe		
Insulation		Pre-insulated		
Access		Good		
Vents returning to CWST		Recirculating line from system		
Is drain present?		Yes (short)		
Booster pumps	Fitted	2 x Fire System Pumps		
	Vibration Couplings			
	Expansion Vessel			
	Drain on Vessel?			
Overall risk rating		**High**		

WATER SYSTEMS RISK ASSESSMENT

System	**12th Floor Heli-pad fire suppression system**
Location(s)	12th Floor heli-pad fire tank/suppression system
Responsibility	Estates & Facilities
Water Source	Trades Water via 12m^3 Cold Water Storage Tank in 12th floor Plantroom. Trades system runs approx. 100m from last tee-off in 12th floor before supplying the tank (and last tee-off is itself approx. 50m to a tap which is unlikely to be used)
Filtration Present	None
Running Temperature	Ambient
Use	In order to maintain readiness in case of emergency both cannons are tested for 5 to 10 mins per week, with cannons using 30 litres of water per min. Advised a weekly test using water (no foam) is carried out through all areas of the system with staff wearing appropriate PPE. Thereafter this for Emergency use only. Testing creates a significant quantity of spray and therefore aerosols are expected to the be released in a significant enough volume as to warrant implementation of control measures. As testing is carried out on the roof aerosols may spread over the surrounding as drift from a cooling tower would with the greatest density of aerosol (weather conditions permitting) being disseminated onto users of the immediate areas, which would be users of the Queen Elizabeth University Hospital.
Aerosol Created	Fire cannon (Droplet size undetermined). As the system is located on the rooftop any aerosol could be dispersed over a larger area (similar to a cooling tower) In addition to direct dissemination there are air conditioning systems located in the Adults and Children's Hospitals and other hospital buildings where aerosols could then be dispersed within buildings.
Comments	Due to the volumes of water used during fire cannon testing it is not anticipated that weekly testing will turn over the full contents of the storage tank until several months of testing has elapsed though this requires confirmation from NHS Estates. DMA were advised that following use, the system drains down naturally which we understand will mean some lower points of the system remain fully wetted and other areas dry. This may create conditions for biofilm formation within the pipework, increasing the likelihood of legionella proliferation. Pipework is constructed from Mild Steel and Galvanised Steel which also may be conducive to Legionella growth. There are 3 x recirculation lines back to the tank which may also return potential contamination from pipework back to the tank. The CWST was cleaned and disinfected in July 2018. Further guidance on this can be found in *"FIA Guidance for the Fire Protection Industry - Guidance on Legionella in Fire Fighting Systems and Equipment"*

WATER SYSTEMS RISK ASSESSMENT

System Description

Fire suppression/sprinkler system (including water cannon).

The 12th floor CWST supplies two fire 'cannons' on the roof top helipad which are required for emergency fire fighting.

In order to maintain readiness in case of emergency both cannons are tested for 5 to 10 mins per week, with cannons using 30 litres of water per min.

Testing creates a significant quantity of spray and therefore aerosols are expected to the be released in a significant enough volume as to warrant implementation of control measures. NHS Estates/Facilities advised a foam suppressant is added to the discharged water when in use for emergency only, during weekly testing only water is used with no foam.

As testing is carried out on the roof, aerosols may spread over the surrounding area (similar to the drift from a cooling tower) with the highest density of aerosol (weather conditions dependant) being disseminated onto persons in the immediate area, i.e. users of the Queen Elizabeth University Hospital and surrounding industrial and residential areas.

In addition to direct dissemination, there are air conditioning systems located in the Adults and Children's Hospitals and other hospital buildings which aerosols could be drawn into and dispersed within buildings.

Estates advised DMA that the system pipework is steel, with short flexible hoses also present, and may be lined internally, though DMA were not provided with any supporting literature to confirm this. It has been noted that there are also what appear to be mild steel/iron valves which are corroding and these should potentially be replaced, if practicable. It appears reasonable to presume therefore that nutrients may be available to aid bacterial growth, including Legionella.

There are various bypasses and drain points on the system which we would normally recommend are removed or included in a site flushing regime (e.g. weekly) though we would advise that the manufacturer or supplier confirms what elements, pipework etc. can be safely flushed and/or removed without potentially affecting the operation of this critical system.

Facilities advised the system remains full and charged with water at all times with no drain down after usage. Therefore, water within the pipework will only be replaced during weekly flushing and will remain at ambient temperature for the majority of that time. This is of particular concern during summer months when ambient temperature is likely to be within the growth range for Legionella. Insulation is likely to be of limited use in maintaining lower temperatures, given the length of time between uses (water temperature of 14.5°C recorded from both cannons at time of assessment)

As the CWST contains approx. 9,000 litres of water with testing expected to use approximately 500 litres per test, water within the CWST will stagnate. Water quality within the CWST was heavily discoloured. Whilst stagnation will have a detrimental effect on water quality, the discolouration visible may indicate dirt/debris from the system is being flushed back into the tank from the recirculating line. As pipework could not be internally inspected during the survey this cannot be confirmed.

As turnover through the supply line and trades system generally is low, stagnation within the system may contribute to poor water quality within the tank.

When the CWST is next drained for cleaning (or prior to this if suitable flushing points can be identified), it may be prudent record the water quality from the incoming supply before any heavy flushing is carried out. This would provide an indication of the typical supply to the CWST. **N.B.** As the trade water tank was cleaned internally last year it is presumed this is not commonly the source of discoloured water.

In addition (when system refilled) the pumps should be run and samples taken from recirculating pipework to note the quality of water returning to the tank.

If the stored water volume is reduced the CWST supply may not keep up within demand in an emergency situation. Therefore, any reductions in capacity would require to be risk assessed appropriately.

DMA were not provided with documentation regarding governance (incl. testing records and RAMS).

WATER SYSTEMS RISK ASSESSMENT

Recommendations

Minimise aerosol creation during maintenance procedures (if practicable). Maintain in accordance with manufacturers/installers instructions.

Ensure all points on the trades system (including inlet to fire tank) are included in site flushing regime.

Consider implementing a sampling regime to include the storage tank and points on the system and the supply. This would be particularly important during summer months where ambient temperatures are likely to be higher.

It is advised temperature monitoring and visual inspection should be carried out on the Storage Tank on a weekly basis prior to testing and should the storage temperature exceed 20^0 C then additional precautions should be considered (E.g. flush the tank to reduce stored water temperature, manually dose tank with suitable disinfectant chemical if no automated system installed).

Given the potential control issues described above, but the need for such a system to be in place, it would be prudent to consider a permanent chemical dosing system or process for microbial control, and/or filtration system, for this water system (though it should be confirmed that any chemicals used on this system would not interfere with the foam used for emergencies) with suitable testing and monitoring included.

The fire system supplier should confirm that treatment will not be detrimental to system operation or maintenance or provide suitable alternatives.

Control and management parameters and procedures should be compiled along with procedures for correction of out of specification results and any escalation procedures that may be required.

We would advise a full clean and disinfection is carried out, including through the cannons, if practicable. The manufacturer should be consulted to confirm which disinfectant(s) are suitable.

Increased turnover of the system may be achieved by additional flushing, which may be automated or manual. However, the poor make-up may result in a reduction in the volume of stored water immediately afterwards which may have an impact in emergency situations. Similarly reducing the capacity of stored water may have a detrimental impact in emergency situations.

Rodents screens should be fitted to overflow and warning pipes.

WATER SYSTEMS RISK ASSESSMENT

BASEMENT FIRE TANKS/SPRINKLER SYSTEM

Name/number of CWST		Sprinkler Tanks		
Location of CWST		Basement Sprinkler		
Labelled		**CWST**	**Pipework**	**Valves**
		No	No	No
Type		Sectional		
Materials		GRP		
Lined		No		
Dimensions (m)		2 off (8 x 2.5 x 5)		
Volume (litres)		2 off 100,000		
Linked/single		2 off Linked		
M/U opposite draw off		Yes		
Make up source		Town Mains (Dedicated)		
Services supplied		Sprinkler		
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**
		Not run	20.4	20.9
Internal condition	Internal	Difficult to confirm internal condition due to water condition		
	Waterline	Ok		
	Dirt & silt	Heavy		
Water condition		Cloudy/Dirty		
Stagnation		Yes		
Deadlegs around CWST		On fire system		
Close fitting lid/screened vent		Yes	No	
Warning Pipe Screen		No		
Overflow Screen		Weir overflow screened, no screens visible on overflow and warning pipe		
Insulation		Pre-insulated		
Access		Good		
Vents returning to CWST		2 x Recirculating lines returning to each tank		
Is drain present?		Yes (short)		
Booster pumps	Fitted	2 x Fire System Pumps		
	Vibration Couplings			
	Expansion Vessel			
	Drain on Vessel?			
Overall risk rating		**High (Emergency use)**		

WATER SYSTEMS RISK ASSESSMENT

System	**Sprinkler/wet fire-fighting system (Sprinkler System)**
Location(s)	Main fire tanks in basement (Sprinkler system throughout the building)
Responsibility	Estates
Water Source	Fed from dedicated fire main (Hardgate Road – Small) via Dedicated Sprinkler System Storage Tanks in the Basement
Filtration Present	None
Running Temperature	Ambient
Use	NHS Estates were unable to confirm if any manual testing is carried out. Outwith any manual testing, the system is used for emergency use only.
Aerosol Created	High when discharging. (Droplet size undetermined)
Comments	The CWSTs were very dirty internally when inspected and heavily stagnant. Further guidance on this can be found in *"FIA Guidance for the Fire Protection Industry - Guidance on Legionella in Fire Fighting Systems and Equipment"*

System Description

Fire suppression/sprinkler system.

DMA witnessed routine testing of the system by Estates. Estates staff advised the sprinkler system is tested every week by estates. Testing involves running the system pumps with water returning via the small bore return line to the tanks (1 pump returns to each tank). On an annual basis inspection and maintenance is carried out by a contractor with water recirculated to the CWSTs via the large bore pipe (this was not run during DMA survey).

Return lines enter the tank with very small gaps to accommodate the pipe. Returns enter the tank in proximity of the weir overflow which could allow aerosol to reach maintenance personnel involved in testing. However, the weir overflows appeared to remain dry (to the naked eye) during the testing witnessed by DMA and although aerosols are very fine suspensions of water particles we would anticipate larger droplets being created and collected by the mesh.

In addition, there was no evidence of rust or other deposits on the mesh to provide indications of longer term wetting and drying (and no records to advise the mesh had been changed).

Estates advised water is never run off from the system as part of maintenance procedures.

Steel pipework on make up to the LHS tank is unlikely to be WRAS approved.

Recommendations

Consider clean and disinfection of the CWST and then regular inspection as per domestic water tanks with cleaning/disinfection as required by inspection.

Minimise aerosol creation during maintenance procedures. Consider wearing suitable masks to prevent ingestion as recommended by the FIA guidance, and prevent access by unauthorised personnel into test area.

Maintain in accordance with manufacturers/installers instructions.

Weir overflow, overflow and warning pipework connected at inappropriate heights to function as intended. This should be corrected.

Given the potential control issues described above, but the need for such a system to be in place, it would be prudent to consider a permanent chemical dosing system, and/or filtration system, for this water system with suitable testing and monitoring included. If chemical dosing systems are implemented then control and management parameters and procedures should be compiled along with procedures for correction of out of specification results and any escalation procedures that may be required. The fire system supplier should confirm that treatment will not be detrimental to system operation or maintenance or provide suitable alternatives.

WATER SYSTEMS RISK ASSESSMENT

Rodents screens should be fitted to overflow and warning pipes.

Section 9

Governance & Documentation Review

WATER SYSTEM RISK ASSESSMENT

Governance & Accountability (including Water Safety Plan & Policies and Procedures)

Written Scheme reviewed was the QEUH Campus Wide document, Revision D June 2018.

The document is version controlled, with revisions recorded within Section 2.1 of the document. The most recent review was conducted by Colin Purdon (Site Manager Operational Estates) in June 2018.

The buildings covered within this document are;

- Queen Elizabeth University Hospital (QEUH)
- New Children's Hospital (NCH)
- Maternity Building
- Neonatal Hospital
- Neurology
- Neurosurgery
- Spinal Unit
- PDRU
- Westmarc
- New Laboratory
- Podiatry

The Written Scheme states *"Full descriptions and information on the individual written schemes are available in the Log book/Risk Assessment folders for each building."*

Location of records and correspondence are recorded within section 2.2 of the document. Only a single entry has been recorded in version reviewed, relating to "Flushing DCFP kitchen dishwasher and outlets" for 16/07/18.

Non-compliance issues and fault details are to be held in the individual building logbooks, with an example sheet included within Section 2.3.

Archived information is to be held separately from the Written Scheme, with the details of the information and the location/person holding the archived records to be recorded in Section 2.4. No records or archived information details recorded within Written Scheme reviewed.

Calibration records are to be held within the QEUH Campus Logbook, stored in the main estates office. Electronic copies are also to be held on *"QEUH Shared Drive>Water Quality Folder"*

Roles and Responsibilities are covered within Section 3 of the document with Section 3.1 giving a description of the responsibilities for the following roles;

- NHS Greater Glasgow & Clyde Chief Executive (Duty Holder)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Jane Grant

- NHS Greater Glasgow & Clyde Director of Facilities (Designated Person)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Alan Gallacher and Mary-Anne Kane.

- NHS Greater Glasgow & Clyde Infection Control Manager – Designated Person (Pseudomonas)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Lead Microbiologist Dr Teresa Inkster

- Senior Estates Manager – Responsible Person (Water)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Andy Wilson
  N.B. *This will require updating as Andy Wilson leaving the organisation.*

WATER SYSTEM RISK ASSESSMENT

- Authorising Engineer (AE)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Legionella Control International Ltd, Dennis Kelly.

- Authorised Person (Water)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Mel MacMillan (Lead Authorised Person).

  Kerr Clarkson, Scott Macer and Darren Hopkins named as Authorised Persons, though noted as being "TBC".

- Head of Capital Planning – Deputy Responsible Person (Water)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Hazel McIntyre

- Site Estates Manager Deputy Responsible Person (Water)

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Colin Purdon.
  N.B. *This will require updating as Colin Purdon takes on new role within the organisation.*

- Acute Services Directors, CH(C)P Directors and Corporate Division Directors

  Directors do not appear to be named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table, or elsewhere within the Written Scheme.

- Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's

  Dr Teresa Inkster (Infection Control), Dr Iain Kennedy (Public Health) and Janet Young (Laboratory Services) are named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table. Other clinical staff do not appear to be named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table, or elsewhere within the Written Scheme.

- Legionella Risk Assessor

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as DMA Water Services Ltd*, David Watson, Mike Kinghorn and Allan McRobbie.

  * Note this should be changed to DMA Canyon Ltd

- Competent Person (Water)

  Description is based on

  Named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table as Bernard McCulloch, though noted as being "TBC" and generically "Plumbers/Engineers", with Martin Inglis, Andrew Hamilton, David Fickling and Peter McCabe named within the Training Records Section as "Tech Plumber" and having completed the Competent Persons training course.

- Maintenance Tradesperson

  Maintenance Tradesperson(s) do not appear to be named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table, or elsewhere within the Written Scheme. It is assumed the term Maintenance Tradesperson relates to NHS Estates Staff working on the water system(s) and are included within the Competent Persons "Tech Plumbers".

- Installer

  Installer(s) do not appear to be named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table, or elsewhere within the Written Scheme. It is assumed for the Adult and Children's

WATER SYSTEM RISK ASSESSMENT

Hospital this would refer predominantly to the Main contractors and sub-contractors from the original construction period.

Any contractors who have installed equipment or made alterations to the water systems on site since the building has been handed over to the NHS should also be included within the organogram.

- Contractor

  Contractor(s) do not appear to be named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table, or elsewhere within the Written Scheme.

An Estates organogram is included within the Written Scheme. This covers only the Estates department and does not cover positions outwith the Estates Department, though it does incorporate other Estates Personnel who do not appear to have any direct involvement with the water services (Paul McAllister, Darrel Conner and Paul Allan. ***N.B.*** *This will require to be updated sue to some named personnel leaving the organisation and others taking up new roles*.

Some members of staff named within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table do not appear within the Estates organogram (e.g. Scott Macer and Darren Hopkins), with the Estates Competent Persons (Water Systems) referred to only by Job Title.

Ian Powrie (Asst. General Manager Estates) and William Madden are included within the organogram, though do not appear within the NHS GG&C South Sector (QEUH) Hierarchy Appointment Table.

No dates are provided or details of who appointed each personnel into the roles are included as highlighted within SHTM 04-01 Part G.

The example organisation structure diagram within SHTM 04-01 Part G covers additional positions and roles outwith the Estates Department, not currently covered by the current Written Scheme.

Training records are detailed for Estates Personnel within Section 3.4. with additional information included within the *Boardwide Water Skills Register"*. Training noted as being carried out for;

Andy Wilson (RP)	Responsible Person Course (noted in Written Scheme only)
Mel MacMillan (Lead AP)	WHH01 & WH003 (noted in Boardwide Water Skills Register and Written Scheme) AP Letter of appointment issue dated 05/06/18 from Alan Gallacher and Authorised Competency Check dated 31st May 2018 (Score 75%, Band B – Competent)
Darren Hopkins (AP)	WHH01 & WH003 (noted in Boardwide Water Skills Register only) AP Letter of appointment issue dated 28/08/18 from Alan Gallacher and Authorised Competency Check dated 24th August 2018 (Score 71%, Band B – Competent) and stating "Although Darren scores as competent my concern here is lack of experience which may not have been exposed by the question set. He also only recently was trained. Recommend retest in six months".
Kerr Clarkson (AP)	WHH01 & WH003 (noted in Boardwide Water Skills Register only) AP Letter of appointment issue dated 28/08/18 from Alan Gallacher and Authorised Competency Check dated 24th August 2018 (Score 78%, Band B – Competent) and stating "Technically suitable for AP appointment".
Scott Macer (CP Proposed)	WHH01 & WH003 (noted in Boardwide Water Skills Register only)
Martin Inglis (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register and Written Scheme) Date Assessed/Trained 20/03/18
Andrew Hamilton	Competent Person (noted in Written Scheme only)
David Fickling (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register and Written Scheme) Date Assessed/Trained 20/03/18
Peter McCabe. (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register and Written Scheme) Date Assessed/Trained 20/03/18
George Collins (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register only) Date Assessed/Trained 2/03/18

WATER SYSTEM RISK ASSESSMENT

Mark McInally (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register only) Date Assessed/Trained 24/07/18
Michael Daniels (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register only) Date Assessed/Trained 24/07/18
Paul Dempster (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register only) Date Assessed/Trained 21/03/18
Stephen Gilmour (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register only) Date Assessed/Trained 21/03/18
William Murray (CP Proposed)	WHH02 (noted in Boardwide Water Skills Register only) Date Assessed/Trained 26/03/18
Paul McAllister	TBA (noted in Written Scheme only)
Colin Purdon	TBA (noted in Written Scheme only)

No other training highlighted within the Written Scheme for other personnel.

Training requirements are to be recorded within Section 3.5. The only record within this section of the document reviewed is *"Toolbox talks on Written Scheme Section 4 for staff".*

Details of when Risk assessment should be reviewed are included within Section 3.6 of the Written Scheme, with details of where individual risk assessments for each of the buildings are stored *"QEUH Shared Drive>Water Quality>Risk Assessments"*

Descriptions of the plant and services along with schematic layouts are contained within the individual log books/risk assessments for each building. Log books are stored in the mains estates office. Electronic copies are also to be held on *"QEUH Shared Drive>Water Quality Folder".*

All plant details and system schematics and as-fitted drawings for the Adult and Children's Hospitals are contained in the Zutec system, though DMA are aware of concerns being raised by NHS GG&C over the accuracy of some drawings provided to them.

Sections 3.8 through 3.13 of the document provides procedures covering Water Systems Audits, Internal Audits, External Audits, Management Review, SCART Report and Contractor Management. No provision is made within the Written Scheme for escalation of non-compliances identified during the various audit processes.

WATER SYSTEM RISK ASSESSMENT

Correct and Safe Operation of the System and Standard Operating Procedures

This describes the temperatures both hot and cold water should be stored and distributed at. However, the hot system does not mention hot return temperatures, either within the distribution system or at return to calorifiers.

There are automated dump valves on the cold water distribution system incorporated into the Adult & Children's Hospital within the ground, first and second floors. The operating parameters of these are set to "Open at 23°C, Close at 20°C". Consideration may be given to altering the set point to reflect the cold water incoming mains temperature/distribution profile. This would require the system set point to be altered periodically throughout the year as the incoming mains temperature varied.

The BMS system has end of line monitors on the system on each floor throughout the hospital, though otherwise there is no full description of the readings taken and locations of these, along with the appropriate control parameters within the Written Scheme.

Instructions for completing log sheets and inspection reports are included within the document.

The list of maintenance procedures included within the Written Scheme do not appear to cover all necessary PPM tasks required for the domestic water systems (and other potentially "at risk" systems) which may impact on water quality.

Please refer to Section 10 of this assessment document for details of PPM tasks required.

SOPs for the following procedures are included within the Witten Scheme

- BMS Temperature Monitoring
- Daily "Manual Temperature Monitoring" (P1CC1A) is stated as being required, though SHTM 04-01 Part G guidance advises this is only necessary should the BMS system not be operational. **N.B.** As the Written Scheme covers other buildings within the QEUH campus and not just the Adult & Children's hospital this may be more pertinent to other buildings.
- Flushing of Intermittently Used Outlets, though the flushing does not record any temperature requirements for flushing regime, only that outlet(s) should be flushed for 3 minutes. The SOP states that GG&C considers the flushing of intermittently used outlets to be completed when Domestic Services staff conduct the daily cleaning of WHBs, showers etc. Additional instructions relating to the daily flushing in clinical areas in relation to Pseudomonas are included within section 5.8 of the Written Scheme. Due cognisance should also be taken of *"Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water" (August 2018 V2.3).*
- Flushing of Deadlegs and Drain Cocks, though the flushing does not record any temperature requirements for flushing regime, only that outlet(s) should be flushed for 3 minutes.
- Rotation of the Duty/Standby Pumps, though this is controlled by the BEMS. **N.B.** As the Written Scheme covers other buildings within the QEUH campus and not just the Adult & Children's hospital this may be more pertinent to other buildings.
- Flushing of Emergency/Deluge Showers. Temperature guidelines are provided within the SOP, though no guidance or additional steps provided for if temperatures do not reach or are slow to reach the recommended temperatures. The SOP also advises that aerosol creation should be minimised during the flushing of the shower(s), though no guidance of how this should be achieved is included.
- Sentinel Outlet Temperature Recording, though it advises to take temperatures from pipework directly where sentinels are TMV/TMT supplied. Within the Adult and Children's hospital this is not routinely able to be achieved as the removal of IPS panels is generally prohibited without the appropriate procedures/Scribe being put in place. Also the hot temperature referred to is 50°C, whereas the guidance documentation and system parameters for the Adult & Children's hospital is 55°C. No reference to mixed temperatures being recorded from TMV/TMTs included within SOP.

WATER SYSTEM RISK ASSESSMENT

- Temperature Monitoring of Calorifiers. Temperature guidelines are provided within the SOP, though the return temperature referred to is 50°C whereas the system parameters for the Adult & Children's hospital is 55°C.

- Shower Head and Hose Disinfection/Replacement. The SOP covers only the replacement part of the procedure and does not cover disinfection procedure (should this be the protocol utilised by GG&C). The SOP also advises that aerosol creation should be minimised during the flushing of the shower(s), though no guidance of how this should be achieved is included.

- Calorifier and Expansion Vessel Flushing, though no reference to noting water quality from drain flushing is included within the SOP. The procedure describes the flushing of the calorifier only, and not the expansion vessels. **N.B.** Procedure states this is a quarterly task, though *"This task is covered monthly at present"*

- Horne Tap Flow Restrictor Exchange. SOP states *"This task is currently contracted out to DMA Water".* DMA have provided additional method statements/risk assessments for these works.

- Review of Intermittently Used Water Outlets/Change in Use. This is to be reviewed every 3 months and circulated around all Heads of Department.

- TMV/TMT & Thermostatic Shower Disinfection and Function Test (High Risk). This appears to cover specifically the Horne Optitherm. No guidance temperatures are provided for TMVs to be set to. Additional actions would also be required in order for TMV to be serviced in accordance with manufacturer's instructions. Contour taps and showers should also be included though it should be noted that these are unable to be isolated for full servicing to be carried out, or to record inlet temperatures to the TMV without an HAI Scribe.

- TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non High Risk). This appears to cover specifically the Horne Optitherm. No guidance temperatures are provided for TMVs to be set to. Additional actions would also be required in order for TMV to be serviced in accordance with manufacturer's instructions. Contour taps and showers should also be included though it should be noted that these are unable to be isolated for full servicing to be carried out, or to record inlet temperatures to the TMV without an HAI Scribe.

- CWST Inspection and Temperature Monitoring, though tank inspection procedure only covers external elements and not the internal inspection. It is worth noting that due to the size of the tanks within the Adult & Children's hospital and the fact there is only a single access point into the tanks at the make-up, tank temperatures taken from the drain valves may be more representative of the stored water temperatures rather than those taken at inlet hatch.

- DWS Calorifier/Expansion Vessel Inspection.

- Pipework and distribution Systems Checks. These specifically relate to inspecting accessible pipework for damage or corrosion and missing or damaged insulation.

- Representative Tap Temperature Monitoring. Within the Adult and Children's hospital this is not routinely able to be achieved at outlets other than those within DSRs, Clean Utilities, Dirty Utilities and Kitchens as the vast majority of outlets are TMV controlled. Removal of IPS panels is generally prohibited without the appropriate procedures/Scribe being put in place. Also the hot temperature referred to is 50°C, whereas the guidance documentation and system parameters for the Adult & Children's hospital is 55°C. No reference to mixed temperatures being recorded from TMV/TMTs included within SOP, or hot/cold supply into TMV/TMTs.

- Vibration Coupling Inspection.

- BMS Temperature Sensor Calibration, though this is not listed within the Maintenance Procedures Summary on Page 35 of the Written Scheme. This task is to be included within the BMS Service Contract Specification.

Flexible Hose/Connection Inspection and Exchange, though this is not listed within the Maintenance Procedures Summary on Page 35 of the Written Scheme. Inspection/replacement of these are scheduled as bi-annually.

WATER SYSTEM RISK ASSESSMENT

SHTM 04-01 advises wherever possible these should be removed or replaced with alternative materials other than EPDM wherever practicable.

- CWST Drop Test, though this is not listed within the Maintenance Procedures Summary on Page 35 of the Written Scheme. No guidance as to water storage time periods is included within the SOP, or when the drop test should be carried out (i.e. during period of normal usage).

WATER SYSTEM RISK ASSESSMENT

Incident and Emergency Procedures

Section 5 of the document would appear to be based on SHTM 04-01 Part G with some alterations to make the procedures more specific to the QEUH Campus.

However, section 5.3 Low Hot Water Supply Temperature repeats the information relating to the cold water systems. This section appears to have been incorrectly incorporated into the document. Later in the section, under the heading "Hot Water Services" the correct information relating to the hot services appears to be incorporated. (Note the Written Scheme still refers to SHTM 04-01 Part G as a draft document within this section.)

Contrary to previous information within the Written Scheme, outlet and calorifier return temperatures are stated as being 55°C minimum, which are the correct system parameters for the Adult & Children's hospital.

The table detailing the actions necessary in the event of hot water plant breakdowns details the actions to be taken based on the building/patient risk category and the time taken for hot water system temperatures to recover. No guidance as to which risk category each of the buildings/systems within the QEUH campus (and specifically for this assessment the Adult and Children's hospital) fall into is included within the Written Scheme.

No patient risk rating/register – or reference to where this is stored is included within the Written Scheme.

The table relating to the actions required in relation to positive samples does not include the actions from SHTM 04-01 Part G and HSG 274 Part 2, in relation to positive samples with results <100 cfu/L. The control actions for results >100 but<1000 cfu/L and for those >100cfu/L have been split into "Low risk area Estates action only" and "High Risk areas". "Low Risk" actions have been amended slightly from the SHTM guidance to incorporate input from the Board Water Safety Group should remedial actions be ineffective, and High Risk areas having ICD agreeing actions and the closure of areas. A communication pathway for legionella results from water samples is included within this section also.

Whilst the cold water guidance provides guidance as to disinfection where there are water temperatures up to 25°C, no guidance as to routine disinfections frequency or methodology for either hot or cold systems is provided.

A protocol for removal of Intermittent or Infrequently Used Water Outlets, including wards departments being closed or taken out of use for an extended period in included with Section 5.5

Emergency repairs are covered within Section 5.6 of the Written Scheme, stating that the integrity and safety of the water distribution must be maintained at all times, with guidance provided in relation to disinfection covered within section 5.7. No guidance as to system/component cleanliness, disinfection of tools or other practical steps and methodology to be adopted to maintain system cleanliness and integrity are provided.

A Pseudomonas SOP is included within Section 5.8, relating only to critical control points 2-4 only of the "*HPS (2013) Guidance for neonatal units (NNUs) (Levels 1, 2 & 3), adult and paediatric care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water".* This section places responsibilities on Senior Charge Nurses, Estates, Domestic Services, Managers and Water Systems Group. Actions covered by this SOP relate to access, flushing maintenance of outlets and appropriate record keeping.

No guidance is provided within the Written Scheme for "The Course of Action for Suspected Nosocomial Legionnaires' Disease, or other water borne bacteraemia's.

Appendix 1 is a *"Site plan with Block Codes".*

Appendix 2 is an *"Escalation of Sampling Results out-of spec"* procedure, though this refers only to potable water analysis, with no other references to potable sampling protocols within the Written Scheme.

Appendix 3 is *"Maintenance recommendations by Building"* – with no information recorded within this section.

Appendix 4 is *"Risk Assessment Review Guidance"* with a list of management tasks required for L8 and SHTM 04-01 compliance, though some additional items may be recommended on this list – Please refer to Section 10 of this assessment document for details of Management tasks recommended. Due to the complexity, volume of tasks and the number of guidance documents which Estates have to follow this list should be reviewed on a regular basis, by all relevant parties to ensure this is as current and exhaustive as is practicable.

WATER SYSTEM RISK ASSESSMENT

Pseudomonas Risk Assessment

A pseudomonas risk assessment was carried out in August 2014 by Ian Powrie, John Green and Sandra McNamee and subsequent review completed by the same persons in February 2016.

The stated review date (assumed to be date for next review) on this document is January 2017.

The document summarises the current controls in place with the risk matrix providing a current risk level of Medium.

The proposed actions to control the problem are to;

- *Develop site specific written scheme (Action due date Dec 2014)*
- *3 monthly: Carry out TMT operation test & Replacement of outlet flow control device (Action due date Feb 2016)*
- *6 monthly; Service exchange TMT maintenance procedure including; (Action due date April 2015)*
    - *Visual inspection and manual clean of components.*
    - *Full mechanical service & inspection.*
    - *Functional testing.*
    - *Thermal sanitisation*

Areas where action required to prevent Pseudomonas aeruginosa infection in healthcare settings (within the Adult and Children's hospital) are designated as;

- *Ward 1D (Paediatric Critical Care)*
- *Ward 1E (Cardiology)*
- *Ward 2A (Schiehallion)*
- *Adult Critical Care Unit*
- *Coronary Care Unit*
- *Ward 4B (BMT)*
- *Ward 4A (BMT 2 off isolation rooms)*

The list of areas of concern would appear to have increased since this document was last reviewed with POU/anti-microbial filters fitted in locations throughout the Adult & Children's hospital (See information relating to filter fitting within this section of the assessment).

DMA were provided with *"New Southern General Hospital Dispensers – General Principles for Contractors 6th January 2014".* This document provides guidance issued to contractors during the construction phase regarding positioning of various dispensers;

- Soap
- Handtowel
- Hibiscrub
- Betadine
- Alcohol Based Hand Rubs (ABHR) 800ml & 500ml
- Moisturiser
- Sterilium
- Danicentre
- Apron

Guidance provided states ABHR dispensers at clinical wash hand basins (CWHB) should be sited *"1300mm from floor, 60mm from panel side and 15mm from panel top"* and soap dispensers *"1260mm from floor to base of dispenser".*

Patient bedrooms should have "soap dispenser 1050mm from floor to base of dispenser, 145mm from centre of horizontal grab rail below on wall beside CWHB".

DMA completing checks as part of sentinel outlet survey to determine if sited correctly and record findings.

WATER SYSTEM RISK ASSESSMENT

Water Source and variations of supply water

A copy of *Water Register Sample taken on or after 17/03/2017 Regulation Zone = Milngavie M3* was submitted for review.

This document details the number of samples taken for various analysis (54 different parameters) prior to the date stated above, and the % of results failing PVC. No samples were noted as failing on the document provided which would suggest the water quality to be of a suitable standard.

No details included within the document as to who the samples were taken by or which lab carried out the analysis.

WATER SYSTEM RISK ASSESSMENT

Maintenance and cleaning of wash-hand basins and other water outlets & appropriate cleaning of the environment and equipment

A copy of *The NHS Scotland National Cleaning Services Specification Healthcare Associated Infection Task Force (Version 5.0 June 2016)* was submitted along with the documentation for review.

No other supporting documentation have been provided as to how this document and procedures etc. within it are implemented by NHS GG&C. No staff induction records or training records available or any SOPs relating to how staff carry out cleaning services on individual asset types or generally within specific areas.

Clinical practice where water may come into contact with patients and their invasive devices

A copy of *Health Care Associated Infection Operational Guidance and Standards for Health Protection Units (Issue 1.0* 22/5/2012

No other supporting documentation have been provided as to how this document and procedures etc. within it are implemented by NHS GG&C.

Clinical environment and patient safety

A copy of *Health Care Associated Infection Operational Guidance and Standards for Health Protection Units (Issue 1.0* 22/5/2012

No other supporting documentation have been provided as to how this document and procedures etc. within it are implemented by NHS GG&C.

Disposal of blood, body fluids and patients' wash-water

A copy of *Health Care Associated Infection Operational Guidance and Standards for Health Protection Units (Issue 1.0* 22/5/2012

No other supporting documentation have been provided as to how this document and procedures etc. within it are implemented by NHS GG&C.

Medical Devices such as cardiopulmonary coolers

A copy of *Health Care Associated Infection Operational Guidance and Standards for Health Protection Units (Issue 1.0* 22/5/2012

No other supporting documentation have been provided as to how this document and procedures etc. within it are implemented by NHS GG&C.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements

Information provided by:

Colin Purdon (NHS, Site Manager Operational Estates)
Mel McMillan (NHS, Estates Manager)
Phyllis Urquhart (NHS, Compliance Manager)

Information collated by:
David Watson (DMA Canyon, Director)
Allan McRobbie (DMA Canyon, Compliance Manager)

Summary of L8 Management Tasks Recommended for L8 and SHTM 04-01 Compliance	Previous Responses - In place or being carried at present?
Regular check to ensure that legislation and guidance has not changed	This is a function of the Estates Compliance Department who advise Operational Estates Managers of any updates to the legislation or guidance documents, who would then update internal procedures and SOPs as necessary. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	This is a function of the Estates Compliance Department, in conjunction with the Water Safety Group, who advise Operational Estates Managers of any updates to policy updates and documents, who would then update internal procedures and SOPs as necessary. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of Water Systems Management Structure to ensure up-to-date and accurate	An up to date management structure was provided at the time of report, with Estates advising this is updated as and when required. Please see previous comments within this document relating to how information provided compares to the exemplar management structure as provided within SHTM 04/01 Part G. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of communication lines to ensure still accurate and correct	The management organogram, individual SOPs and policies within the Written Scheme (Revision D) provide some guidance for communication lines though no overarching communication structure is included. The review of this is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of escalation & emergency procedures to ensure still valid and correct	The management organogram, individual SOPs and policies within the Written Scheme (Revision D) provide some guidance for escalation of issues raised though no overarching communication structure is included, or guidance on the practical fault finding and remedial actions to be undertaken to correct issue is provided in the majority of instances. No emergency procedures included. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of L8 Management Tasks Recommended for L8 and SHTM 04-01 Compliance	Previous Responses - In place or being carried at present?
Regular review of duties allocated to site staff and ensure accurate and recorded	There are SOPs included within the Written Scheme (Revision D). Whilst not all of these directly state who the task is carried out by, it is inferred that unless specifically stated otherwise these are to be carried out by appropriate Estates staff. The list of maintenance procedures included within the Written Scheme do not appear to cover all necessary PPM tasks required for the domestic water systems (and other potentially "at risk" systems) which may impact on water quality. Please refer to Section 10 of this assessment document for details of PPM tasks recommended. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of roles allocated to individual departments in relation to the water systems and ensure accurate and recorded	This is not included within the Written Scheme at present.
Regular review of duties of sub-contractors and ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered)	A procedure for "Contractor Management & Audit Report" is included within the Written Scheme (Revision D) and Estates advised that regular contractor meetings/audits are held (DMA attend monthly meetings with Estates managers) though no records were available for other contractors at time of report. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of staff training and competency requirements and update training matrix	Training records are included within the Written Scheme (Revision D), along with a table relating to Training requirements, though the table only includes for toolbox talks for plumbers, with no other job roles or training requirements identified within the Training Requirements table. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of PPM requirements, method statements, SOPs and risk assessments to ensure still valid and correct	Various SOPS included within the Written Scheme (Revision D) and other have been provided to DMA for works on site, though this would appear to be incomplete for the PPM list within section 10 of this document. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review or remedial works or system alteration progress	No central register of remedial works or system alterations was available, though Estates aware of all ongoing works in relation to installation of ClO_2 plant and associated works.
Regular review of site documentation to ensure all records up to date and present	Records reviewed by DMA were incomplete, did not cover all required tasks, with the majority of records provided covering only the period from September 2018 onwards. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of L8 Management Tasks Recommended for L8 and SHTM 04-01 Compliance	Previous Responses - In place or being carried at present?
Regular update of "Patient Risk Rating" register for all areas of hospital.	The "High Risk" areas are reviewed by Infection Control/Clinical staff, though DMA were not provided with a definitive list. Estates advised that areas where anti-microbial filters (PALL) are fitted would be those considered as "High Risk". This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of sentinel outlet locations register.	Sentinel outlets list was provided by Brookfield/Mercury at the construction phase and these have been reviewed as part of the on-going chlorine dioxide installation programme. No major system alterations which would impact on sentinel outlet locations have been carried out on the water systems since construction. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of little-used outlet locations register (input from clinical staff required, and including any changes in use of wards/departments).	Low use outlets locations recorded, along with flushing records in folder F1 – Flushing Water Outlets Record Forms (026b). Review to ensure up to date in light of recent works on the water systems and this assessment. DMA carry out flushing of removed water coolers three times per week within the A&C.
Regular review of deadlegs/blind ends locations register (input from clinical staff required, and including any changes in use of wards/departments)	Low use outlets locations recorded, along with flushing records in folder F1 – Flushing Water Outlets Record Forms (026b). Review to ensure up to date in light of recent works on the water systems and this assessment. DMA carry out flushing of removed water coolers three times per week within the A&C.
Regular review of POU/Anti-microbial (PALL) filters locations (and manufacturer's/types of filters fitted) **N.B.** it would be prudent to review this in conjunction with "Patient Risk Register	Locations where filters are to be fitted are determined by Infection Control and Clinical Staff, who then request filters to be fitted by Estates. DMA manage the routine management and swap outs of the filters providing records to Estates.
Regular review TMV/TMT locations and manufacturer/model.	Almost all taps are TMT, with very few direct hot and cold outlets (typically DSR, Kitchens and Utility rooms) throughout the hospital. Clinical WHBs are Horne Optitherms, with bathrooms/patient toilets typically Armitage Contour Taps. Some public toilets have infra-red sensor taps which have a Horne TMV fitted prior to the sensor solenoid. No register of the locations of every TMT/TMV was available at time of report.
Regular review shower & spray outlet locations (including emergency/deluge showers)	No register of the locations of every spray outlet/shower was available at time of report.
Regular review of primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations – e.g. specifically in relation to works being carried out in Wards 2A & 2B in late 2018.	No register of flow and return loops, other than at calorifier returns were available. No major system alterations which would impact on hot flow and return loops have been carried out on the water systems since construction. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of L8 Management Tasks Recommended for L8 and SHTM 04-01 Compliance	Previous Responses - In place or being carried at present?
Regular review and record all plant, valves, equipment and services and their associated maintenance schedules).	The list of maintenance procedures included within the Written Scheme do not appear to cover all necessary PPM tasks required for the domestic water systems (and other potentially "at risk" systems) which may impact on water quality. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of BEMS temperature sensor locations to reflect any system alterations	No register of BEMS temperature sensor locations were available. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of schematic/as-fitted drawings to ensure up-to-date and accurate	All plant details and system schematics and as-fitted drawings for the Adult and Children's Hospitals are contained in the Zutec system, though DMA are aware of concerns being raised by NHS GG&C over the accuracy of some drawings provided to them. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.
Regular review of all backflow prevention devices, locations and type (E.g. Check valves, RPZs etc.) to reflect any system alterations.	No register of backflow prevention devices were available, though Estates were beginning to compile this.
Regular review of all flexible hoses (EPDM) (E.g. at Arjo baths, Pressure reducing valves etc.) to reflect any system alterations.	No register of flexible hoses has been generated.
Regular Review of water systems risk assessment as a "live" document (DMA recommend a maximum period of 2 years). An indication of when to review the assessment and what to consider should be recorded and this may result from, e.g.: • a change to the water system or its use; • a change to the use of the building where the system is installed; • new information available about risks or control measures; • the results of checks indicating that control measures are no longer effective; • changes to key personnel; • a case of legionnaires' disease/legionellosis associated with the system.	Previous Risk Assessment was carried out during in late 2017, early 2018. This is included within the *Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance* table of the Written Scheme (Revision D) though not specifically allocated to any individual or department.

N.B. By "Regular" DMA would advise a Quarterly or 6 monthly review of all tasks above or as and when there are changes in system operation, management or other control parameters which would warrant a review of any particular task. (e.g. if change of use or changes in legislation or any other factor which could affect validity any of the current documentation)

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Initial tasks recommended to aid compilation of PPM schedules/ registers within site written scheme	In place or being carried at present?
Identify, label and record all plant, valves and services	All labelling carried out at construction phase. Some areas where labelling is incorrect have been highlighted with this document.
Identify, label and record sentinel outlets on hot and cold water services.[1]	All sentinel outlets are recorded on a sentinel outlet register. Access to the majority of the sentinels require a HAI Scribe to remove panels to access pipework or flush through Optitherm taps to record temperatures.
Identify, label and record all "drinking" and "non-drinking" water outlets	All cold water is deemed as wholesome throughout the hospital, under normal operating conditions. Should this alter based on water system checks suitable alternative arrangements should be made and relayed to all relevant parties (e.g. provision of bottled drinking water for patients etc.)
Identify, label and record all primary, sub-ordinate and tertiary flow and return loops and their access points for temperature profile/mapping	Hot flow and return loops are only identified at calorifier returns where there are also BEMS sensors fitted. NHS GG&C are currently looking into remote monitoring options though this is not in place at present.
Identify, label and record all BEMS temperature sensor locations for temperature profile/mapping	Locations of these are not specifically recorded other than on the BEMS system (Which DMA have not been provided access to at time of report).
Identify, label and log all mixing devices (TMVs) with a unique identification as well as identification of its type. Hot and cold water pressures also need to be measured and recorded for each mixing device together with all the test parameters from the in-service tests	This has not been completed.
Identify, label and log all "other uses of water" (e.g. use of ice machines, drinking water fountains, bottled water dispensers etc.)	DMA advised no bottled water dispensers within the building, though 2 were noted in the DCFP department (4th floor of Children's hospital). DMA advised no ice machines fitted, though DMA advised that wards/clinical staff may initiate or arrange installation of equipment without notifying estates management. DMA would advise estates emphasise to clinical staff the importance of keeping estates staff abreast of any changes to the water system, and that no changes should be carried out, or equipment installed/removed without first consulting with Estates.
Identify, label and log all backflow prevention devices (E.g. Check valves, RPZs etc.)	This has not been completed, though Estates working on it at time of report.
Identify, label and log all flexible hoses (EPDM) (E.g. at Arjo baths, Pressure reducing valves etc.) where these cannot be swapped out and system hard piped.	This has not been completed.

[1] Sentinel outlets are normally those that – on a hot water service – are the first and last outlets on a recirculating system with additional points on larger systems where monitoring of primary, sub-ordinate and tertiary loops is required. On cold water systems (or non-recirculating hot water systems), they are the closest and furthermost from the storage tank (or water heater). The choice of sentinel taps should also include other outlets that are considered to represent a particular risk, for example those installed in accommodation in which particularly susceptible patients are treated, or others identified in the risk assessment and temperature mapping exercise as having the least satisfactory temperature performance.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Daily check of BEMS incidents and faults	This is being carried out. This is an integral part of Estates managers jobs. Escalations highlighted as required by results. Calorifier anomalies due to MTHW being low on occasion, generally PR41 affected as furthest away. Flushing and temperature monitoring during December 2018 within Wards 2A & 2B have highlighted issues with boilers/CHP units in the energy centre. Reported to Estates and issues rectified on each occasion.
Daily check the flow and return temperatures on the domestic hot water calorifier systems using the temperature gauges fitted or a suitable surface temperature probe – required until such times as Estates staff have full access to BEMS system.	BEMS now always on and Written Scheme requires a daily check by Estates staff on the BEMS system to identify/rectify faults.
Daily water draw-off should form part of the daily cleaning process.	Advised this is being carried out by clinical/facilities staff, though no SOP for clinical/facilities staff covering this available. This is all outwith estates remit. Water coolers/dispensers have been removed in the Children's Hospital and a flushing regime has been implemented (Carried out by DMA) three times per week.
Daily flushing of all outlets in "High Risk Areas"/ICUs in accordance with *"Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water" (August 2018 V2.3).*	Advised this is being carried out by clinical/facilities staff, though no SOP for clinical/facilities staff covering this available. This is all outwith estates remit except Wards 2A/2B which are being refurbished and the water coolers which have been removed with the supply lines in the Children's Hospital are incorporated into a flushing regime (carried out by DMA). **N.B.** Guidance document advises flushing for a period of 1 minute though this may not be sufficient in all areas to turnover full length of pipework to outlet(s).
Verification that entire body of calorifier reaches 60°c for a period of 1 hour each day (generally at a time of low use e.g. Early morning/late evening).	BEMS monitors top and return temperatures to all calorifiers. During flushing works in Wards 2A & 2B as part of the ongoing water system upgrade in this area several instances of hot water temperatures dropping below the normal control parameters have been identified. These have been reported to Estates at each instance with issues being identified in the Energy Centre as the cause.
Incoming Water Mains - maintain in accordance with installation/design guidelines, ensuring alteration of incoming mains lines to run at least daily. (DMA advised 9 hourly swap over).	Automatic. Govan Road temps always higher than Hardgate Rd. Hardgate Rd supply was throttled back as Scottish Water advised inconsistent draw off. PALL analysis indicated Hardgate Rd supply had a higher solids content, however DMA noted more debris from Govan Rd Mains when cleaning tanks.
Cyclical alteration of CWST booster pumps (ensuring every pump runs at least weekly)	Automatic via BEMS. Demand driven, which may create longer time periods when pump out of use (E.g. single pump may be in operation during the night when system is using less water) though all pumps should run at least twice per week.
Daily check of pumps/filters on Veolia Filter Unit	Advised carried out but no records available.
Twice-weekly flushing of all outlets in unoccupied areas and low use/sporadically used outlets. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile.	Trades Water – these should be included within the site flushing regime, but this is not being carried out as frequently as required. Line to roof level fire tank – confirm if this requires to be included within this flushing. A programme of removing all bib taps within plant rooms is under way by Estates and DMA advised all irrigation connections now disconnected.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Twice weekly flushing of emergency/deluge shower for a minimum of 3 minutes and the water temperature stabilises in line with current temperature profile.	Pool flushing included within Pool monitoring programme. A&E 028z Decontamination room to be added to list.
Twice weekly flushing of deadlegs/blind ends where these cannot be removed. All deadlegs should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile. [2]	List to be updated by Estates to reflect current status following plumbing works by Estates and Contractors. This should include the bypasses at the newly installed connection points for the ClO_2 units (not all fully installed at time of report)
Weekly water system check for chloramines (if required)	This is not required at present though to be reviewed following Scottish Water switch over to Chloramines.
Weekly check of water levels within water tanks	Tanks have low level alarms connected to the BEMS.
Weekly manual test of pump functionality	These are on a fail alarm as part of BEMS, no manual checks completed
Check spray taps for satisfactory spray, where necessary remove spray orifice and clean, remove any accumulation of scale.	DMA advised no spray taps fitted (and none have been noted during works within the hospital). Spray washers in kitchens under catering remit and DMA advised cleaned/disinfected by catering staff.
Weekly initially and then moving to Monthly measure the concentration of chlorine dioxide at the sentinel taps – the concentration should be at least 0.1 mg/l; and adjust the chlorine dioxide dosage to establish the required residual at the sentinel sample points.	Chlorine Dioxide installation not completed at time of report.
Weekly initially and then moving to Monthly test the treated water for both chlorine dioxide and total oxidant/chlorite at an outlet close to the point of injection to verify the dosage rate and conversion yield.	Chlorine Dioxide installation not completed at time of report.
Weekly check on the ClO_2 dosing system(s) operation to ensure operating correctly and dosing at correct levels (as per HSG 274 Part 2, NHS GG&C Dosing System Specifications and in accordance with manufacturer's instructions) and chemical stocks in the reservoir	Chlorine Dioxide installation not completed at time of report.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Monthly calorifier storage temperatures checks at top (flow) and return pipework Flow temperature – min 60°C, return temperature – min 55°C	This is monitored by BEMS. No manual checks carried out.
Monthly temperature checks on hot outlets at sentinel, little-used & selected outlets. >55°c within 1 minute (also note potential scald risks and out of spec TMVs)[2] to create a temperature profile of building and monitor flow and return system with all primary flow and return loops being monitored monthly, sub-ordinates quarterly and tertiary loops annually.	September 18 records only available, same date recorded against all areas though likely carried out across different dates. Theatres not included – assume inaccessible (Theatre servicing protocols to tie in with Theatre downtime). October monitoring not completed at time of meeting.
Monthly temperature checks on cold outlets at sentinel, little-used & selected outlets. <20°c within 2 minutes to create a temperature profile of building and monitor heat gain within the cold water system.	September 18 records only available, same date recorded against all areas though likely carried out across different dates. Theatres not included – assume inaccessible (Theatre servicing protocols to tie in with Theatre downtime). October monitoring not completed at time of meeting. No temperature monitoring on trades water system
Monthly temperature checks on all primary flow and return loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system.	This is partially monitored on BEMS (at calorifier returns) though not being carried out at other points on system.
Monthly/Quarterly take temperatures (ideally on a rolling monthly rota to ensure all covered on a quarterly basis) at return legs of subordinate loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system.	This is not being carried out at present. Access to flow and return pipework restricted as HAI Scribes required to remove panels to access pipework.
Monthly/Annually take temperatures (ideally on a rolling monthly rota to ensure all covered on an annual basis) at return legs of tertiary loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system	This is not being carried out at present. Access to flow and return pipework restricted as HAI Scribes required to remove panels to access pipework.
Monthly check to ensure CWST overflows are unobstructed	This could only be checked using boroscope – not included at present.
Monthly flushing of expansion vessels as not 'flow through' design	Estates advised this is included in monthly program however no records available. Vessels to be changed to flow through as part of ongoing works.

[2] Representative outlets include conventional and mixed-temperature taps; 20% of the total number installed throughout the premises would be tested annually on a rotational basis: that is, all taps checked every five years.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Monthly changing of tap/showerhead POU/Anti-microbial (PALL) filters within designated "Highest-Risk" Wards/Departments/Rooms (i.e. Children's Wards 2A & 2B, Adults Wards 4B, 4B/s and 6A during period when children decanted into this ward)	This is sub-contracted to DMA Canyon Ltd, who keep records and submit to Estates after each swap out.
Monthly changing of inline POU/Anti-microbial (PALL) dishwasher filters	This is sub-contracted to DMA Canyon Ltd, who keep records and submit to Estates after each swap out.
Monthly Inspect, clean & log glass traps and overflow condition on Air Handling Units (and if fitted to CWST overflow/warning pipes)	No records of this being carried out were provided to DMA.
Bi-Monthly (i.e. 62 days) changing of tap/showerhead POU/Anti-microbial (PALL) filters within designated "High-Risk" Wards/Departments/Rooms	This is sub-contracted to DMA Canyon Ltd, who keep records and submit to Estates after each swap out.
Quarterly descaling, cleaning and disinfection of showerheads & hoses & spray outlets, or replace with new disinfected Shower Head and Hose (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	Not being completed (shower filters fitted in 'High Risk' locations)
Quarterly inspection and cleaning of strainers	This is not currently being carried out.
Quarterly each calorifier and any associated storage/buffer vessels should be flushed through its drain valve by opening the drain valve 3 times, each time for a 3 minute period.	This is not currently being carried out but calorifier drains have been piped to the floor drain (not into – air gap left) to allow this to be carried out.
Quarterly (or frequency as indicated by the rate of fouling) inspection of outlets for evidence of scale formation (descaling as necessary).	This is carried out on a reactive basis by Estates though no records of works being carried out were provided to DMA
Quarterly servicing TMV's or mixer valves, including fail safe tests and cleaning/disinfection of strainers within "Designated High Risk Area"/ICUs (more frequently if recommended by manufactures, infection control, or if 'drift' in excess of 1°C at mixed outlet temperature highlighted during temperature monitoring or other maintenance)	This is not currently being carried out though advised a TMV tender has been issued for servicing across the GG&C estate though no contract award had been issued at time of report.
Quarterly diffuser/flow straightener exchange for Thermostatic Mixing Taps (TMTs)	This is currently carried out by DMA on the Optitherm taps only. No replacement of diffusers in contour taps currently carried out.
Quarterly during periods of Change - Water System Sampling (at random water outlets in High Risk Patient Areas) in Water Systems still serving High Patient Risk Areas	This is not specifically being carried out, though an extensive sampling regime was carried out in 2018 and is anticipated as part of the ClO_2 installation efficacy confirmation.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Six monthly cold water summer / Winter temperature monitoring of cold water at inlet to building. Also to be continuously monitored by BEMS & log of all alarms	This is recorded on the BEMS system. High incoming mains temperatures were noted in Summer 2018 and a sampling regime implemented during this period to monitor the impact of higher temperature on the water system.
Six monthly CWST condition inspection noting appearance of water, stagnation, odour, rust, scale, sediment, debris, paint/liner condition and bio film accumulation and tank lid fitting ok and insulation condition	This has recently been carried out by DMA as part of the ongoing sampling regime.
Six monthly CWST temperature checks (summer and winter) on tank supply and stored water at opposite side from tank inlet if possible (inlet and stored water should be <20°C, with stored water no more than 2°C warmer than make-up water.)	This has recently been carried out by DMA as part of the ongoing sampling regime.
Six monthly servicing TMV's or mixer valves, including fail safe tests and cleaning/disinfection of strainers. (more frequently if manufacturer recommends – Documentation not available on Zutec at time of writing, or if 'drift' in excess of 1°C at mixed outlet temperature highlighted during temperature monitoring or other maintenance)	This is not currently being carried out though advised a TMV tender has been issued for servicing across the GG&C estate though no contract award had been issued at time of report.
Six monthly chemical and microbiological water samples from water tanks which feed drinking water outlets	This is not being carried out at present, though microbiological sampling is being carried out as part of the ongoing works.
Six monthly inspection of Air Handling Units humidity section (where installed) and cooling section (specifically requested to be included within this assessment)	Frequency, procedures etc. to be clarified by Estates.
Cleaning and Disinfection of Air Handling Units (specifically requested to be included within this assessment)	Frequency, procedures etc. to be clarified by Estates.
Annually arrange for samples to be taken from hot water calorifiers/water heaters in order to note condition of drain water.	Not being carried out at present

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Annual cleaning and disinfection CWST *and downservices* (more frequently if required dependant on CWST inspection & sample results). TVC and Legionella samples should be taken upon completion of disinfection works. **Please Note:** *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained.*	CWSTs cleaned and disinfected in the summer of 2018.
Annual internal inspection and cleaning/descaling of the calorifier/water heater with disinfection/pasteurisation upon completion	Not being carried out at present.
Arrange for microbiological samples to be taken from water system which represent the complexity of the water system(s) and particularly in areas of concern. All sampling should be carried out in accordance with BS 7592:2008 and all analysis by a UKAS accredited laboratory.	Ongoing but requires formalisation of the sampling regime after efficacy of the ClO_2 installation and other remedial works have been completed.
Pasteurisation/disinfection of calorifier/ water heaters carried out as and when required dependent on temperature monitoring and sample results	Completed as required by monitoring/sampling results.
Turnover test on cold water storage system. Checks should be carried out to ensure that volume of water stored is no more than would generally be used in a normal 12 hour period. N.B. This should be reviewed as part of the phased occupancy period with volume of sorted water adjusted as the building use alters during this process.	Not formally completed however Estates advised tanks drain quickly when mains outage/filter set issues occur.
Annually test the chlorine dioxide and total oxidant/chlorite concentration at a representative selection of outlets throughout the distribution system – the concentration should be at least 0.1 mg/l chlorine dioxide.	Chlorine Dioxide installation not completed at time of report.

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Annual inspection of vibration coupling on pumps/plant, replacing as necessary (more frequently if recommended by manufacturer)	Not being carried out at present. DMA understands this related only to the calorifier circulation pump in Plantroom 41.
Annual inspection & cleaning of buffer/accumulator vessels (more frequently if recommended by manufacturer)	Estates advised these are tested/inspected along with pump servicing, though no records available for inspection at time of report.
Annual inspection of plant and pipework insulation, repairing where necessary.	Ongoing task – very little works have been carried out on the water system.
Annual test to ensure that plant temperature, pressure gauges and thermostats are accurate (Also note during routine temperature monitoring where appropriate)	Not being carried out at present.
Biennial stratification checks on plate heat exchangers/calorifiers. These checks should extend over a period of seven (7) days using a logging device to establish that the water temperature at the base of the vessel achieves 60ºC.	Partially covered by BEMS, though base temperatures not recorded.
Maintenance/servicing of Veolia filtration plant as per manufacturers recommend frequency	This is carried out by Veolia. Filtration units swapped automatically by BEMS system. Estate change pre-filter as required.
Annual (or periodic as specified by manufacturer) servicing of backflow prevention devices (i.e. RPZ)	This is not being carried out at present.
Drinking water dispensers - maintain in accordance with manufacturers guidelines. Please note freestanding drinking water machines (i.e. bottled) and ice machines should not be installed in healthcare premises and should be removed wherever found.	Drinking water dispensers removed from hospital at time of survey with lines incorporated into site flushing regime (Carried out by DMA). 2 bottled water drinks dispensers were noted in the DCFP department (4th floor of Children's hospital).

WATER SYSTEM RISK ASSESSMENT

Gap Analysis of L8/HSG 274 and SHTM 04-01 requirements (Cont…)

Summary of ppm tasks recommended within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	In place or being carried at present?
Reports have been received intimating that high levels of Pseudomonas and Legionella bacteria have been found in water samples taken from outlets fed by flexible hoses lined with ethylene propylene diene monomer (EPDM) due to colonisation of the lining, although it is possible that other lining materials and washers within couplings could be similarly affected. Wherever practical these should be replaced with services hard piped. Where this is not practical should be given to changing EPDM flexible hoses and other lining materials and washers. Where changing to alternative materials is not practical periodic (e.g. six monthly) monitoring should be implemented on EPDM hoses, with hoses swapped out as necessary dependant on sample results and/or rate of fouling witnessed.	Flexible hoses present in kitchens (dishwasher supplies) and on Pressure reducer valves. Where practical these should be changed to PEX or hard piped.
All plant items should be maintained in accordance with manufacturer's instructions and maintenance schedules, with tasks/duties allocated and recorded.	Further review of manufacturers/installers instructions required.
Closed Heating and Chilled Water Systems – Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturer's/installers instructions.	This is not being carried out at present.
Air Conditioning and Ventilation – Maintain in accordance with manufacturer's/installers instructions and SHTM 03-01.	Frequency, procedures etc. to be clarified by Estates.

N.B. For "Other Risk Systems" please refer to Section 8 of this document for information.

A49585984

WATER SYSTEM RISK ASSESSMENT

Additional Information and Supplementary Measures Introduced in light of Ongoing Water System Microbiological Control Issues.

In February 2018 DMA were requested by Estates to take samples for analysis for Cupriavidus from outlets within the hospital, particularly within Children's Wards 2A and 2B.

As these results returned positive results various remedial actions were implemented, including additional sampling, disinfection of the hot and cold water systems locally in Wards 2A and 2B and increased TMT servicing on the Horne Optitherm taps, including thermal disinfections, within Ward 2A.

As part of the control measures implemented in response to Cupriavidus bacteria being detected, commencing in March 2018 DMA, originally with additional labour resources supplied by Morris & Spottiswood and G&C Estates Staff were instructed to fit point of use water filters to outlets in various designated "High Risk" wards or patient rooms, as specified by Infection Control/Clinical Staff and Estates.

Originally the filters fitted were Pall 31 day filters (Pall AQ31F1S filters for Optitherm and Contour taps and Pall AQF4 for Showers) i.e. filters were scheduled to be replaced within 31 days of filter being fitted.

In August 2018 62 day filters (Pall QDTC docking station with Pall QJ212 filters for Optitherm and Contour taps and Pall QDS docking station and Pall QR212 filters for showers) were introduced in all areas except Children's Wards 2A & 2B and in Adult Wards 4B and 4B/2, where the original 31 day filters were retained.

When Children's Wards 2A and 2B were decanted to allow for remedial works on the water system in late September 2018 outlets in the Adults Hospital within wards 6A were then filtered using the Pall 31 day filters

In addition to the filters being fitted to outlets within clinical areas, patient bedrooms and patient toilets as instructed all dishwashers are fitted with inline filters, commencing in June 2016.

The use and management of these filters should be as per manufacturers instructions and in accordance with their guidance documents. Please refer to PALL instructions for use, installation and filter exchange included within filters supplied.

Filter locations are detailed in table below.

Additional sampling works have also highlighted potential issues with tap flow regulators/diffusers on Horne Optitherm taps, and subsequently all Optitherm taps which do not have a PALL filter fitted have the flow regulator/diffuser swapped out, with a slightly modified flow regulator/diffuser, on a quarterly basis.

DMA manage the filter and diffuser swap outs and record keeping on behalf of NHS GG&C with the records submitted to Estates periodically.

Whilst the above works are being carried out additional sampling on the wash hand basin drains (Swabbing) has been undertaken by ICT/Clinical staff with resultant drain cleaning and disinfection having been implemented in designated high risk areas by both Estates staff and DMA.

The drain cleaning/disinfection has been a combination of physically cleaning drains utilising bottle brushes, dismantling and cleaning of WHB and shower drain traps and disinfecting using high level (≈10,000ppm) chlorine (Actichlor) and a Chlorine Dioxide Solution (Hysan HSSC) dependant upon the instructions issued to Estates by ICT/Clinical staff.

Drain cleaning is carried out by Estates and DMA (where instructed) on an as requested basis, as directed by Infection Control.

Issues have been identified with WHB drains backing up at various points in the hospital, which in light of the issues identified with potential retrograde contamination from drains to taps, along with the potential reduction in use of outlets where WHBs not draining freely should be rectified. It was noted whilst cleaning drains in the Children's Theatres that theatre scrub sinks had numerous nail picks in the traps, which staff advised were included in hand wash/disinfection packs used by theatre staff.

WATER SYSTEM RISK ASSESSMENT

In September 2018 a decision was made by NHS GG&C to decant the children from Wards 2A and 2B and relocate the wards into the Adult Hospital Ward 6A, which had filters fitted and other remedial works in order to make the unit suitable for the specialist needs of the children being moved.

In late 2018 The Water Solutions Group (Tim Wafer) were commissioned to write a specification for a chlorine dioxide (ClO_2) background dosing system for the domestic water system in the Adult and Children's Hospital.

Installation of the first ClO_2 units commenced in November 2018, installed and commissioned by Scotmas Ltd, with the local hot and cold water systems feeding Wards 2A & 2B in the Children's Hospital being dosed from risers M36 and M39.

At this time Wards 2 A and 2B had alterations made to the water system, including new clinical taps and WHBs fitted (Markwik 21), hot flow and return lines brought down as close as practical to the WHBs, trough sinks disconnected and removed in the isolation rooms, and the assisted bathroom repurposed into a treatment room. These works were completed in late 2018 with chlorine dioxide background dosing in these wards installed prior to the taps being installed. An extensive program of flushing and testing was implemented as the ClO_2 dosing was commissioned with the taps not installed by the end of 2018 (flushing works carried out utilising Markwik flushing kits).

In December 2018 NHS GG&C released a statement to the press detailing that whilst Wards 2A & 2B were closed for upgrade works to the domestic water system, this opportunity was now also going to be used to upgrade the air conditioning system in the wards. This is anticipated to take up to 12 months to complete and it is expected the wards shall remain closed for this period.

Mr Ian Powrie (NHS GG&C Estates) is investigating options for maintaining the water system in a satisfactory condition during this extended closure (Manual flushing, automated flushing etc.), though no decision of exactly how this will be implemented, or whether this will be undertaken by in-house staff or sub-contracted out had been taken at the time of report.

Chlorine dioxide units were specified for installation at key points on the domestic water system with the aim of providing a consistent effective dose of background disinfectant throughout the large and complex system.

The points selected for installation were:

Veolia Filtration Units (Backwash)
Post Filtration/Bulk Water Storage Tanks (1A, 1B, 2A & 2B)
Post Booster Pumps on riser to PR22/PR41, PR21, PR32/PR33 & PR31)
Calorifiers PR21, PR22, PR31 (01,02,03), PR31 (04,05,06), PR31 (07,08,09), PR32, PR33 & PR41
Temporary Units have also been installed in Riser M36 & M39 feeding Wards 2A & 2B though once other units have been installed and commissioned it is anticipated that these shall be removed.

The Post Filtration/Bulk Water Storage tank dosing units were turned on and commissioned on 10th Dec 2018. DMA understands the original dose rate was set to be 0.3mg/L ClO_2 within the tanks.

On 13th December DMA undertook a sampling sweep across the Adult & Children's Hospital with samples being submitted to Intertek for analysis. As part of this sweep ClO_2 readings were recorded in the direct hot and cold outlets sampled. Whilst no ClO_2 was detected in the hot system, testing of the cold system highlighted that the ClO_2 was penetrating into all parts of the hospital, though the results, as would be expected so quickly after commissioning were inconsistent.

Microbiological sampling has also been undertaken during December 2018 form Wards 2A & 2B. Whilst the majority of these samples have returned clear, or low level bacterial counts some fungal counts have been identified, particularly within the Anaesthetics Dept kitchen (part of the same system as Ward 2A, though no alterations to the water system were made in this department).

The additional ClO_2 dosing units are scheduled to be turned on during January 2019.

The Estates department have identified the ongoing testing and monitoring of the ClO_2 systems as being an essential component of the future PPM regime, though DMA have not been advised whether the testing and monitoring works will be undertaken by in-house staff or will be sub-contracted out.

WATER SYSTEM RISK ASSESSMENT

In order to facilitate the installation of the dosing system substantial alterations required to be made in each of the plantrooms, with sections of pipework being removed and replaced with new fabricated sections with suitable connections points for the dosing units.

During the pipework alterations it has been noted and reported to DMA that some sections of pipework may have been 304 Stainless Steel rather than 316 Stainless Steel and that not all pipework was WRAS approved. It is advised that should this be the case confirmation should be sought from the manufacturers and/or installers that the pipework is of a suitable standard and that this will not contribute to microbial growth, or in any other way impact on the safe operation of the water system(s). Alternatively, independent testing of the non-WRAS approved materials could be undertaken to confirm suitability or otherwise of the materials and components in question.

It has been noted as sections of pipework and water meters have been removed as part of the ongoing upgrade works within plantrooms that internal surfaces of water meters have spot corrosion evident and that internal surfaces of some sections of pipework had a thin, light, green film. DMA understands samples sent away for analysis though no reports provided to DMA of the results of the analysis.

Basement Tankroom – As part of the ongoing works air sampling was carried out in the basement tank room which identified bacteria and fungi within the samples. Concepts for mitigating this are being investigated by Estates, though DMA Are not aware of any decision being made on how to proceed with this.

WATER SYSTEM RISK ASSESSMENT

Locations of Anti-Microbial (PALL) Filters

Children's Hospital

Ward	Type of Filter	Entire Ward of Part Ward	Jamie Clayforth Comments
OPD/Rehab	PALL 62 Day Filter	Part of Dept	
1A	PALL 62 Day Filter	Whole Ward?	
1B	PALL 62 Day Filter	Whole Ward?	
1C	PALL 62 Day Filter	Part Ward	
1D (PICU)	PALL 62 Day Filter	Whole Ward?	
1E	PALL 62 Day Filter	Part Ward	
2A	PALL 31 Day Filter	Full Ward (Temporarily closed in late September for remedial works)	
2B	PALL 31 Day Filter	Full Ward (Temporarily closed in late September for remedial works)	
2C	PALL 62 Day Filter	Part Ward	
3A	PALL 62 Day Filter	Part Ward	
3B	PALL 62 Day Filter	Part Ward	
3C	PALL 62 Day Filter	Whole Ward?	

Adults Hospital

Ward	Type of Filter	Entire Ward of Part Ward	Jamie Clayforth Comments
A&E	PALL 62 Day Filter	2 Rooms	
CDU	PALL 62 Day Filter	3 Rooms	
HDU 1	PALL 62 Day Filter	3 Showers	
HDU 2	PALL 62 Day Filter	3 Showers	
HDU 5	PALL 62 Day Filter	3 Showers	
HDU 6	PALL 62 Day Filter	3 Showers	
MRI	PALL 62 Day Filter	1 Outlet	
4A	PALL 62 Day Filter	Whole Ward?	
4B	PALL 31 Day Filter	Whole Ward?	
4B/2 (Part of 4C)	PALL 31 Day Filter	Whole Ward?	
4C	PALL 62 Day Filter	Whole Ward?	
4D	PALL 62 Day Filter	Whole Ward?	
6A	PALL 31 Day Filter	Whole Ward (Temporarily housing children from Ward 2A from late September for remedial works)	
7A	PALL 62 Day Filter	Whole Ward?	
7B	PALL 62 Day Filter	Whole Ward?	
7C	PALL 62 Day Filter	Whole Ward?	
7D	PALL 62 Day Filter	Whole Ward?	
8C	PALL 62 Day Filter	Whole Ward?	
9D	PALL 62 Day Filter	Whole Ward?	
10A	PALL 62 Day Filter	Whole Ward?	
11C	PALL 62 Day Filter	Whole Ward?	
Neo Natal[1]	PALL 62 Day Filter	2 Rooms	
NICU Level 1[1]	PALL 62 Day Filter	Part Ward	
NICU Level 2[1]	PALL 62 Day Filter	Part Ward	

[1] Outlets in these areas not supplied by Adult & Children's water system.

WATER SYSTEM RISK ASSESSMENT

Summary & Recommendations

Using the Governance and Documentation review, including the gap analysis, the Written Scheme should be amended and expanded upon to incorporate all necessary information to allow for the safe operation of the water systems on site.

The list of inclusions recommended to form the written scheme are included within section 10 of this document. Due to the complexity, volume of tasks and the number of guidance documents which require due cognisance, this list should be reviewed on a regular basis, by all relevant parties to ensure this is as current and exhaustive as is practicable.

All tasks, including management, should be formally assigned to suitably trained and competent personnel. Appropriate procedures, SOP's and safety risk assessments should be generated for each of the individual tasks, including review timescale and parameters, signed off as suitable by relevant parties (multi-disciplinary where required). Escalation procedures for out of specification incidents should be included. A general escalation procedure for unforeseen, non-standard incidents should also be included (e.g. seek further guidance from Authorised Engineer or specialist water treatment company).

The Water Safety Group meetings provide the opportunity for regular inter-departmental collaboration on the water systems governance and accountability, which is a fundamental requirement for the management and safe operation of the water systems. All relevant parties should be encouraged to participate in these meetings in order for NHS GG&C to meet their regulatory obligations.

The Water Safety Group is a multidisciplinary group formed to undertake the commissioning, development, implementation and review of the Water Safety Plan (and/or Written Scheme). The aim of the Water Safety Group is to ensure the safety of all water used by patients/residents, staff and visitors, to minimise the risk of infection associated with water. It provides a forum in which people with a range of competencies can be brought together to share responsibility and take collective ownership for ensuring it identifies microbiological hazards, assesses risks, identifies and monitors control measures and develops incident protocols.

Section 10

Summary of PPM Tasks Recommended for Written Scheme / Water Safety Plan

WATER SYSTEMS RISK ASSESSMENT

Summary of Governance Tasks Recommended for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Regular check to ensure that legislation and guidance has not changed	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of Water Systems Management Structure to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of communication lines to ensure still accurate and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of escalation & emergency procedures to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties allocated to site staff and ensure accurate and recorded (including any changes in use of wards/departments).	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of roles allocated to individual departments in relation to the water systems and ensure accurate and recorded	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties of sub-contractors to ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered, etc.)	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review staff training and competency requirements and update training matrix	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review PPM requirements, method statements, SOPs and risk assessments to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review remedial work progress	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of site documentation to ensure all records up to date and present	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review "Patient Risk Rating" for all areas of hospital (including any changes in use of wards/departments).	SHTM 04-01 Part B	
Create register and regularly review sentinel outlet locations register (inc. Sentinel TMV/TMTs).	SHTM 04-01 Part B	
Create register and regularly review little-used outlet locations register (input from clinical staff required, and including any changes in use of wards/departments)	SHTM 04-01 Part G	
Create register and regularly review deadlegs/blind ends locations register (input from clinical staff required, and including any changes in use of wards/departments)	SHTM 04-01 Part G	
Create register and regularly review POU/Anti-microbial (PALL) filters locations (and manufacturer's/types of filters fitted)	SHTM 04-01 Part G	
Create register and regularly review TMV/TMT locations and manufacturer/model.	SHTM 04-01 Part G	
Create register and regularly review shower & spray outlet locations (including emergency/deluge showers)	SHTM 04-01 Part G	
Create register and regularly review primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	HSG 274 Pt 2	
Create register and regularly review and record all plant, valves, equipment and services and their associated maintenance schedules).	HSG 274 Pt 2 SHTM 04-01 Part B	

Cont...

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

Summary of Governance Tasks Recommended for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Create register and regularly review BEMS temperature sensor locations to reflect any system alterations	HSG 274 Pt 2	
Create register and regularly review schematic/as-fitted drawings to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review all backflow prevention device locations/type (E.g. Check valves, RPZs etc.) to reflect any system alterations.	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review all flexible hoses locations (EPDM) (E.g. at Arjo baths, Pressure reducing valves etc.) to reflect any system alterations.	SHTM 04-01	
Create register of drains to be cleaned and disinfected and frequency	Good practice in light of ongoing issues	
Review of water systems risk assessment as a "live" document (DMA recommend a maximum period of 2 years). An indication of when to review the assessment and what to consider should be recorded and this may result from, e.g.: • a change to the water system or its use; • a change to the use of the building where the system is installed; • new information available about risks or control measures; • the results of checks indicating that control measures are no longer effective; • changes to key personnel; • a case of legionnaires' disease/legionellosis associated with the system.	L8 STHM 04-01	

N.B. By "Regular" e.g. a Quarterly or 6 monthly review of all tasks above or as and when there are changes in system operation, management or other control parameters which would warrant a review of any particular task. (e.g. if change of use or changes in legislation or any other factor which could affect validity of the current documentation)

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	**Recommended**	**Allocated To**
Daily review of BEMS records (temperature records, alarms etc.)	Yes	
Daily check the flow and return temperatures on the domestic hot water calorifier systems using the temperature gauges fitted or a suitable surface temperature probe – *required when BEMS is not operational.*	Yes (if/when BEMS not operational)	
Daily water draw-off should form part of the daily cleaning process.	Yes	
Daily flushing of all outlets in "High Risk Areas". Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile.	Yes	
Verification that entire body of calorifier reaches 60°c for a period of 1 hour each day (generally at a time of low use e.g. Early morning/late evening).	Yes Monitored on BEMS	
Incoming Water Mains – maintain in accordance with installation/design guidelines, ensuring alteration of incoming mains lines to run at least daily. (advised 9 hourly swap over)	Yes Monitored on BEMS	
Cyclical alteration of CWST booster pumps (ensuring every pump runs at least weekly)	Yes Automatic on BEMS systems	
Daily check of pumps/filters on Veolia Filter Unit	Yes	
Twice-weekly flushing of all outlets in unoccupied areas and low use/sporadically used outlets. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile (<20°C for cold water and >55°C for hot water) (or until removal is carried out)[1 & 2]	Yes	
Twice weekly flushing of emergency/deluge shower for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile (<20°C for cold water and >55°C for hot water) – located in A&E Decontamination Room and Hydrotherapy Pool Plantroom[1 & 2]	Yes	
Twice weekly flushing of deadlegs/blind ends (inc CWST Drain pipework where these cannot be removed) where these cannot be removed. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile (<20°C for cold water and >55°C for hot water) (or until removal is carried out)[1 & 2]	Yes	
Weekly Chloramination sampling from hot and cold water outlet point, representative of each secondary distribution pipework system. These should initially be conducted weekly and then subject to ongoing trend based frequency risk assessment, limited to no less than at once per month sampling test frequency.	Yes (Once water utility company confirm incoming mains dosed with Chloramines)	
Weekly check of water levels within water tanks	Yes Monitored on BEMS	
Weekly alteration of hot water secondary circulation pumps (ensuring every pump runs at least weekly)	N/A Individual pumps	N/A
Weekly test to confirm booster, recirculation and de-stratification pumps operating correctly	Yes	
Weekly initially and then moving to Monthly measure the concentration of chlorine dioxide at the sentinel taps – the concentration should be at least 0.1 mg/l (or as advised by WSG); and adjust the chlorine dioxide dosage to establish the required residual at the sentinel sample points.	Yes once installed	
Weekly initially and then moving to Monthly test the treated water for both chlorine dioxide and total oxidant/chlorite at an outlet close to the point of injection to verify the dosage rate and conversion yield.	Yes once installed	
Weekly check on the ClO_2 dosing system(s) operation to ensure operating correctly and dosing at correct levels (as per HSG 274 Part 2, NHS GG&C Dosing System Specifications and in accordance with manufacturer's instructions) and chemical stocks in the reservoir	Yes once installed	

Cont...

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	Recommended	Allocated To
Monthly calorifier/water heater storage (including plate heat exchangers) temperatures checks at top (flow) and return pipework (where applicable). Recommended flow temperature – min 60°c, return temperature – min 55°c. *also note potential scald risks	Yes Monitored on BEMS	
Monthly temperature checks on hot outlets at sentinel, little-used & selected outlets. >55°c within 1 minute (also note potential scald risks and out of spec TMVs) to create a temperature profile of systems.	Yes	
Monthly temperature checks on cold outlets at sentinel, little-used & selected outlets. <20°c within 2 minutes to create a temperature profile of building and monitor heat gain within the cold water system.	Yes	
Monthly temperature checks on all primary flow and return loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system.	Yes Partially monitored on BEMS	
Monthly/Quarterly take temperatures (ideally on a rolling monthly rota to ensure all covered on a quarterly basis) at return legs of subordinate loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system.	Yes	
Monthly/Annually take temperatures (ideally on a rolling monthly rota to ensure all covered on an annual basis) at return legs of tertiary loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system	Yes	
Monthly check to ensure CWST overflows are unobstructed (Boroscope may be required)	Yes	
Monthly flushing of expansion vessels as not 'flow through' design	Yes	
Monthly changing of tap/showerhead POU/Anti-microbial filters within designated "Highest-Risk" Wards/Departments/Rooms (i.e. Children's Wards 2A & 2B, Adults Wards 4B, 4B/2 and 6A during period when children decanted into this ward)	Yes	
Monthly changing of inline POU/Anti-microbial dishwasher filters	Yes	
Monthly Inspect, clean & log glass traps and overflow condition on Air Handling Units (and if fitted to CWST overflow/warning pipes)	Yes	
Bi-Monthly (i.e. 62 days) changing of tap/showerhead POU/Anti-microbial filters within designated "High-Risk" Wards/Departments/Rooms	Yes	
Quarterly[1] descaling, cleaning and disinfection of showerheads & hoses & spray outlets, or replace with new Shower Head and Hose (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	Yes	
Quarterly inspection and cleaning of system strainers (including angle valve strainers) (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	Yes	
Quarterly, each calorifier and any associated storage/buffer vessels should be flushed through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. Arrange for samples to be taken from hot water calorifiers, to note condition of drain water.	Yes	
Quarterly (or frequency as indicated by the rate of fouling) inspection of outlets for evidence of scale formation (descaling as necessary).	Yes	
Quarterly servicing TMV/TMTs or mixer valves, including fail safe tests and cleaning/disinfection of strainers within "Designated High Risk Area"/ICUs (more frequently if manufacturer recommends – or if 'drift' in excess of 1°C at mixed outlet temperature when highlighted during temperature monitoring or other maintenance) including thermal pasteurisation where practical and as directed by ICT/manufacturer's instructions.	Yes	
Quarterly changing of Horne Optitherm Diffuser/Flow Straightener on non-filtered outlets	Yes	

Cont...

[1] HSG Part 2 recommends that all showers are cleaned and descaled quarterly at least quarterly. SHTM 04-01 Part G recommends that this should be carried out "Three-monthly for high risk areas and as required elsewhere, but at least once annually".

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	**Recommended**	**Allocated To**
Quarterly during periods of Change - Water System Sampling (at random water outlets in High Risk Patient Areas) in Water Systems still serving High Patient Risk Areas	Yes	
As required/as directed by ICT – drain cleaning and disinfection of drains and traps in designated areas	Yes	
Six monthly cold water summer / Winter temperature monitoring of cold water at inlet to building. Also to be continuously monitored by BEMS & log of all alarms	Yes Monitored on BEMS	
Six monthly CWST condition inspection noting appearance of water, stagnation, odour, rust, scale, sediment, debris, paint/liner condition, bio film accumulation, tank lid fitting satisfactorily and insulation condition	Yes	
Six monthly CWST temperature checks on tank supply and stored water at opposite side from tank inlet if possible (inlet and stored water should be <20°c, with stored water no more than 2°c warmer than make-up water.)	Yes	
Six monthly or Annual[2] servicing TMV/TMTs or mixer valves, including fail safe tests and cleaning/disinfection of strainers. (more frequently if manufacturer recommends – or if 'drift' in excess of 1°C at mixed outlet temperature when highlighted during temperature monitoring or other maintenance)	Yes	
Six monthly chemical and microbiological water samples from water tanks which feed drinking water outlets	Yes	
Six monthly inspection of Air Handling Units humidity section (where installed) and cooling section	Yes	
Cleaning and Disinfection of Air Handling Units	Yes See frequency guidelines provided below	
Annually arrange for samples to be taken from hot water calorifiers/water heaters in order to note condition of drain water.	Yes	
Cleaning and disinfection of Cold Water Storage Tanks (and water systems if practicable) in accordance with BS EN806/BS 8558 (Formerly BS 6700) as and when required (dependant on CWST inspection & sample results). Other remedial works to be carried out as necessary where highlighted during routine inspections or whilst tanks drained etc.	Yes See frequency guidelines provided below	
Annual internal inspection and cleaning/descaling of the calorifier/water heater with disinfection/pasteurisation upon completion	Yes	
Arrange for microbiological samples to be taken from water system which represent the complexity of the water system(s) and particularly in areas of concern. All sampling should be carried out in accordance with BS 7592:2008 and all analysis by a UKAS accredited laboratory.[3]	Yes Dependant on Monitoring results, and as directed by ICT	
Pasteurisation/disinfection of calorifier/water heaters carried out as and when required dependent on temperature monitoring and sample results	Yes See frequency guidelines provided below	
Annual turnover test on cold water storage system. Checks should be carried out to ensure that volume of water stored is no more than would generally be used in a normal 12 hour period.	Yes	
Annually test the chlorine dioxide and total oxidant/chlorite concentration at a representative selection of outlets throughout the distribution system – the concentration should be at least 0.1 mg/l chlorine dioxide.	Yes once installed	
Annual inspection of vibration coupling on pumps/plant, replacing as necessary (more frequently if recommended by manufacturer)	Yes	

Cont...

[2] TMV Servicing frequency is contradictory in the various guidance documents. We would advise an initial sweep of servicing with ongoing frequency determined based on the findings of the initial servicing.

[3] Sampling regime should be formulated by site/client based on the known history of the water systems and the details included within this and previous risk assessments, with assistance of specialist legionella consultant (e.g. DMA) if necessary. Although L8 does not specifically request legionella sampling in cases where there are incorrect distribution or supply temperatures, water quality issues or other factors which may increase the likelihood of legionella (and other bacterial) proliferation and dissemination sampling should be carried out. For further guidance please refer to HSG 274 Part 2, HTM/SHTM 04-01 and BS 7592:2008

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	**Recommended**	**Allocated To**
Annual inspection & cleaning of buffer/accumulator vessels (more frequently if recommended by manufacturer)	Yes	
Annual inspection of plant and pipework insulation, repairing where necessary.	Yes	
Annual test to ensure that plant temperature, pressure gauges and thermostats are accurate (Also note during routine temperature monitoring where appropriate)	Yes	
Biennial stratification checks on calorifiers. These checks should extend over a period of seven (7) days using a logging device to establish that the water temperature at the base of the vessel achieves 60ºC.	Yes	
Maintenance/servicing of Veolia filtration plant as per manufacturers recommend frequency	Yes	
Annual (or periodic as specified by manufacturer) servicing of backflow prevention devices (i.e. RPZ)	Yes	
Drinking water dispensers - maintain in accordance with manufacturers guidelines. Please note freestanding drinking water machines (i.e. bottled) and ice machines should not be installed in healthcare premises and should be removed wherever found. ***N.B.*** *Drinking water dispensers removed from hospital at time of survey with lines incorporated into site flushing regime.*	Yes If Water coolers reinstated	
Reports have been received intimating that high levels of Pseudomonas and Legionella bacteria have been found in water samples taken from outlets fed by flexible hoses lined with ethylene propylene diene monomer (EPDM) due to colonisation of the lining, although it is possible that other lining materials and washers within couplings could be similarly affected. Wherever practical these should be replaced with services hard piped. Where this is not practical should be given to changing EPDM flexible hoses and other lining materials and washers. Where changing to alternative materials is not practical periodic (e.g. six monthly) monitoring should be implemented on EPDM hoses, with hoses swapped out as necessary dependant on sample results and/or rate of fouling witnessed.	Yes	
All plant and equipment should be serviced and maintained in accordance with manufacturers recommendations	Yes	
Closed Heating and Chilled Water Systems – Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturer's/installers instructions.	Yes	
Air Conditioning and Ventilation – Maintain in accordance with manufacturer's/installers instructions and SHTM 03-01.	Yes	

Task frequencies described above are for guidance only. Frequencies may vary dependent on system conditions highlighted during routine monitoring. Suitable Method Statements/SOPs should be followed for each task.

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

System / Service	Circumstance Requiring Cleaning and Disinfection	Frequency
Domestic Cold Water Tank	New installations	As required
	Re-commissioning empty/unused tanks	As required
	Tank temperature exceeds 25ºC	As required
	Tank contains moderate sediment, i.e. a complete covering of the tank base.	As required
	Evidence of tank corrosion	As required
	Any contamination of tank (by organic, by vermin or vermin faeces or similar)	As required
	Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
	Regular programme for high-risk healthcare category, with disinfection	Annually
Domestic Cold Water Distribution System	New installations and modifications or additions	As required
	Temperature exceeds 25ºC	As required
	Any contamination of tank (by organic, by vermin or vermin faeces or similar)	As required
	Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
Domestic Hot Water Calorifier and Storage/ Buffer Vessels	New installations and modifications or additions	As required
	Temperature has fallen below 45ºC	As required
	Re-commissioning of empty/unused plant	As required
	Any contamination of header tank (by organic, by vermin or vermin faeces or similar)	As required
	Regular programme	Annually
Domestic Hot Water Distribution System	New installations and modifications or additions	As required
	Temperature has fallen below 45ºC	As required
	Any contamination of header tank (by organic, by vermin or vermin faeces or similar)	As required
Air Handling Units	Any contamination (by organic, by vermin or vermin faeces or similar)	As required
	Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
	Chiller battery, drip trays and drainage pipework	6 monthly

N.B. *Information in table above taken from SHTM 04-01*

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

Section 11

Photographic Appendix

WATER SYSTEM RISK ASSESSMENT

	
Basement CWST Drains (Typical)	Basement Drain Trade Water Tank
	
Basement Fire Tank Overflow	Basement Govan Road Mains Deadlegs
	
Basement Leaking Flange at Filter Unit	Basement Link Pipework between Pump Sets
	
Basement Plumbing Spares Store	Basement Post Filter Pipework Link

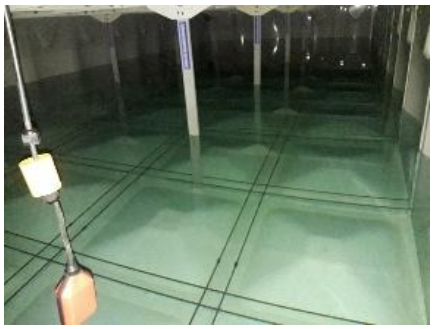
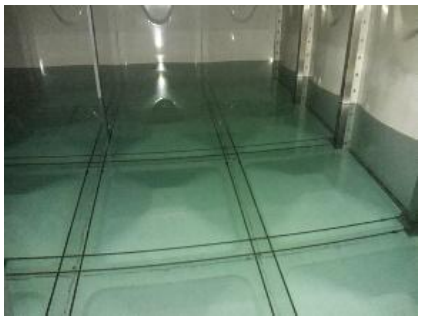
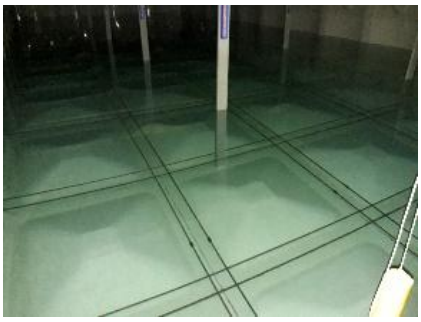
WATER SYSTEM RISK ASSESSMENT

	
Basement Post Filter Tank Deadlegs	Basement Pre Filter Tank 1A-1B Deadleg
	
Basement Pre Filter Tank 2A-2B Deadleg	Basement Pre Filter Unit Deadlegs
	
Basement Pump Set Manifold	Basement Riser to P41-P22 Deadleg
	
Basement Tanks Overflow (Typical)	Basement Trades CWST Outlet Deadleg

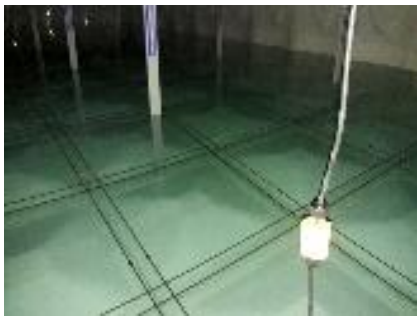
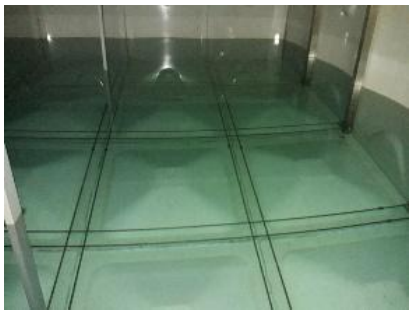
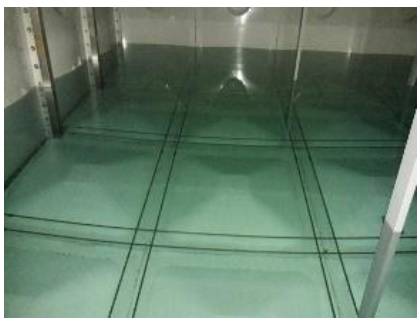
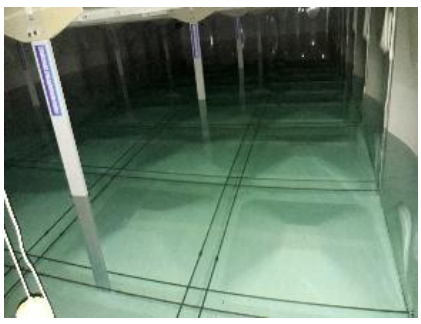
WATER SYSTEM RISK ASSESSMENT

	
Basement Flange Post Pump	CWST Bulk 1A (1)

WATER SYSTEM RISK ASSESSMENT

	
CWST Bulk 1A (2)	CWST Bulk 1A (3)
	
CWST Bulk 1A (4)	CWST Bulk 1A (5)
	
CWST Bulk 1B (1)	CWST Bulk 1B (2)
	
CWST Bulk 1B (3)	CWST Bulk 1B (4)

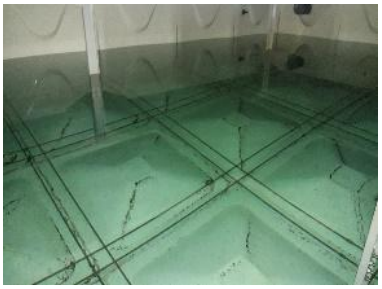
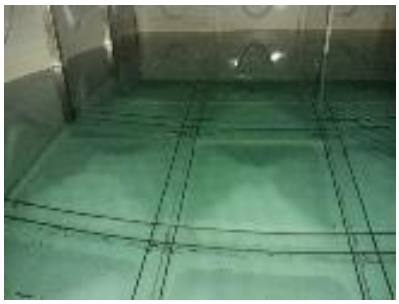
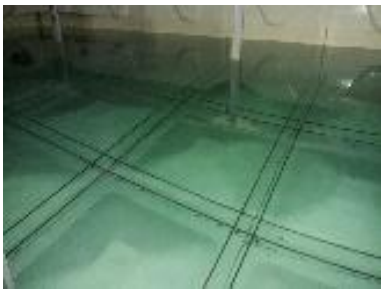
WATER SYSTEM RISK ASSESSMENT

	
CWST Bulk 1B (5)	CWST Bulk 2A (1)
	
CWST Bulk 2A (2)	CWST Bulk 2A (3)
	
CWST Bulk 2A (4)	CWST Bulk 2A (5)
	
CWST Bulk 2B (1)	CWST Bulk 2B (2)

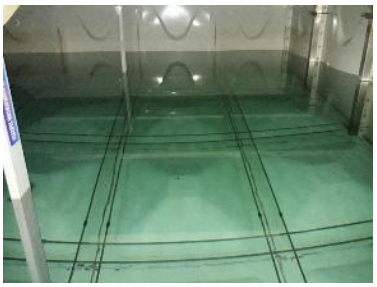
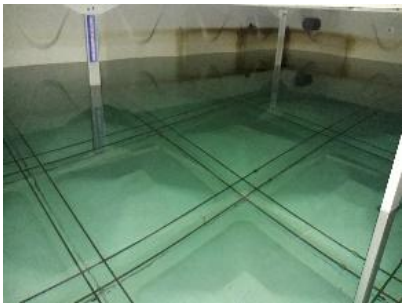
WATER SYSTEM RISK ASSESSMENT

	
CWST Bulk 2B (2)	CWST Bulk 2B (3)
	
CWST Bulk 2B (4)	CWST Bulk 2B (5)
	
CWST RAW 1A (1)	CWST RAW 1A (2)
	
CWST RAW 1A (3)	CWST RAW 1A (4)

WATER SYSTEM RISK ASSESSMENT

	
CWST RAW 1A (5)	CWST RAW 1B (1)
	
CWST RAW 1B (2)	CWST RAW 1B (4)
	
CWST RAW 1B (5)	CWST RAW 2A (1)
	
CWST RAW 2A (2)	CWST RAW 2A (3)

WATER SYSTEM RISK ASSESSMENT

	
CWST RAW 2A (4)	CWST RAW 2A (5)
	
CWST RAW 2B (1)	CWST RAW 2B (2)
	
CWST RAW 2B (3)	CWST RAW 2B (4)
	
CWST RAW 2B (5)	Endoscopy Wash Plant Leak

WATER SYSTEM RISK ASSESSMENT

	
Endoscopy Wash Plant	Endoscopy Wash Plant 2
	
Endoscopy Wash Plant Bulb	Endoscopy Wash UV 1
	
Flexible Hoses on Pressure Reducers (Typical)	P21 Flexible Hoses on Pressure Reducers
	
P21 Water Meter	P22 Connections to Press Units (1)

WATER SYSTEM RISK ASSESSMENT

	
P22 Connections to Press Units (2)	P31 AHU Condair Units
	
P31 Cal 7 Drain	P31 Cal Excessive Line to Expansion
	
P31 Cold Line to Endoscopy and Riser M12	P31 Line to Condair and RPZ (at Cals 04-05-06)
	
P31 Lines to Press Units (at Cals 01-02-03) (1)	P31 Lines to Press Units (at Cals 01-02-03) (2)

WATER SYSTEM RISK ASSESSMENT

P31 Lines to Press Units (at Cals 01-02-03) (3)

P31 Lines to Press Units (at Cals 01-02-03) (4)

P31 Optitherm Service Rig (1)

P31 Optitherm Service Rig (2)

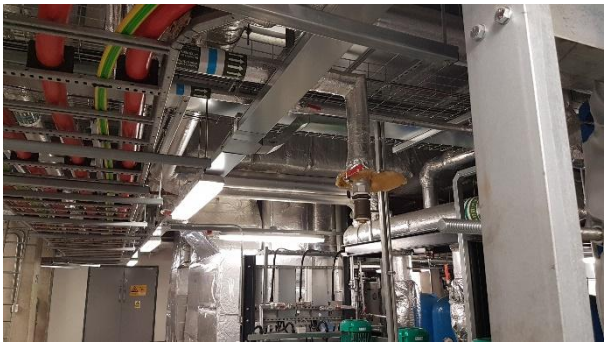
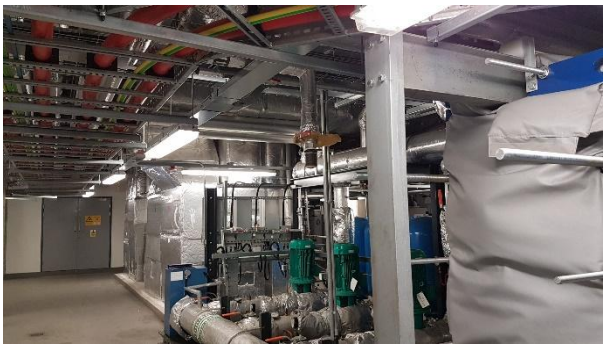
P31 PHE For Optitherm Rig

P31 PHE For Optitherm Rig 2

P32 Connection to Press Unit

P32 Deadleg 2

WATER SYSTEM RISK ASSESSMENT

	
P32 Renal Connection (1)	P32 Renal Connection
	
P32 Deadleg 1.7M Rear of Cal	P33 Line to Press Unit 1
	
P33 Line to Press Unit 2	P33 Line to Press Unit 3
	
P41 Cal Return Pump Coupling	P41 Cal Return Pump Coupling

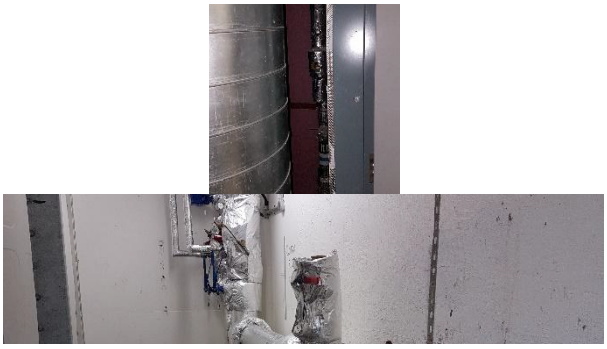
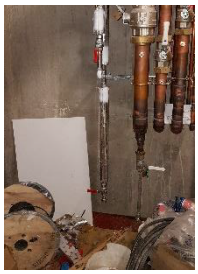
WATER SYSTEM RISK ASSESSMENT

	
P41 Connection to Press Unit	P41 Deadleg (Disconnected Press Unit at 41AHU27A)
	
P41 Deadleg at 41AHU27A	P41 Deadleg Tee to Downturned Deadleg and CWH Press at AHU24
	
P41 Deadleg to CWH Press at AHU24	P41 Press Unit Fast Fill
	
AHU Condair Units (Typical)	

Section 11

Photographic Appendix

WATER SYSTEM RISK ASSESSMENT

	
ARU-121 Valve Partially Open No CV	Cal 11-006 Injection Point
	
Cal 11-014 No Access to Pipework (1)	Cal 11-014 No Access to Pipework (2)
	
CA6-006 Injection Point Uninsulated	CA8-006 Injection Valve (1)
	
CA8-006 Injection Valve Open	CC0-008 Deadleg on Cold (Bottom)

WATER SYSTEM RISK ASSESSMENT

	
CC0-008 Deadlegs on Cold HF&R (Bottom)	CC0-021 Deadlegs on Cold HF&R (Bottom)
	
Filter with Sample Point Caps	GENW6-068 Faulty Temp Gauge (1)
	
GENW6-068 Faulty Temp Gauge (2)	GENW7-068 Evidence of Leak
	
GENW7-068 Incorrectly Labelled Pipework	GENW7-068 Injection Point

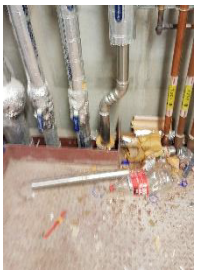
WATER SYSTEM RISK ASSESSMENT

	
GENW11-068 Evidence of Leak	GENW11-068 Evidence of Leak (2)
	
GENW11-068 Evidence of Leak (3)	GENW15-068 Evidence of Leak (1)
	
GENW15-068 Evidence of Leak (2)	GENW15-068 Evidence of Leak (3)
	
GENW16-068 Injection Point	GENW19-068 Evidence of Leak (1)

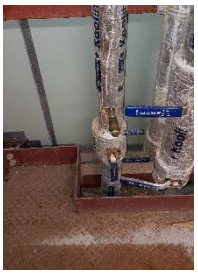
WATER SYSTEM RISK ASSESSMENT

	
GENW19-068 Evidence of Leak (2)	GENW19-068 Evidence of Leak (3)
	
GENW20-068 Injection Point (Uninsulated)	GENW23-068 Leaking Valve
	
GENWB-068 Incorrectly Labelled Pipework	GENWB-068 Incorrectly Labelled Pipework (2)
	
Hot F&R in Riser no Commvalve	RCG-008 Unlabelled and Missing Insulation (1)

WATER SYSTEM RISK ASSESSMENT

	
RCG-008 Unlabelled and Missing Insulation (2)	RENW-212 Evidence of Leak (1)
	
RENW-212 Evidence of Leak (2)	RENW-212 Evidence of Leak (3)
	
Riser CC3-008 (Insulation)	Riser CC3-008 2in Connection
	
Riser CC3-008 F&R Label	Riser Injection Points (Typical) (1)

WATER SYSTEM RISK ASSESSMENT



Riser Injection Points (Typical) (2)

Riser Injection Points (Typical) (3)

STW-012 Missing Insulation

Typical Drain Cock in Riser (1)

Typical Drain Cock in Riser (2)

Water Meter to Hydropool (Basement)

NHS National Services Scotland

Risk Assessment
Temperature Monitoring of Plumbing Fittings in High Risk Areas

Date:
Contractor:

Estates Officer:

SCN/Manager

Infection Control Nurse: Lynn Pritchard LIPCN / Teresa Inkster LICD / Susie Dodds LIPCN

SHFN 30:
HAI-SCRIBE

Question sets and checklists

Health Facilities Scotland
Engineering and Environment

October 2018

Introduction

Scottish Health Facilities Note (SHFN) 30 in its 2014 published form comprises two parts:

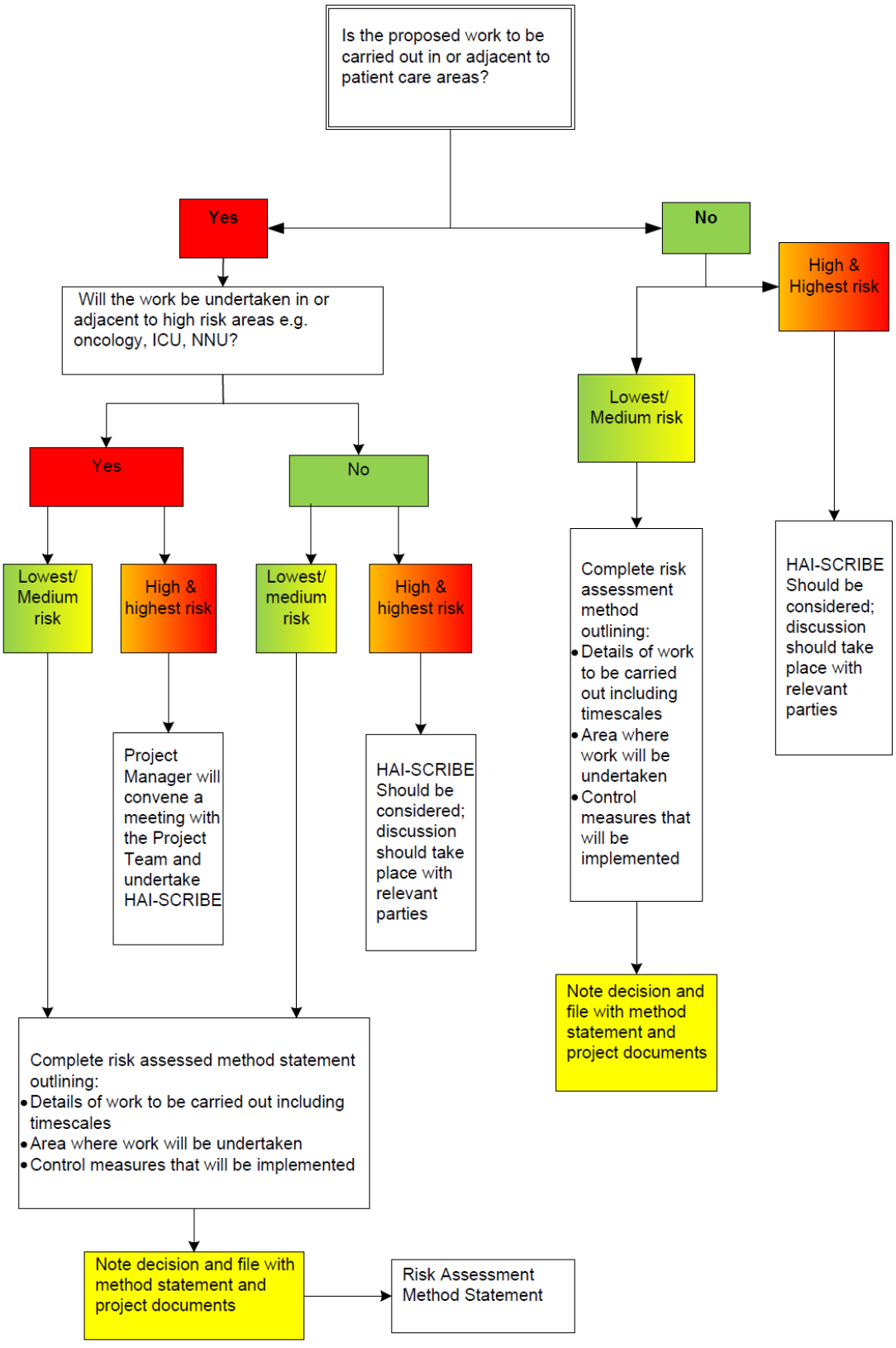
- **Part A**: Manual: Information for Design Teams, Construction Teams, Estates & Facilities and Infection Prevention & Control Teams.
- **Part B**: HAI-SCRIBE Implementation Strategy and Assessment Process.

Both have been published in book form.

It is appreciated that, as familiarity with the use of the procedures grows there will be progressively less need to rely on printed text, eventually leading to situations where question sets and checklists will themselves be sufficient. Photocopying from published books is a ponderous and time-consuming process with a tendency to produce distorted images and/or damage binding. To facilitate the process, therefore, question sets and checklists for each of the four project development stages have been produced in the form of an information pack ready for photocopying and distributing to project teams to assist in the HAI-SCRIBE review procedures as each new Project requires assessment. This pack is only available electronically.

The various proforma, comprising question sets, checklists and certifications, are provided for the following:

- **Development Stage 1:** Initial briefing and proposed site for development:
- **Development Stage 2:** Design and planning:
- **Development Stage 3:** Construction and refurbishment work:
- **Development Stage 4:** Pre-handover check, ongoing maintenance and feed-back.


Is the proposed work to be carried out in or adjacent to patient care areas?
Yes
No
Will the work be undertaken in or adjacent to high risk areas e.g. oncology, ICU, NNU?
High & Highest risk
Lowest/ Medium risk
Yes
No
Lowest/ Medium risk
High & highest risk
Lowest/ medium risk
High & highest risk
Complete risk assessment method outlining:
• Details of work to be carried out including timescales
• Area where work will be undertaken
• Control measures that will be implemented
HAI-SCRIBE Should be considered; discussion should take place with relevant parties
Project Manager will convene a meeting with the Project Team and undertake HAI-SCRIBE
HAI-SCRIBE Should be considered; discussion should take place with relevant parties
Note decision and file with method statement and project documents
Complete risk assessed method statement outlining:
• Details of work to be carried out including timescales
• Area where work will be undertaken
• Control measures that will be implemented
Note decision and file with method statement and project documents
Risk Assessment Method Statement

Type	Construction/Refurbishment Activity
Type 1	**Inspection and non-invasive activities.** Includes, but is not limited to, removal of ceiling tiles or access hatches for visual inspection, painting which does not include sanding, wall covering, electrical trim work, minor plumbing and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
Type 2	**Small scale, short duration activities which create minimal dust.** Includes, but is not limited to, installation of telephone and computer cabling, access to chase spaces, cutting of walls or ceiling where dust migration can be controlled.
Type 3	**Any work which generates a moderate to high level of dust, aerosols and other contaminants or requires demolition or removal of any fixed building components or assemblies.** Includes, but is not limited to, sanding of walls for painting or wall covering, removal of floor coverings, ceiling tiles and casework, new wall construction, minor duct work or electrical work above ceilings, major cabling activities, and any activity which cannot be completed within a single work shift.
Type 4	**Major demolition and construction projects.** Includes, but it not limited to, activities which require consecutive work shifts, requires heavy demolition or removal of a complete cabling system, and new construction.

Table 1: Redevelopment and construction activity

Risk to patients of infection from construction work in healthcare premises, by clinical areas	
Risk rating	**Area**
Group 1 Lowest risk	1. Office areas; 2. Unoccupied wards; 3. Public areas/Reception; 4. Custodial facilities; 5. Mental Health facilities.
Group 2 Medium risk	1. All other patient care areas (unless included in Group 3 or Group 4); 2. Outpatient clinics (unless in Group 3 or Group 4); 3. Admission or discharge units; 4. Community/GP facilities; 5. Social Care or Elderly facilities.
Group 3 High risk	1. A & E (Accident and Emergency); 2. Medical wards; 3. Surgical wards (including Day Surgery) and Surgical outpatients; 4. Obstetric wards and neonatal nurseries; 5. Paediatrics; 6. Acute and long-stay care of the elderly; 7. Patient investigation areas, including; • Cardiac catheterisation; • Invasive radiology; • Nuclear medicine; • Endoscopy. Also (indirect risk) 8. Pharmacy preparation areas; 9. Ultra clean room standard laboratories (risk of pseudo-outbreaks and unnecessary treatment); 10. Pharmacy Aseptic suites.
Group 4 Highest Risk	1. Any area caring for immuno-compromised patients*, including: • Transplant units and outpatient clinics for patients who have received bone marrow or solid organ transplants; • Oncology Units and outpatient clinics for patients with cancer; • Haematology units • Burns Units. 2. All Intensive Care Units; 3. All operating theatres; Also (indirect risk) 4. CSSUs (Central Sterile Supply Units).

Table 2: Different areas of health care facility and the risk associated with each area.

	Construction Project Type			
Patient Risk Group	**TYPE 1**	**TYPE 2**	**TYPE 3**	**TYPE 4**
Lowest Risk	Class I	Class II	Class II	Class III/IV
Medium Risk	Class I	Class II	Class III	Class IV
High Risk	Class I	Class II	Class III/IV	Class IV
Highest Risk	Class II	Class III/IV	Class III/IV	Class IV

Table 3: Estimates the overall risk of infection arising and will indicate the class of precaution that should be implemented

Control measures			
	During Construction Work	**After Construction Work**	**By**
Class I	• Execute work by methods to minimise raising dust from construction operations;. • Immediately replace any ceiling tiles displaced during inspection.	• Clean areas by damp dusting with neutral detergent in warm water;. • Vacuum floor and damp mop.	Request via domestic supervisor. Request via domestic supervisor.
Class II	• Provide active means to prevent airborne dust from dispersing into atmosphere; • Water mist work surfaces to control dust while cutting; • Seal unused doors with duct tape; • Block off and seal air vents; • Place dust mat at entrance and exit of work area; • Remove or isolate HVAC system in areas where work is being performed.	• Dampwork surfaces and ledges with neutral detergent solution; • Contain construction waste before transport in tightly covered containers; • Damp mop and/or vacuum with HEPA filtered vacuum before leaving work area; • Remove isolation of HVAC system in areas where work is being performed.	Request via domestic supervisor. Estates staff. Request via domestic supervisor. Estates staff.
Class III	• Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system; • Complete all critical barriers eg plasterboard, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins; • Maintain negative air pressure within work site utilizing HEPA equipped air filtration units; • Contain construction waste before transport in tightly covered containers; • Cover transport receptacles or carts. Tape covering unless solid lid.	• Do not remove barriers from work area until completed project is inspected by the Board's Health & Safety representative and Infection Control Department and thoroughly cleaned by the Board's domestic services staff;. • Remove barrier materials carefully to minimise spreading of dirt and debris associated with construction; • Vacuum work area with HEPA filtered vacuums; • Damp mop area with neutral detergent and warm water; • Remove isolation of HVAC system in areas where work is being performed.	Request by Estates Dept. Contractor/Estates Staff. Request via domestic supervisor. Request via domestic supervisor. Contractor/Estates Staff.

Table 4: Describes the required infection control precautions depending on class of risk

	During Construction Work	After Construction Work	By
Class IV	• Isolate HVAC system in area where work is being done to prevent contamination of duct system; • Complete all critical barriers eg plasterboard, plywood, plastic to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins; • Maintain negative air pressure within work site utilizing HEPA equipped air filtration units; • Seal holes, pipes, conduits, and punctures appropriately; • Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site; • All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area; • Do not remove barriers from work area until completed project is inspected.	• Remove barrier material carefully to minimise spreading of dirt and debris associated with construction; • Contain construction waste before transport in tightly covered containers;. • Cover transport receptacles or carts. Tape covering unless solid lid; • Vacuum work area with HEPA filtered vacuums; • Damp dust area with neutral detergent and warm water; • Scrub floor area with neutral detergent in warm water; • Remove isolation of HVAC system in areas where work is being performed.	Contractor. Contractor. Contractor. Request via domestic supervisor. Request via domestic supervisor. Contractor/Estates Staff.

Table 4 continued: Describes the required infection control precautions depending on class of risk

Construction and refurbishment Stage

Project particulars and checklists for Development Stage 3

Development stage 3: Construction and refurbishment work: Checklist to ensure all aspects have been addressed		
HAI-SCRIBE Name of Project	**Temperature monitoring of hot and cold water system via plumb fittings (without removal of the IPS Fitting) in High Risk areas as agreed by IPCT.**	
Name of Establishment	NHS GG&C	
National allocated number	--	
HAI-SCRIBE Review Team		
HAI-SCRIBE Sign Off		
Completed By (Project Manager) (Print Name)		Date
Signature		Date
Stage 3		

Additional Notes

All works in co-ordination with Department staff

Contractors to report to staff when entering the department.

Doors to the area where the works are being undertaken should remain closed during the period of the works.

Hep vacuum to be used mop clear ant dust and dirt during and after all work of the surrounding floor area.

Following works the sink and fittings should be cleaned using Acticlor wipes (Clorox Wipes) and the PAL filter should be cleaned using Alcohol wipes. These are required to be provided by Estates Dept / Contractor as they will not be available in the ward or Dept.

Safe routes for entry and exit /removal of material agreed with Department Staff.

All Rubbish to be wrapped in dust free plastic bags for removal from department and removed via the agreed route in accordance with Infection Control requirements.

Ward / Dept staff should be notified and advise sought as to whether the patient can remain in the room for the duration of the works or if it is preferred that the room should be vacated for this period.

Development stage 3: HAI-SCRIBE applied to Construction and refurbishment work Prior to the commencement of work		
3.1.1	Brief description of the work being carried out.	**Temperature monitoring of hot and cold water system via the plumb fittings**
3.1.2	Using the matrix above establish the type and extent of construction and refurbishment /repair work, patients at risk and level of control measures.	**Class II**
	Type of work	**Type 1**
	Patient risk group	**Group 4 (High Risk)**
	Risk class	**Class II**
3.1.3	Identify any potential hazards Associated with this work.	**Potential water release when plumb fittings removed.**
3.1.4	Identify any risk associated with the hazards identified above.	**Release of debris / water during removal works.** **Transfer of dust / dirt to surrounding areas via footwear.** **Noise – disturbance to patients / staff** **Movement – Emergency movement of patients in working areas** **Access – access to certain areas may be restricted due to patient type**
3.1.5	Outline the control measures that require to be implemented to eliminate or mitigate the identified risks. Ensure these are entered on the project risk register.	**Room door will remain closed during the duration of the works. Following works the sink and fittings should be cleaned using Acticlor wipes (Clorox Wipes) and the PAL filter should be cleaned using Alcohol wipes. These are required to be provided by Estates Dept / Contractor as they will not be available in the ward or Dept.** **Any waste generated will be double bagged in clean dust free bags before being removed from the room.**
	Control measures **As per class II Recommendations.**	
3.1.6	It has been recognised that control measures identified to address the project risk may have unintended consequences e.g. closure of windows can lead to increased temperatures in some areas. Such issues should be considered at this point, they should be noted and action to address these taken.	**Access for staff.**

	Potential problems **None perceived**	
	Control measures **As per class II recommendations.**	
3.1.7	Actions to be addressed **No Requirement**	
By		Deadline

Development stage 3: In terms of infection risk confirmation that the following been addressed		
3.2.1	The population groups most susceptible to infection. Items to be considered: Adjacent rooms, wards and departments Relocation of susceptible patients Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐ Yes √ No ☐ N/A ☐
Comments **Controls as per Class II recommendations.**		
3.2.2	The hours of operation of the construction work and the impact of this on the clinical area. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐ Yes √ No ☐ N/A ☐
Comments **Work programme discussed and agreed with ward staff and infection control.**		
3.2.3	Separation of construction and healthcare activities including delivery and supply routes, removal of waste and patient transfers. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐ Yes √ No ☐ N/A ☐
Comments **Work discussed with ward staff and control measures agreed. Any Removal of waste and delivery of tools & materials will be scheduled to minimise disruption to service.**		
3.2.4	The construction of temporary barriers and/or sealing of doors and windows to minimise contamination of the environment by dust and potentially infectious particles created during the construction works. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐ Yes √ No ☐ N/A ☐
Comments Room door to remain closed during the duration of the works.		

Development stage 3: In terms of infection risk confirmation that the following been addressed (continued)		
3.2.5	Airflow patterns including:	
	Internal and external ventilation systems	Yes √ No ☐ N/A √
	Exhaust ventilation	Yes √ No ☐ N/A ☐
	Sealing of doors and windows	Yes √ No ☐ N/A ☐
	Oxygen and Suction points	Yes ☐ No ☐ N/A √
	Air handlers, coils, fans and grilles	Yes ☐ No ☐ N/A √
	Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐
Comments **As per class II Recommendations.**		
3.2.6	Work with sinks or plumbing which could give rise to aerosol water droplets in high risk areas.	Yes √ No ☐ N/A ☐
	Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐
Comments **As per class III/IV Recommendations.**		
3.2.7	Impact on stock storage areas including:	
	Sterile and non-sterile items	Yes √ No ☐ N/A ☐
	Patient care equipment	Yes √ No ☐ N/A ☐
	Medications	Yes ☐ No ☐ N/A √
	Medical records and documentation	Yes √ No ☐ N/A ☐
	Linen and waste facilities including sharps	Yes √ No ☐ N/A ☐
	Have these issues and actions to be taken been noted in actions to be addressed section?	Yes √ No ☐ N/A ☐
Comments **Discuss with ward staff if any equipment is to be removed.**		

Development stage 3: During the construction phase have the following been addressed?		
3.3.1	Where external work is being carried out: Prevention of insect and rodent entry and prevention of weather/water entry to internal areas during the construction phase. Have these issues and actions to be taken been noted in actions to be addressed section?	 Yes ☐ No ☐ N/A ☑ Yes ☐ No ☐ N/A ☑
Comments **No Requirement.**		
3.3.2	Cleaning of site and adjacent areas both during the construction phase and prior to handover. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes ☑ No ☐ N/A ☐ Yes ☑ No ☐ N/A ☐
Comments **Contractor to keep work area clean and to remove waste material from site on completion of works.** **Following works the sink and fittings should be cleaned using Acticlor wipes (Clorox Wipes) and the PAL filter should be cleaned using Alcohol wipes. These are required to be provided by Estates Dept / Contractor as they will not be available in the ward or Dept.**		
3.3.3	Enforcement of control and reporting system to ensure compliance with above issues. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes ☑ No ☐ N/A ☐ Yes ☑ No ☐ N/A ☐
Comments **Estates Manager will inspect the site regularly and identify any breaches in HAI Scribe.**		
Additional notes - Stage 3 **There will be no additional clean required following the works other than the clean undertaken by Estates/contractor.**		

Development stage 3: HAI-SCRIBE applied to the construction / redevelopment phase

Certification that the following documents have been accessed and the contents discussed and addressed at the Infection Control and Patient Protection Meeting held on

Venue		Date	

'Healthcare Associated Infection System for Controlling Risk in the Built Environment' *('HAI-SCRIBE) Implementation Strategy Scottish Health Facilities Note (SHFN) 30: Part B).*

Declaration: We hereby certify that we have co-operated in the application of and where applicable to the aforesaid documentation.

Present

Print name	Signature	Company	Telephone Numbers	Email address
Teresa Inkster		NHSGGC	[redacted]	[redacted]
Lynn Pritchard		NHSGGC	[redacted]	[redacted]
Susie Dodds		NHSGGC	[redacted]	

HAI-SCRIBE Name of Project		
Name of Establishment		National allocated number
HAI-SCRIBE Review Team		
HAI – SCRIBE Sign Off		
Completed by (Print name)	Date	
Signature(s)	Date	
Stage 4		
Additional notes		

Pre-handover check, ongoing maintenance & feedback Stage:

NHS National Services Scotland

Risk Assessment

Temperature monitoring of Plumbing Fittings in hot and cold water system via IPS in Low Risk Areas

Date:
Contractor:

Estates Officer:

SCN/Manager

Infection Control Nurse: Lynn Pritchard LIPCN / Susie Dodd LIPCN / Teresa Inkster LICD

SHFN 30:
HAI-SCRIBE

Question sets and checklists

Health Facilities Scotland
Engineering and Environment

October 2018

Introduction

Scottish Health Facilities Note (SHFN) 30 in its 2014 published form comprises two parts:

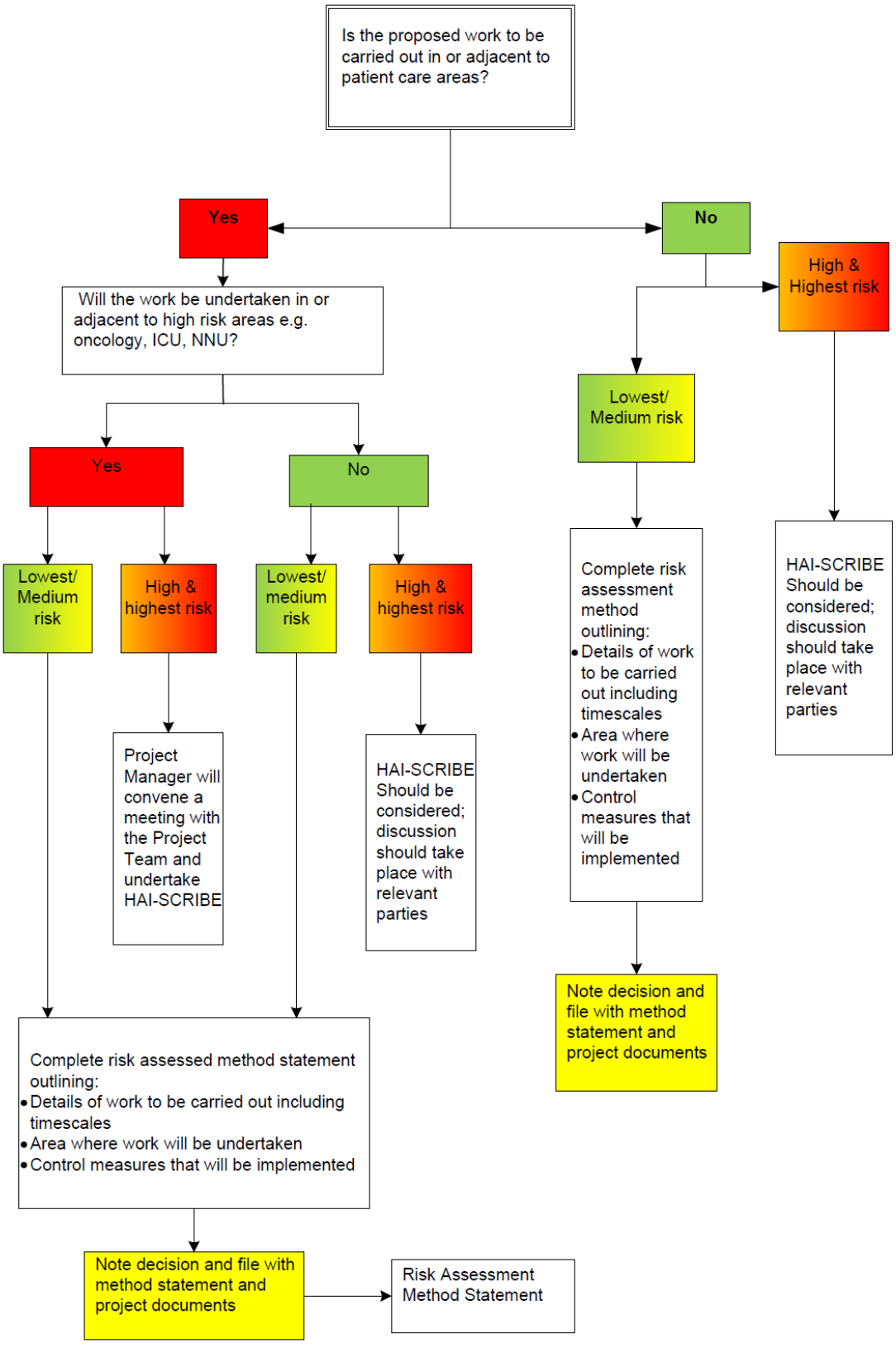
- **Part A**: Manual: Information for Design Teams, Construction Teams, Estates & Facilities and Infection Prevention & Control Teams.
- **Part B**: HAI-SCRIBE Implementation Strategy and Assessment Process.

Both have been published in book form.

It is appreciated that, as familiarity with the use of the procedures grows there will be progressively less need to rely on printed text, eventually leading to situations where question sets and checklists will themselves be sufficient. Photocopying from published books is a ponderous and time-consuming process with a tendency to produce distorted images and/or damage binding. To facilitate the process, therefore, question sets and checklists for each of the four project development stages have been produced in the form of an information pack ready for photocopying and distributing to project teams to assist in the HAI-SCRIBE review procedures as each new Project requires assessment. This pack is only available electronically.

The various proforma, comprising question sets, checklists and certifications, are provided for the following:

- **Development Stage 1:** Initial briefing and proposed site for development:
- **Development Stage 2:** Design and planning:
- **Development Stage 3:** Construction and refurbishment work:
- **Development Stage 4:** Pre-handover check, ongoing maintenance and feed-back.


Is the proposed work to be carried out in or adjacent to patient care areas?
Yes
No
Will the work be undertaken in or adjacent to high risk areas e.g. oncology, ICU, NNU?
High & Highest risk
Lowest/ Medium risk
Yes
No
Lowest/ Medium risk
High & highest risk
Lowest/ medium risk
High & highest risk
Complete risk assessment method outlining:
• Details of work to be carried out including timescales
• Area where work will be undertaken
• Control measures that will be implemented
HAI-SCRIBE Should be considered; discussion should take place with relevant parties
Project Manager will convene a meeting with the Project Team and undertake HAI-SCRIBE
HAI-SCRIBE Should be considered; discussion should take place with relevant parties
Note decision and file with method statement and project documents
Complete risk assessed method statement outlining:
• Details of work to be carried out including timescales
• Area where work will be undertaken
• Control measures that will be implemented
Note decision and file with method statement and project documents
Risk Assessment Method Statement

Type	Construction/Refurbishment Activity
Type 1	**Inspection and non-invasive activities.** Includes, but is not limited to, removal of ceiling tiles or access hatches for visual inspection, painting which does not include sanding, wall covering, electrical trim work, minor plumbing and activities which do not generate dust or require cutting of walls or access to ceilings other than for visual inspection.
Type 2	**Small scale, short duration activities which create minimal dust.** Includes, but is not limited to, installation of telephone and computer cabling, access to chase spaces, cutting of walls or ceiling where dust migration can be controlled.
Type 3	**Any work which generates a moderate to high level of dust, aerosols and other contaminants or requires demolition or removal of any fixed building components or assemblies.** Includes, but is not limited to, sanding of walls for painting or wall covering, removal of floor coverings, ceiling tiles and casework, new wall construction, minor duct work or electrical work above ceilings, major cabling activities, and any activity which cannot be completed within a single work shift.
Type 4	**Major demolition and construction projects.** Includes, but it not limited to, activities which require consecutive work shifts, requires heavy demolition or removal of a complete cabling system, and new construction.

Table 1: Redevelopment and construction activity

Risk to patients of infection from construction work in healthcare premises, by clinical areas	
Risk rating	**Area**
Group 1 Lowest risk	1. Office areas; 2. Unoccupied wards; 3. Public areas/Reception; 4. Custodial facilities; 5. Mental Health facilities.
Group 2 Medium risk	1. All other patient care areas (unless included in Group 3 or Group 4); 2. Outpatient clinics (unless in Group 3 or Group 4); 3. Admission or discharge units; 4. Community/GP facilities; 5. Social Care or Elderly facilities.
Group 3 High risk	1. A & E (Accident and Emergency); 2. Medical wards; 3. Surgical wards (including Day Surgery) and Surgical outpatients; 4. Obstetric wards and neonatal nurseries; 5. Paediatrics; 6. Acute and long-stay care of the elderly; 7. Patient investigation areas, including; • Cardiac catheterisation; • Invasive radiology; • Nuclear medicine; • Endoscopy. Also (indirect risk) 8. Pharmacy preparation areas; 9. Ultra clean room standard laboratories (risk of pseudo-outbreaks and unnecessary treatment); 10. Pharmacy Aseptic suites.
Group 4 Highest Risk	1. Any area caring for immuno-compromised patients*, including: • Transplant units and outpatient clinics for patients who have received bone marrow or solid organ transplants; • Oncology Units and outpatient clinics for patients with cancer; • Haematology units • Burns Units. 2. All Intensive Care Units; 3. All operating theatres; Also (indirect risk) 4. CSSUs (Central Sterile Supply Units).

Table 2: Different areas of health care facility and the risk associated with each area.

	Construction Project Type			
Patient Risk Group	**TYPE 1**	**TYPE 2**	**TYPE 3**	**TYPE 4**
Lowest Risk	Class I	Class II	Class II	Class III/IV
Medium Risk	Class I	Class II	Class III	Class IV
High Risk	Class I	Class II	Class III/IV	Class IV
Highest Risk	Class II	Class III/IV	Class III/IV	Class IV

Table 3: Estimates the overall risk of infection arising and will indicate the class of precaution that should be implemented

Control measures			
	During Construction Work	**After Construction Work**	**By**
Class I	• Execute work by methods to minimise raising dust from construction operations;. • Immediately replace any ceiling tiles displaced during inspection.	• Clean areas by damp dusting with neutral detergent in warm water;. • Vacuum floor and damp mop.	Request via domestic supervisor. Request via domestic supervisor.
Class II	• Provide active means to prevent airborne dust from dispersing into atmosphere; • Water mist work surfaces to control dust while cutting; • Seal unused doors with duct tape; • Block off and seal air vents; • Place dust mat at entrance and exit of work area; • Remove or isolate HVAC system in areas where work is being performed.	• Dampwork surfaces and ledges with neutral detergent solution; • Contain construction waste before transport in tightly covered containers; • Damp mop and/or vacuum with HEPA filtered vacuum before leaving work area; • Remove isolation of HVAC system in areas where work is being performed.	Request via domestic supervisor. Estates staff. Request via domestic supervisor. Estates staff.
Class III	• Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system; • Complete all critical barriers eg plasterboard, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins; • Maintain negative air pressure within work site utilizing HEPA equipped air filtration units; • Contain construction waste before transport in tightly covered containers; • Cover transport receptacles or carts. Tape covering unless solid lid.	• Do not remove barriers from work area until completed project is inspected by the Board's Health & Safety representative and Infection Control Department and thoroughly cleaned by the Board's domestic services staff;. • Remove barrier materials carefully to minimise spreading of dirt and debris associated with construction; • Vacuum work area with HEPA filtered vacuums; • Damp mop area with neutral detergent and warm water; • Remove isolation of HVAC system in areas where work is being performed.	Request by Estates Dept. Contractor/Estates Staff. Request via domestic supervisor. Request via domestic supervisor. Contractor/Estates Staff.

Table 4: Describes the required infection control precautions depending on class of risk

	During Construction Work	After Construction Work	By
Class IV	• Isolate HVAC system in area where work is being done to prevent contamination of duct system; • Complete all critical barriers eg plasterboard, plywood, plastic to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins; • Maintain negative air pressure within work site utilizing HEPA equipped air filtration units; • Seal holes, pipes, conduits, and punctures appropriately; • Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site; • All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area; • Do not remove barriers from work area until completed project is inspected.	• Remove barrier material carefully to minimise spreading of dirt and debris associated with construction; • Contain construction waste before transport in tightly covered containers;. • Cover transport receptacles or carts. Tape covering unless solid lid; • Vacuum work area with HEPA filtered vacuums; • Damp dust area with neutral detergent and warm water; • Scrub floor area with neutral detergent in warm water; • Remove isolation of HVAC system in areas where work is being performed.	Contractor. Contractor. Contractor. Request via domestic supervisor. Request via domestic supervisor. Contractor/Estates Staff.

Table 4 continued: Describes the required infection control precautions depending on class of risk

Construction and refurbishment Stage

Project particulars and checklists for Development Stage 3

Development stage 3: Construction and refurbishment work: Checklist to ensure all aspects have been addressed		
HAI-SCRIBE Name of Project	**Temperature monitoring of Plumbing Fittings in hot and cold water system via IPS in Low Risk Wards and Depts**	
Name of Establishment	NHS GG&C	
National allocated number	--	
HAI-SCRIBE Review Team		
HAI-SCRIBE Sign Off		
Completed By (Project Manager) (Print Name)		Date
Signature		Date
Stage 3		

Additional Notes

All works in co-ordination with Department staff

Contractors to report to staff when entering the department.

Doors to the area where the works are being undertaken should remain closed during the period of the works.

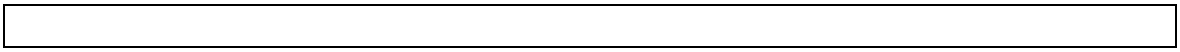
Hep vacuum to be used mop clear ant dust and dirt during and after all work of the surrounding floor area.

Following works the sink and fittings should be cleaned using Acticlor wipes (Clorox Wipes) and the PAL filter should be cleaned using Alcohol wipes. These are required to be provided by Estates Dept / Contractor as they will not be available in the ward or Dept.

Safe routes for entry and exit /removal of material agreed with Department Staff.

All Rubbish to be wrapped in dust free plastic bags for removal from department and removed via the agreed route in accordance with Infection Control requirements.

Ward / Dept staff should be notified and advise sought as to whether the patient can remain in the room for the duration of the works or if it is preferred that the room should be vacated for this period.



Development stage 3: HAI-SCRIBE applied to Construction and refurbishment work Prior to the commencement of work		
3.1.1	Brief description of the work being carried out.	**Temperature monitoring of Plumbing Fittings in hot and cold water system via IPS in Low Risk Wards and Dept**
3.1.2	Using the matrix above establish the type and extent of construction and refurbishment /repair work, patients at risk and level of control measures.	**Class I**
	Type of work	**Type 1**
	Patient risk group	**Group 3 Medium Risk**
	Risk class	**Class I**
3.1.3	Identify any potential hazards Associated with this work.	**Potential release of dust when panel removed and wall is exposed.**
3.1.4	Identify any risk associated with the hazards identified above.	**Release of dust / debris to sink and surrounding area during removal works.** **Transfer of dust / dirt to surrounding areas via footwear.** **Noise – disturbance to patients / staff.** **Movement – Emergency movement of patients in working areas.**
3.1.5	Outline the control measures that require to be implemented to eliminate or mitigate the identified risks. Ensure these are entered on the project risk register.	**Room door will remain closed during the duration of the works. Following works the sink and fittings should be cleaned using Actichlor wipes (Clorox Wipes) and the PAL filter should be cleaned using Alcohol wipes. These are required to be provided by Estates Dept / Contractor as they will not be available in the ward or Dept.** **Upon completion if there is any debris on the floor this should be cleaned with detergent wipes and if required should be followed with a domestic clean.** **Any waste generated will be double bagged in clean dust free bags before being removed from the room.** **ON REMOVAL OF THE IPS PANEL THERE IS ANY DISCOLOURATION OR MOULD NOTED THEN THE ROOM SHOULD BE CLOSED OFF AND AN ESTATES SUPERVISOR AND THE INFECTION CONTROL TEAM SHOULD BE CONTACTED.**
	Control measures **As per class I Recommendations.**	

3.1.6	It has been recognised that control measures identified to address the project risk may have unintended consequences e.g. closure of windows can lead to increased temperatures in some areas. Such issues should be considered at this point, they should be noted and action to address these taken.	**Access for staff.**
	Potential problems **None perceived**	
	Control measures **As per class I recommendations.**	
3.1.7	Actions to be addressed **No Requirement**	
By		Deadline

Development stage 3: In terms of infection risk confirmation that the following been addressed		
3.2.1	The population groups most susceptible to infection. Items to be considered: Adjacent rooms, wards and departments Relocation of susceptible patients Have these issues and actions to be taken been noted in actions to be addressed section?	Yes [√] No [ ] N/A [ ] Yes [√] No [ ] N/A [ ]
Comments **Controls as per Class I recommendations.**		
3.2.2	The hours of operation of the construction work and the impact of this on the clinical area. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes [√] No [ ] N/A [ ] Yes [√] No [ ] N/A [ ]
Comments **Work programme discussed and agreed with ward staff and infection control.**		
3.2.3	Separation of construction and healthcare activities including delivery and supply routes, removal of waste and patient transfers. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes [ ] No [√] N/A [ ] Yes [ ] No [√] N/A [ ]
Comments **Work discussed with ward staff and control measures agreed. Any Removal of waste and delivery of tools & materials will be scheduled to minimise disruption to service.**		
3.2.4	The construction of temporary barriers and/or sealing of doors and windows to minimise contamination of the environment by dust and potentially infectious particles created during the construction works. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes [ ] No [ ] N/A [√] Yes [ ] No [ ] N/A [√]
Comments The door to the room should remain closed during the works. None		

Development stage 3: In terms of infection risk confirmation that the following been addressed (continued)						
3.2.5	Airflow patterns including:					
	Internal and external ventilation systems	Yes	√	No		N/A	√
	Exhaust ventilation	Yes	√	No		N/A	
	Sealing of doors and windows	Yes	√	No		N/A	
	Oxygen and Suction points	Yes		No		N/A	√
	Air handlers, coils, fans and grilles	Yes		No		N/A	√
	Have these issues and actions to be taken been noted in actions to be addressed section?	Yes	√	No		N/A	
Comments **As per class I Recommendations.**						
3.2.6	Work with sinks or plumbing which could give rise to aerosol water droplets in high risk areas.	Yes	√	No		N/A	
	Have these issues and actions to be taken been noted in actions to be addressed section?	Yes	√	No		N/A	
Comments **As per class III/IV Recommendations.**						
3.2.7	Impact on stock storage areas including:					
	Sterile and non-sterile items	Yes	√	No		N/A	
	Patient care equipment	Yes	√	No		N/A	
	Medications	Yes		No		N/A	√
	Medical records and documentation	Yes	√	No		N/A	
	Linen and waste facilities including sharps	Yes	√	No		N/A	
	Have these issues and actions to be taken been noted in actions to be addressed section?	Yes	√	No		N/A	
Comments **Discuss with ward staff if any equipment is to be removed from the room prior to the works commencing.**						

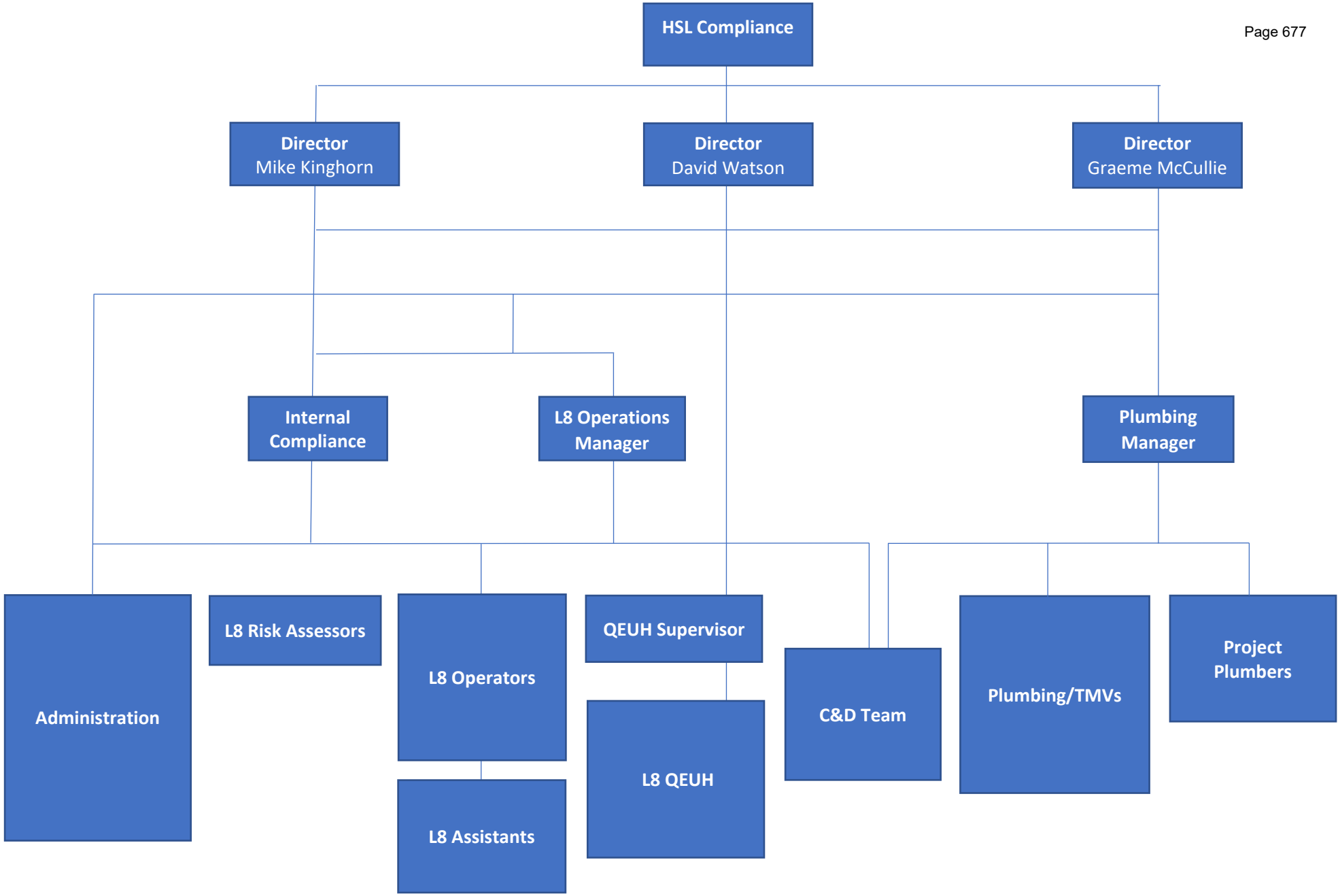
Development stage 3: During the construction phase have the following been addressed?		
3.3.1	Where external work is being carried out: Prevention of insect and rodent entry and prevention of weather/water entry to internal areas during the construction phase. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes ☐ No ☐ N/A ☑ Yes ☐ No ☐ N/A ☑
Comments **No Requirement.**		
3.3.2	Cleaning of site and adjacent areas both during the construction phase and prior to handover. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes ☑ No ☐ N/A ☐ Yes ☑ No ☐ N/A ☐
Comments **Contractor to keep work area clean and to remove waste material from site on completion of works.** **Following works the sink and fittings should be cleaned using Acticlor wipes (Clorox Wipes) and the PAL filter should be cleaned using Alcohol wipes. These are required to be provided by Estates Dept / Contractor as they will not be available in the ward or Dept.**		
3.3.3	Enforcement of control and reporting system to ensure compliance with above issues. Have these issues and actions to be taken been noted in actions to be addressed section?	Yes ☑ No ☐ N/A ☐ Yes ☑ No ☐ N/A ☐
Comments **Estates Manager will inspect the site regularly and identify any breaches in HAI Scribe.**		
Additional notes - Stage 3 **Unless the contractor feels that there has been a significant amount of debris from removal of the IPS Panel then here will be no additional clean required following the works other than the clean undertaken by Estates/contractor.**		

Development stage 3: HAI-SCRIBE applied to the construction / redevelopment phase			
Certification that the following documents have been accessed and the contents discussed and addressed at the Infection Control and Patient Protection Meeting held on			
Venue		Date	
'Healthcare Associated Infection System for Controlling Risk in the Built Environment' *('HAI-SCRIBE) Implementation Strategy Scottish Health Facilities Note (SHFN) 30: Part B).*			
Declaration: We hereby certify that we have co-operated in the application of and where applicable to the aforesaid documentation.			
Present			

Print name	Signature	Company	Telephone Numbers	Email address
Lynn Pritchard		NHSGGC	[redacted]	Lynn.Pritchard[redacted]
Susie Dodd		NHSGGC		
Teresa Inkster		NHSGGC	[redacted]	

HAI-SCRIBE Name of Project		
Name of Establishment		National allocated number
HAI-SCRIBE Review Team		
HAI – SCRIBE Sign Off		
Completed by (Print name)	Date	
Signature(s)	Date	
Stage 4		
Additional notes		

Pre-handover check, ongoing maintenance & feedback Stage:


HSL Compliance
Director
Mike Kinghorn
Director
David Watson
Director
Graeme McCullie
Internal
Compliance
L8 Operations
Manager
Plumbing
Manager
Administration
L8 Risk Assessors
L8 Operators
L8 Assistants
QEUH Supervisor
L8 QEUH
C&D Team
Plumbing/TMVs
Project
Plumbers

8th November 2016

DMA Ref: Q17/1049/DW

Mr Coling Purdon
Estates Department
Southern General Hospital
1345 Govan Road
Glasgow
G51 4TF

C.C. Mr Ian Powrie

RE: Legionella Risk Assessment Update

Dear Mr Purdon,

As per your request the cost for updating the L8 risk assessment within the QEUH Adult & Children's Hospital would be [redacted]

In order to carryout the updated risk assessment we would require full access to all plant areas, sentinel and other representative outlets throughout the building and access to the L8 monitoring and management records. Sentinel outlet, low use flushing and other registers created as part of the L8 monitoring regime would be required in order to carry out this update. DMA would also require assistance from a designated member of Estates staff familiar with the management and implementation of the L8 monitoring regime to assist with the assessment.

The risk assessment shall comprise a review of the control records and regime currently in place and assessment of the plant items and sentinel (and representative other) outlets within the building.

We understand that no access behind panels or above ceiling would be permissible during the assessment. Should estates be able to provide access to areas where they have particular areas of concern whilst DMA are on site carrying out the assessment then these areas can be incorporated into the update.

I trust this information is satisfactory but if you require any further information please do not hesitate to contact me.

Yours faithfully
for **DMA Canyon Ltd**

David Watson
Director

All prices are exclusive of vat & delivery. Costs based on work being carried out during normal office hours unless otherwise stated. Quote valid for 30 days from date of issue. Terms and Conditions apply.

Records for these works will be issued electronically to the works originator or other party to be designated by the client. Records will be issued via electronically unless otherwise requested. It is the responsibility of the originator or designated person to escalate where required to the Responsible Person/Duty Holder or to ensure any recommendations made by DMA Canyon are carried out in an appropriate and timely manner.

DMA Canyon Ltd is ISO 9001 and OHSAS 18001 accredited and are a SNIPEF and Water Safe registered company. All our engineers have been Disclosure Scotland Checked.

DMA Canyon Ltd are registered by the Legionella Control Association and are members of the PHCA Legionella Risk Assessment and Disinfection Scheme

This quotation only covers the aspects of Legionella control specifically detailed. DMA Canyon will only offer legionella specific services for which we have LCA registration. Please refer to www.dmacanyon.co.uk to view our LCA certificate and the LCA code of conduct for service providers.

All other works required by L8/HSG 274/client written scheme are out with the scope of this contract and should be carried out by the responsible person or persons/parties appointed by the Responsible Person.

DMA Canyon would advise all records regarding legionella control are held in a specified location and records for all works including those completed as part of this proposal are retained for at least 5 years.

For your full Legionella control responsibilities for all water systems you should refer the following legislation.

Current legislation which client may have duties under:

L8 - ACoP and Guidance – Legionnaires' disease: The control of legionella bacteria in water systems (L8)
HSG 274 Parts 1, 2 & 3
The Health and Safety at Work Act 1974
SHTM 04-01 (Healthcare premises only)
The Management of Health and Safety at Work Regulations 1999
The Control of Substances Hazardous to Health Regulations 2002
The Notification of Cooling Towers and Evaporative Condensers Regulations 1992
Water Regulations Guide & Water Byelaws 2014 (Scotland)
RIDDOR - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
Other relevant standards as applicable to site/system (e.g. BS EN 806, BS 8558, BS 8580)

Asbestos

Where DMA Canyon operators may be working in areas potentially containing asbestos which could be disturbed, prior to works commencing a Demolition/Maintenance asbestos survey must be carried out on ALL materials that which DMA Canyon are going to be coming into contact with and are potentially cutting/disturbing.

This MUST cover all of the following areas:

- *General work area. Walls, floors, floor covering, ceiling tiles, loft insulation etc. where DMA shall be working and we could potentially disturb (even accidentally)*
- *This must also include walkways, platforms etc. around and to the work areas and areas around them which could get disturbed when moving materials to and from work areas.*
- *All CWST/calorifier and pipework insulation and coverings that DMA Canyon are working on.*
- *All CWST/calorifier and pipework insulation and coverings around the areas DMA Canyon*
- *are working in and could potentially come into contact with (even accidentally).*
- *CWST/calorifier materials and any lining materials on the internal surfaces which DMA Canyon are working on.*
- *Any other materials and/or areas which DMA Canyon could potentially disturb (even accidentally)*

Requirements to allow effective risk assessment referring to BS 8580:2010

1. The findings and recommendations presented in our reports shall be based on information made available and inspection of areas made accessible by site staff during the survey. DMA Canyon are only able to assess areas/systems, which they have been given access to and using information supplied by site personnel. The survey will be undertaken only on pipework/areas that are accessible and visible, and it is possible that some sections will remain hidden during the survey. Schematic drawings, where produced, and how services link up, have been assumed to run as indicated using basic engineering principles and our experience. However, no responsibility can be accepted for systems and/or areas, which DMA Canyon have not been provided access to, or as a result of incorrect, misleading information supplied or information not provided. No guarantees as to the completeness of the information within the report is provided.

2. Safe and reasonable access must be provided to all areas where there are water services and/or services pipework/plant items etc. requiring assessment.

3. Any areas which cannot be accessed during the assessment for safety and/or any other reasons outwith the control of DMA Canyon shall be classed as unable to be assessed. Prior to the site survey commencing, it must be agreed which areas can be accessed and those which cannot – i.e. is assessment to be invasive or non-invasive.

4. Where DMA Canyon cannot safely and reasonably access services then only visible services will be assessed, pipework layouts may be referenced according to likely layout but no guarantees are given as to the accuracy or completeness of schematics or assessment ratings as they cannot be accessed for survey. In such instances further action will be required by the client to attempt to provide access for survey and assessment.

5. Should any specific procedures be required for gaining access to any particular area (e.g. permits to work, long length ladders etc.) then details of this should be forwarded to DMA Canyon prior to works commencing on site to minimise delays.

6. Revisits or delays incurred due reasons outwith the control of DMA Canyon may incur surcharges on the assessment costs unless otherwise agreed prior to the work commencing.

7. Unless otherwise agreed prior to works commencing, DMA Canyon shall be attending site during normal office hours. Should any areas require to be assessed on an out of hours basis then costs for this can be supplied.

8. Ideally all assessment works should be carried out when the building is operating under normal conditions. Should any assessment work, for any reason, be required to be carried out when building is empty, or during periods of low occupancy, then this can affect the temperature distribution of water at services and outlets throughout the building, and this should be taken into account when interpreting risk ratings and remedial actions being undertaken. DMA Canyon are only able to comment on conditions found/temperature noted at time of survey.

9. Systems being risk assessed shall normally cover the domestic water systems only, unless otherwise agreed in writing prior to works commencing on site.

10. Client/site management should appoint or provide a member of the building management or maintenance staff who is familiar with the water services for the site to assist the assessor in locating relevant systems, pipework, plant and services.

11. A full, suitable and up to date asbestos survey will be required for examination prior to start and DMA Canyon will not assess plant in areas which is or may be suspected to contain asbestos until the areas are made or are proven safe.

12. BS 8580:2010 States - "Where the system being assessed consists of several repeated units, such as multiple storeys or pods in a commercial building, the assessor should decide on representative examples to be assessed." Client must decide, based on the above statement and knowledge of the domestic water system on site, and how it "repeats" throughout the building, that only a representative number of rooms and/or floors require to be assessed then this would require to be agreed prior to works commencing. DMA Canyon would advise that as a minimum at least 20% of each rooms type must be assessed, along with all unique or non-repeating rooms/units (e.g. kitchens, bars, toilets etc), plus the plant items as would normally be carried out. Alternatively and as advised by DMA Canyon, it may be decided that all rooms/units require to be assessed, wherever possible, and the risk assessment proceeds on this basis.

13. Prior to works commencing, DMA Canyon should be provided with access to review and audit all records pertaining to the management and control of the water systems on site. These records shall include the management structure, written scheme, L8 monitoring records, training records, schematic drawings, previous L8 risk assessments/reviews, microbiological sampling records and any other records pertaining to the control of the water system(s) on site. DMA Canyon would advise that the duty holder or responsible person meets with the risk assessor at this stage to provide input into how the legionella control program, and other management and Health & Safety procedures are managed on site.

14. Schematic drawings of the water system shall not be produced as part of the L8 risk assessment unless agreed in writing prior to risk assessment commencing on site. Schematic drawings on site should be supplied for review/comment as part of the assessment if available.

15. Calorifiers and pressure vessels should wherever possible be opened for inspection as part of the L8 Risk Assessment. Where this is not possible at the time of the assessment, inspection reports from vessels being opened previously should be available and/or Risk Assessor should be requested to return to site when vessels can be opened. Additional charges may apply for additional visits. Unless otherwise agreed in writing, DMA Canyon are not responsible for opening and/or closing and sealing of vessels after inspection. This is to be carried out by site or other contractor.

16. Microbiological (Legionella) sampling can assist in determining risk in specific parts of a system or plant. Prior to risk assessment commencing on site client should instruct DMA Canyon as to whether or not microbiological samples should be taken during the site survey. Should DMA Canyon be instructed to proceed with sampling, the exact numbers of samples taken during the survey shall be relayed to the client prior to submitting to laboratory for analysis, for final approval and instruction to proceed with analysis provided. Costs for sampling shall be provided within risk assessment quote.

17. For healthcare premises, DMA Canyon shall require input with regards to which specification the assessment should be carried out to (i.e. L8, HTM 04-01, SHTM 04-01, 2040 etc). This would be especially relevant, for example, with regards to hot water temperatures at sentinel outlets and TMV inlets, where the HTM/SHTM 04-01 advises these temperatures should be a minimum of 55°C. This should be established prior to assessment commencing on site. For the purposes of this assessment the assessments will be carried out as per the specification for the previously tendered GG&C works with review of the assessments and L8 monitoring being used to highlight the out of specification temperatures.

18. The risk assessment is carried out first and foremost to aid compliance with the relevant legislation and to assist the client in drawing up suitable and sufficient control measures via a written a scheme and identifying non-compliant issues on site for corrective actions to be implemented. The L8 Risk Assessment produced by DMA Canyon shall be based entirely on information supplied by the client, records inspected and evaluated by the assessor and site conditions at time of survey. This document shall be independent of any other works which DMA Canyon either carryout on site or are requested to carry out at a future date.

19. No costs or proposals for works highlighted or advised in this report are included as this is not the function of this document. The client is to refer to this document in formulating their response to the findings and in drawing up the written scheme and assess what external assistance is required and from what organizations this may be sourced from if required.

PURCHASE ORDER: GFSG1333557

Buyer	Order Date	Invoice To
NHS Greater Glasgow & Clyde Please Refer To Order Contact Details .,	04-Sep-2017	Payments Dept. PO Box 7388 Glasgow, G51 9BS
Supplier	**Order Contact**	**Delivery**
DMA Water Treatment Ltd 14 Canyon Road Netherton WISHAW, ML2 0EG Fax: [redacted]	Name: Liz Turner (SGH H/Desk) Phone: [redacted] Fax: [redacted]	Liz Turner (SGH Fac) Facilities Manager - Laboratory Medicine (OFF Hardgate Road), Sth Glasgow University Hospitals 1345 Govan Road Glasgow, G51 4TF

Delivery Information

Order Type:	Direct Ship
Carrier:	Not Selected -Not Selected
FOB - Delivery Terms:	Not Selected -Not Selected

Payment Information

Customer Number:	GGC2584-0139
Payment Terms:	Not Selected

Line	Item Type	Item No	Manufacturer No	UoM	Qty	Unit Price	VAT Type	Extended Amt
	Description						Est. VAT	
1	Non-Catalogue	unknown		EA	1	[redacted]	NSR	[redacted]
	QUEEN ELIZABETH UNIVERSITY HOSPITAL: ADULT HOSPITAL: TO L8 LEGIONELLA RISK ASSESSMENT UPDATE AS PER YOUR QUOTATION REF Q17/1049/DW. TO COMMENCE 4.9.17						[redacted]	
2	Non-Catalogue	unknown		EA	1	[redacted]	NSR	[redacted]
	ROYAL HOSPITAL FOR CHILDREN: TO L8 LEGIONELLA RISK ASSESSMENT UPDATE AS PER YOUR QUOTATION REF Q17/1049/DW. TO COMMENCE 4.9.17.						[redacted]	

Total Extended Amount:	[redacted]
Total Estimated VAT:	[redacted]
Estimated Gross Amount:	[redacted]

VAT Types

Key	Description	Estimated VAT
NSR	NSR - STD RECOV 20%	[redacted]

The Conditions of Contract for this Purchase Order are available at [redacted] unless pre-agreed in Contract

A49585984

From: Allan McRobbie
To: ian.powrie[redacted]
Cc: David Watson
Subject: NHS SGUH
Date: 10 June 2015 17:01:13
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg
QAM15031b NHS SGUH Legionella Control Costs.pdf

Ian
Please find attached details of our recent meeting with Estates managers with costs from DMA to fill some of the gaps found in the current Legionella control program.
We would be happy to attend site at a time suitable to you to discuss this in greater depth.
Should you require any further information in the meantime please do not hesitate to call David or I.
Best regards
Allan McRobbie
Compliance Manager

Mob: 0[redacted]

DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

9th June 2015

DMA Ref: QAM15031b

Mr Ian Powrie
South Glasgow University Hospital
1345 Govan Road
Glasgow

Re: L8/SHTM04-01 Legionella Control Service

Dear Mr Powrie

As requested DMA attended site and carried out a review of the legionella monitoring tasks required on site to determine the services which are currently being covered to the required standards and those which require to have additional resources allocated in order to fulfil the requirements of L8, HSG 274 and SHTM 04-01.

Where appropriate DMA have provided costs to provide legionella control services on site to aid Estates in their compliance requirements.

All services which DMA offer are covered by our LCA accreditation as recommended by L8/SHTM 04-01. A copy of our certification is attached at the end of this quotation.

L8/SHTM 04-01 Monitoring Tasks

DMA are able to offer a variety of services to aid Estates to comply with their obligations and duties under L8, SHTM 04-01 and COSHH regulations with the aim of minimising the potential for legionella (and other bacterial) contamination within the water systems across the estate.

Gap Analysis is as advised by Estates Managers in meeting of 28th May 2015.

	Task	Cost	Unit of cost
1	Temperature monitoring at sentinel outlets[1]	[redacted]	Per Month
	Monthly temperature checks at calorifiers (flow, return and base temperatures)		
	Six-monthly temperature checks and internal inspections of CWSTs		
2	Monthly temperature monitoring at additional 500 outlets throughout the building per month	[redacted]	Per Month
3	Quarterly flushing of calorifier bases (until water runs clear)[2]	[redacted]	Per Month
4	Quarterly descaling, cleaning and disinfection of showerheads[3]	[redacted]	Per Month
5	Monthly flushing of expansion vessels[4]	[redacted]	Per Month
6	Twice weekly flushing of deadlegs, e.g. drinking dispenser connection points (where practicable without plumbing assistance) and trades system outlets[5]	[redacted]	Per Month

[1] Where sentinel outlets are Thermostatic Mixing Valves/Taps DMA will remove panels to access supplies if area unoccupied. In occupied areas access to valves/supply pipework to be as instructed by Estates.
[2] Drains will be purged 3 times for 3 mins to a local drain within plantroom.
[3] NHS Estates to provide location of all showers/rinsers (outwith Ward Areas)
[4] Expansion vessels shall be flushed where drain point is accessible and vessel is able to be flushed.
[5] All deadlegs including unused equipment connection points, drain points and fast fill points to be identified by NHS Estates. Twice weekly flushing required.

VAT Registration No. 743 0970 35 Company Registration Number SC197200
14 Canyon Road, Wishaw ML2 0EG T: 01698 536790 E: office@dmawater.co.uk

Consultancy

DMA are able to provide consultancy services to assist with interpretation of out of specification results, issues highlighted during monitoring works and implementation of the Written Scheme. DMA would also recommend the Legionella Risk Assessment is reviewed once the building is fully occupied.

Task	Cost	Day/Unit of cost
Consultancy	[redacted]	Per Day
Legionella Risk Assessment Review (when building fully occupied)	[redacted]	One off

Microbiological Sampling

DMA currently carryout microbiological sampling with the NHS GG&C Estates. Sampling can be carried out either utilising NHS Labs (e.g. Royal Infirmary) with analysis costs passed internally from the NHS Labs to the Estates department, or by DMA submitting the samples directly to an independent laboratory and processing all results and invoicing within DMA.

Task	Cost	Day/Unit of cost
Water System Sampling (Legionella, TVC/Potable) with samples submitted to NHS Labs[6]	[redacted]	Per Day
Legionella sampling with samples submitted to independent UKAS accredited laboratory[7]	[redacted]	Per Sample
TVC/potable sampling with samples submitted to independent UKAS accredited laboratory	[redacted]	Per Sample

Cleaning and Disinfection Works

DMA are able to offer cleaning and disinfection works on all domestic water systems and have experience of "High Risk" water system disinfections within the hospital environment, such as renal dialysis systems.

Task	Cost	Day/Unit of cost
CWST only Cleaning and Disinfection (Raw x 4 & Bulk x 4)[8]	[redacted]	Per Tank
Trades System CWST and downservices cleaning and disinfection[9]	[redacted]	Full System
Localised injection disinfections	[redacted]	Per Day

N.B. It should be noted that there is no separate dedicated supply to the Renal (or other medical) systems, with all being fed from the Bulk Water system. This means that system disinfections will require to be very carefully scheduled or carried out locally as the disinfection procedure/chemical may interfere with the renal/medical systems and impact on patient welfare. Costs for complete system disinfections can be submitted by DMA if NHS Estates can submit protocols/procedures for how this can be carried out. Costs for Renal system disinfections can also be supplied if required.

Plumbing Works

Through our independent plumbing specialists Canyon Water Services Ltd, DMA are able to offer legionella specific plumbing solutions and PPM assistance.

Canyon Water Services are ISO 9001 and OSHAS 18001 as well SNIPEF, Water Safe and Gas Safe registered demonstrating their commitment to excellence in their field.

Canyon operators are also legionella trained ensuring that their operators do not create rather than resolve any issues you may have with your systems and can undertake everything from minor remedial works such as dead leg removal and TMV servicing to full CWST replacements and re-piping.

[6] No actual "analysis" costs – samples to be submitted directly to NHS Labs at Royal Infirmary (Or other lab as designated by NHS). (Royal will only accept 50 samples per day).
[7] Inclusive of lab and processing costs
[8] Assumes all drains are fully operational and filter sets can deliver a suitable supply of water in order to fill CWSTs in a timely manner

Costs for routine works such as servicing TMVs, internal inspections and cleaning of calorifiers and expansion vessels can be supplied upon request if NHS Estates procedures for these works are supplied to DMA.

I trust this information is satisfactory, but if you would require any further information please do not hesitate to contact me.

Yours sincerely
For **DMA Water Treatment Ltd**

[redacted]

Allan McRobbie
Compliance Manager

All prices are exclusive of vat & delivery. Terms and Conditions apply. Costs based on full and reasonable access being allowed to site when required and work being carried out during normal office hours, weekend working or out of hours will incur a surcharge unless otherwise stated. Quote valid for 30 days from date of issue.

Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance	In place or being carried at present?
Regular check to ensure that legislation and guidance has not changed	No procedures in place at present
Regular review of all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	No procedures in place at present. DMA understands the GG&C Water Safety Policy is being reviewed.
Regular review of L8 Management Structure to ensure up-to-date and accurate	No site specific formal management structure in place at present.
Regular review of communication lines to ensure still accurate and correct	No site specific formal communication structure in place at present.
Regular review of escalation & emergency procedures to ensure still valid and correct	No site specific formal procedures in place, though generic policies from SHTM, L8 and GG&C available.
Regular review of duties allocated to site staff and ensure accurate and recorded	No formal records of this being undertaken.
Regular review of duties of sub-contractors and ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered)	No formal records of this being undertaken.
Regular review of staff training requirements and update training matrix	No formal records of this being undertaken.
Regular review of method statements and risk assessments to ensure still valid and correct	No formal records of this being undertaken.
Regular review of site documentation to ensure all records up to date and present	No formal records of this being undertaken.
Regular update of "Patient Risk Rating" register for all areas of hospital.	No formal records of this being undertaken.
Regular review of sentinel outlet locations register.	Sentinel outlet register is in place though some queries regarding sentinel locations have been raised to building contractor. This was still outstanding when DMA on site.
Regular review of primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	No formal records of this being undertaken.
Regular review of plant and equipment maintenance schedules.	No formal records of this being undertaken.
Regular review of BEMS temperature sensor locations to reflect any system alterations	DMA have been advised that Estates staff now have access to the BEMS system, though locations and numbers of sensors still to be confirmed.
Regular review of schematic/as-fitted drawings to ensure up-to-date and accurate	No formal records of this being undertaken.
Regular review of L8 risk assessment (particularly as the phased occupation process progresses) with a maximum period of two years between updates. (e.g. if change of use or changes in legislation or any other factor which could affect validity of current assessment)	Assessment shall require constant review during the occupancy phase and again once building is fully operational. Review should also take into account alterations made by building contractor where appropriate.

N.B. By "Regular" DMA would advise a Quarterly or 6 monthly review of all tasks above or as and when there are changes in system operation, management or other control parameters which would warrant a review of any particular task. (e.g. if change of use or changes in legislation or any other factor which could affect validity any of the current documentation)

Initial tasks required to aid compilation of PPM schedules/registers within site written scheme	In place or being carried at present?
Identify, label and record all plant, valves and services	Valves in particular require to be labelled in order to produce accurate method statements/shut-down procedures etc.
Identify, label and record sentinel outlets on hot and cold water services.[9]	Sentinel outlets under review – see comments above
Identify, label and record all "drinking" and "non-drinking" water outlets	This has not been undertaken though may not be required if all cold water is designated as drinking water.
Identify, label and record all primary, sub-ordinate and tertiary flow and return loops and their access points for temperature profile/mapping	This has not been undertaken though should be reviewed in conjunction with BEMS sensors and sentinel outlet review described above
Identify, label and record all BEMS temperature sensor locations for temperature profile/mapping	DMA have been advised that Estates staff now have access to the BEMS system, though locations and numbers of sensors still to be confirmed.
Identify, label and log all mixing devices (TMVs) with a unique identification as well as identification of its type. Hot and cold water pressures also need to be measured and recorded for each mixing device together with all the test parameters from the in-service tests	This has not been undertaken.
Identify, label and log all "other uses of water" (e.g. use of ice machines, drinking water fountains, bottled water dispensers etc.)	Information provided in DMA L8 Risk Assessment though maintenance schedules/service intervals etc. require to be formulated.

[9] Sentinel outlets are normally those that – on a hot water service – are the first and last outlets on a recirculating system with additional points on larger systems where monitoring of primary, sub-ordinate and tertiary loops is required. On cold water systems (or non-recirculating hot water systems), they are the closest and furthermost from the storage tank (or water heater). The choice of sentinel taps should also include other outlets that are considered to represent a particular risk, for example those installed in accommodation in which particularly susceptible patients are treated, or others identified in the risk assessment and temperature mapping exercise as having the least satisfactory temperature performance.

Summary of ppm tasks required within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	**In place or being carried at present?**
Daily water draw-off should form part of the daily cleaning process.	Unoccupied areas are currently being flushed by NHS Estates. Confirmation of daily use by domestics in occupied areas should be sought as part of system management identified above.
Daily check the flow and return temperatures on the domestic hot water calorifier systems using the temperature gauges fitted or a suitable surface temperature probe – required until such times as Estates staff have full access to BEMS system.	This is carried out "regularly" by NHS Estates, though no record of this was being maintained. As the BMS alarm system is not fully operation a recorded system of daily checks should be formulated.
Daily check of BEMS incidents and faults	As above.
Incoming Water Mains - maintain in accordance with installation/design guidelines, ensuring alteration of incoming mains lines to run at least daily. (DMA advised 9 hourly swap over).	As above.
Cyclical alteration of CWST booster pumps (ensuring every pump runs at least weekly)	As above.
Daily check to ensure entire body of calorifier(top, middle, base) reaches 60°c for a period of 1 hour each day (generally at a time of low use e.g. Early morning/late evening)	As above.
Daily flushing of all outlets in "High Risk Areas"/ICUs. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile.	Unoccupied areas are currently being flushed by NHS Estates (utilising agency staff). Confirmation of daily flushing in "high risk" areas should be sought as part of system management identified above.
Twice-weekly flushing of all outlets in unoccupied areas and low use/sporadically used outlets. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile.	Unoccupied areas are currently being flushed by NHS Estates (utilising agency staff). Confirmation of flushing in occupied areas should be sought as part of system management identified above.
Twice weekly flushing of emergency/deluge shower for a minimum of 3 minutes and the water temperature stabilises in line with current temperature profile.	Hydrotherapy plantroom shower being flushed weekly as part of the flushing regime. A&E Decontamination shower not being flushed.
Twice weekly flushing of deadlegs/blind ends where these cannot be removed. All deadlegs should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile. [2]	This is not being carried out as part of the flushing regime.
Weekly water system check for chloramines (if required)	This is not being carried out at present.
Weekly check to ensure that non-return valves shut off tightly. Remove covers and examine further if they do not.	This is not being carried out at present.
Weekly check of water levels within water tanks	Weekly tank temperatures are being recorded though no records of water levels are included.
Check spray taps for satisfactory spray, where necessary remove spray orifice and clean, remove any accumulation of scale. *(DMA understands no spray taps fitted though this is to be confirmed)*	No spray taps fitted
Monthly (minimum) *manual* test to confirm water system pumps operating correctly	This is not being carried out at present.
Monthly calorifier storage temperatures checks at top (flow) and return pipework Flow temperature – min 60°C, return temperature – min 55°C	This is carried out by NHS Estates staff.

Summary of ppm tasks required within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274 (cont…)	**In place or being carried at present?**
Monthly temperature checks on hot outlets at sentinel, little-used & selected outlets. >55°c within 1 minute (also note potential scald risks and out of spec TMVs)[10] to create a temperature profile of building and monitor flow and return system with all primary flow and return loops being monitored monthly, sub-ordinates quarterly and tertiary loops annually.	Complete records unavailable. Site Estates staff advised a limited program is underway though not fully completed and unlikely to be fully completed over the summer due to staff shortages. Where temperatures are being recorded in many areas only mixed (via TMV Tap) temperatures being recorded as no access to hot supply pipework. DMA would advise nearest direct hot outlet (e.g. clean utility in ward areas) are added to the sentinel hot outlet register to ensure direct hot temperatures are recorded in all areas.
Monthly temperature checks on cold outlets at sentinel, little-used & selected outlets. <20°c within 2 minutes to create a temperature profile of building and monitor heat gain within the cold water system.	This is currently being carried out by NHS Estates staff though in some areas cold temperatures are being recorded at nearest Horne tap to allow for direct cold temperatures to be obtained.
Monthly check to ensure CWST overflows are unobstructed	This is not being carried out at present.
Monthly flushing of expansion vessels as not 'flow through' design	This is not being carried out at present.
Quarterly descaling, cleaning and disinfection of showerheads & hoses & spray outlets, or replace with replace with new disinfected Shower Head and Hose (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	This is not being carried out at present.
Quarterly each calorifier and any associated storage/buffer vessels should be flushed through its drain valve by opening the drain valve 3 times, each time for a 3 minute period.	This is not being carried out at present.
Quarterly servicing TMV's or mixer valves, including fail safe tests and cleaning/disinfection of strainers within "Designated High Risk Area"/ICUs (more frequently if manufacturer recommends – Documentation not available on Zutec at time of writing, or if 'drift' in excess of 1°C at mixed outlet temperature highlighted during temperature monitoring or other maintenance)	This is not being carried out at present.
Six monthly servicing TMV's or mixer valves, including fail safe tests and cleaning/disinfection of strainers. (more frequently if manufacturer recommends – Documentation not available on Zutec at time of writing, or if 'drift' in excess of 1°C at mixed outlet temperature highlighted during temperature monitoring or other maintenance)	This is not being carried out at present.
Six monthly CWST condition inspection noting appearance of water, stagnation, odour, rust, scale, sediment, debris, paint/liner condition and bio film accumulation and tank lid fitting ok and insulation condition	This is currently being carried out by NHS Estates staff.
Six monthly CWST temperature checks (summer and winter) on tank supply and stored water at opposite side from tank inlet if possible (inlet and stored water should be <20°C, with stored water no more than 2°C warmer than make-up water.)	This is currently being carried out by NHS Estates staff and is also monitored by the BEMS system.
Six monthly chemical and microbiological water samples from water tanks which feed drinking water outlets	This is not being carried out at present, though site staff have indicated this is to be included in sampling regime going forward.
Annually arrange for samples to be taken from hot water calorifiers/water heaters in order to note condition of drain water.	This is not being carried out at present.

[10] Representative outlets include conventional and mixed-temperature taps; 20% of the total number installed throughout the premises would be tested annually on a rotational basis: that is, all taps checked every five years.

Summary of ppm tasks required within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274 (cont…)	**In place or being carried at present?**
Annual cleaning and disinfection CWST *and downservices* (more frequently if required dependant on CWST inspection & sample results). TVC and Legionella samples should be taken upon completion of disinfection works. **Please Note:** *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained.*	Cleaning and disinfection of CWSTS and donwservices have not been required as yet. Local disinfection have been carried out by contractor used during the construction phase in areas where persistent out-of-specification results have been returned.[11]
[A] Annual descaling, cleaning and disinfection of strainers (including angle valve strainers) (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	This is not being carried out at present.
[B] Annual internal inspection and cleaning/descaling of the calorifier/water heater with disinfection/pasteurisation upon completion	This is not being carried out at present.
Annual inspection of vibration coupling on pumps/plant, replacing as necessary (more frequently if recommended by manufacturer)	This is not being carried out at present.
Annual inspection of plant and pipework insulation, repairing where necessary.	This is not being carried out at present.
Biennial stratification checks on plate heat exchangers/calorifiers. These checks should extend over a period of seven (7) days using a logging device to establish that the water temperature at the base of the vessel achieves 50ºC.	Estates staff were unable to confirm if the base temperatures are monitored by the BEMS system. This should be clarified.
Arrange for microbiological samples to be taken from water system which represent the complexity of the water system(s) and particularly in areas of concern. All sampling should be carried out in accordance with BS 7592:2008 and all analysis by a UKAS accredited laboratory.	A sampling regime has been implemented as part of the occupancy phase for the building. The ongoing sampling regime has yet to be established.
[C] Pasteurisation/disinfection of calorifier/water heaters carried out as and when required dependent on temperature monitoring and sample results	This is not being carried out at present. Local disinfections being carried out when persistent out-of-specification results being returned.
Turnover test on cold water storage system. Checks should be carried out to ensure that volume of water stored is no more than would generally be used in a normal 12 hour period. **N.B.** This should be reviewed as part of the phased occupancy period with volume of sorted water adjusted as the building use alters during this process.	This has not been carried out. All tanks are filled to design capacity.
As required descaling of taps/outlets (including aerators and flow straighteners) (frequency dependent on inspection results and hardness of water on site)	This is not being carried out at present.
All EPDM flexi hoses (where fitted to articulated taps/outlets e.g. assisted baths) should be WRAS approved and should be replaced every 2 years if alternative materials cannot be used.	This is not being carried out at present. Flexible hoses are present on pressure reducing valves within plant rooms and in some non-clinical areas – please refer to DMA risk assessment for details.
All plant items should be maintained in accordance with manufacturer's instructions and maintenance schedules, with tasks/duties allocated and recorded.	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.
Filtration equipment (Elga) – maintain in accordance with manufacturers guidelines, ensuring alteration of filtration sets to run at least daily. (DMA advised 9 hourly swap over).	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.

[11] **N.B.** It should be noted that there is no separate dedicated supply to the Renal (or other medical) systems, with all being fed from the Bulk Water system. This means that system disinfections will require to be very carefully scheduled or carried out locally as the disinfection procedure/chemical may interfere with the renal/medical systems and impact on patient welfare.

System/ service	Task	Minimum Frequency	In place or being carried at present?
MRI Chillers Wet/Dry (Adiabatic) Cooling)	Depending on the actual design and operation of these units they may require to be registered with the local authority under the NCTEC Notification Requirements (See HSG 274 Part 1 Para 1.18 – 1.21 inclusive of Figure 1.4 and Info Box 1.1). These may also require ongoing treatment or monitoring programmes to be implemented depending on assessment. Maintain in accordance with manufacturers/installers instructions. Consider use of POU disinfection system such as UV for spray water.	TBC	Further information required.
	Connection point to MRI unit(s) should be included in site flushing regime and have suitable backflow protection fitted.	Twice weekly as part of site flushing regime	Not included in flushing regime at present
Emergency Showers	HSG 274 Part 3 recommends minimum six monthly flushing of emergency/deluge shower, though Risk Control Notice 11/advises "flush through and purge to drain twice per week– source SHTM 04-01 Part G (Draft). NHS Estates should formulate an appropriate flushing regime and maintain in accordance with manufacturers/installers instructions.	Twice weekly as part of site flushing regime	Hydrotherapy plantroom shower being flushed weekly as part of the flushing regime. A&E Decontamination shower not being flushed.
Dental Chairs/System	HSG 274 Part 3 states "Drain down, clean, flush and disinfect all system components, pipework and bottles twice daily. Disinfectant contact time as recommended by manufacturer. Take microbiological measurements (Refer to Decontamination HTM 01-05)	Twice daily	Dental chairs not yet in operation.
	SHTM 04-01 Part G (Draft) states "Drain down and clean at the end of each working day".	Daily	Dental chairs not yet in operation.
	HTM 01-05 provides advice and recommendations for on-going maintenance and this should be followed in addition to manufacturers and installers instructions.	As per manufacturers/installers instructions.	Dental chairs not yet in operation.
	Take microbiological measurements – refer to *Decontamination Health Technical Memorandum 01-05: Decontamination in primary care dental practices*[5]	As indicated by bespoke risk assessment *(to be carried out by others)*	Dental chairs not yet in operation.
Hydrotherapy Pool	Maintain in accordance with manufacturers/installers instructions and "PHLS Hygiene for Hydrotherapy Pools" and Pool Water Treatment Advisory Group (PWTAG) Code of Practice (Feb 2015).	Bespoke written scheme should be created for the hydrotherapy pool based on PHLS/PWTAG and manufacturers/installers instructions.	Hydrotherapy pool not yet in operation.

System/ service	Task	Minimum Frequency	In place or being carried at present?
Air Conditioning & Ventilation	Maintain in accordance with manufacturers/installers instructions and SHTM 03-01 and SHTM 04-01 Part G (Draft).	Maintenance regime/Written Scheme should be created based on SHTMs and manufacturers/installers instructions.	
	This may include:		
	Inspect, clean & log glass traps	Monthly	This is not being carried out at present.
	Humidity Section Inspection, Cooling Section Inspection and Ventilation Plant Inspection and Disinfection	Six monthly	This is not being carried out at present.
Steam Humidification	Maintain in accordance with manufacturers/installers instructions and SHTM 03-01 and SHTM 04-01 Part G (Draft). Offline at time of survey.	Maintenance regime/Written Scheme should be created based on SHTMs and manufacturers/installers instructions.	DMA understand these are not live at present though this requires to be confirmed.
Medical Gases/Medical Equipment (e.g. Nebulisers, incubators, etc.)	Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system and Infection Control/Clinical staff where appropriate. Control procedures within appropriate SHTM (or other relevant guidance) for system being assessed should be taken in to account during assessment(s). Any water softeners or other filtration equipment connected to these systems should be assessed at this time. Devise a control scheme based on the risk assessment.	Monitoring, inspection, and testing frequencies to be determined as indicated by bespoke risk assessment *(to be carried out by others)*	NHE Estates staff informed DMA this has not yet been completed.
Sprinkler System	Minimise aerosol creation during maintenance procedures. Consider wearing suitable masks to prevent ingestion as recommended by the FIA guidance. Maintain in accordance with manufacturers/installers instructions.	As per manufacturers/installers instructions.	NHS Estates staff unable to confirm if these procedures are in place as yet.
12th Floor Heli-pad fire suppression system	Minimise aerosol creation during maintenance procedures. Consider wearing suitable masks to prevent ingestion as recommended by the FIA guidance. Maintain in accordance with manufacturers/installers instructions.	As per manufacturers/installers instructions.	NHS Estates staff informed DMA the fire suppression system has been tested and is fully functioning. Unable to confirm if on-going maintenance contract is in place.
	Include all points on the 12th floor Trades system (including inlet to fire tank) in site flushing regime.	Twice weekly as part of site flushing regime	These outlets are not included in the flushing regime at present.
Irrigation System	Include in site flushing regime. Additional flushing may also be required (outlets run for extended periods) to bring temperatures on distribution system down particularly during periods of low use (e.g. in winter when irrigation system is not required to operate frequently). Maintain in accordance with manufacturers/installers instructions.	Twice weekly as part of site flushing regime	NHS Estates staff flush the connection on the roof garden, though at present the external irrigation pipework is not connected.
Water Softeners	Maintain in accordance with manufacturers/installers instructions (including cleaning and disinfection of resin and brine tanks). Ensure aerosol creation is minimised during maintenance and testing procedures.	As per manufacturers/installers instructions.	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.

System/ service	Task	Minimum Frequency	In place or being carried at present?
Endoscopy Wash	Maintain in accordance with manufacturers/installers instructions and current NHS (SHTM) protocols. Ensure aerosol creation is minimised during maintenance and testing procedures.	Maintenance regime/Written Scheme should be created based on SHTMs and manufacturers/installers instructions.	NHS Estates staff unable to confirm if these procedures are in place as yet. NHS Estates only responsible for the water supply up to the system connection point, with system thereafter the responsibility of the clinical staff.
Renal Dialysis (Adult)	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures.	Maintenance regime/Written Scheme should be created based on SHTMs and manufacturers/installers instructions.	NHS Estates staff unable to confirm if these procedures are in place as yet. NHS Estates only responsible for the water supply up to the system connection point, with system thereafter the responsibility of the clinical staff.
Renal Dialysis (Children's)	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures.	Maintenance regime/Written Scheme should be created based on SHTMs and manufacturers/installers instructions.	NHS Estates staff unable to confirm if these procedures are in place as yet. NHS Estates only responsible for the water supply up to the system connection point, with system thereafter the responsibility of the clinical staff.
Arjo Bath	Maintain in accordance with manufacturers/installers instructions. Where flexible hoses (i.e. internal to bath unit) cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered.	As required	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.
Closed Chilled Systems	Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturers/installers instructions.	As required	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.
Closed Heating Systems	Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturers/installers instructions.	As required	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.
Decorative Bubble Lamps	Maintain in accordance with manufacturers/installers instructions and ensure aerosols minimised during maintenance.	As required	This requires to be confirmed. Maintenance contracts still being set-up as part of the building handover.

DMA Water Treatment Ltd is ISO 9001 and OHSAS 18001 accredited and are approved by the Legionella Control Association. All our engineers have been Disclosure Scotland Checked.

This quotation only covers the aspects of Legionella control specifically detailed. For your full Legionella control responsibilities for all water systems you should refer the following legislation.

Current legislation which client may have duties under:

L8 ACoP - Legionnaires' disease: The control of legionella bacteria in water systems (L8)
HSG 274 Parts 1, 2 & 3
The Health and Safety at Work Act 1974
SHTM 04-01 (Healthcare premises only)
The Management of Health and Safety at Work Regulations 1999
The Control of Substances Hazardous to Health Regulations 2002
The Notification of Cooling Towers and Evaporative Condensers Regulations 1992
Water Regulations Guide & Water Byelaws 2000/2004 (Scotland)
RIDDOR - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
Other relevant standards as applicable to site/system (e.g. BS EN 806, BS 8558, BS 8580)

Requirements for cleaning and disinfecting water systems

The client is responsible for ensuring that all applicable requirements noted below are met as required for site works prior to DMA attending site, and any down time required due these requirements not being in place is chargeable as an extra.

- *There must be suitable safe access to the CWST's and services*
- *A reasonable mains or wholesome water supply to the CWST or relevant systems must be provided(<20m) to allow for refilling after drain downs with sufficient flow to ensure work can be completed in one day unless otherwise stated).*
- *Prior to works commencing DMA would require to be informed of the material of which the pipework is made to ensure that compatible disinfectant chemical is used.*
- *All isolating and control valves should be operating correctly (including float operated valves) ensuring that no valves are passing and that water supply to tanks cuts off when tanks are full*
- *Adequate foul drainage must be provided within a reasonable distance (<20m) to allow water systems to be emptied quickly without restriction or causing flooding.*
- *For mains water disinfections, a suitable connection (minimum 22mm) for injecting disinfecting solution into mains line immediately after isolation valve at point is required. An alternative wholesome water supply must be provided nearby (<20m) to allow for filling, disinfecting and flushing during disinfection process.*
- *For domestic water lines disinfections, a suitable connection (minimum 22mm) for injecting disinfecting solution into lines immediately after live system isolation valve a is required. An alternative wholesome water supply must be provided nearby (<20m) to allow for filling, disinfecting and flushing during disinfection process.*
- *Systems must be full and suitably flushed to remove construction debris, flux etc. from pipework prior to DMA attending site.*
- *The client must provide suitable unrestricted, safe access for DMA to all parts of the system and valves as required, and provide an engineer familiar with the system in order to assist DMA as required on site.*
- *All system pumps (where applicable) must be fully operational and be able to be run for the duration of disinfection works.*
- *A power socket (either 240V or 110V) must be supplied within a reasonable distance of areas where works are to be carried out (<25m to power point).*
- *Parking facilities must be provided nearby and DMA must be able to load/unload equipment from vehicles at building entry points. Lifts must be operational and be able to be used when systems are on upper floors.*

Legionella Control Association
KEEPING WATER SYSTEMS SAFE

Legionella Control Association

A Recommended Code of Conduct for Service Providers

Certificate of Registration

This is to certify that the following company has submitted a registration under the Conditions of Compliance as laid out in the LCA's Code of Conduct for Service Providers

Name of Company: **DMA Water Treatment**

Registration Number: **2012/2218** Certificate valid until: **31st August 2015**

Registration under the following services categories:

(1) Legionella Risk Assessment Services
- 1.1 Hot and Cold Water Services
- 1.2 Evaporative Cooling Systems
- 1.3 Process and Other Systems

(2) Water Treatment Services
- 2.1 Chemicals
- 2.2 Dosing and/or Control Systems
- 2.3 On-site Analytical and Monitoring Services

(3) Hot and Cold Water Monitoring and Inspection Services

(4) Cleaning and Disinfection Services

(5) Independent Consultancy Services

(6) Training Services

(7) Legionella Analytical Services
- 7.1 Sampling
- 7.2 Laboratory Analysis
- 7.3 Interpretation of Analysis

(8) Plant and Equipment Services
- 8.1 Installation
- 8.2 Refurbishment
- 8.3 Servicing
- 8.4 Design and Supply

This Certificate is only valid if the Company named is listed on the LCA website "Directory of Suppliers"

WMS THE WATER MANAGEMENT SOCIETY

Signed: [redacted] *Chairman, Executive Committee*

[redacted] *Certificate Secretary*

BACS British Association for Chemical Specialities

Legionella Control Association Limited. www.legionellacontrol.org.uk

Registered in England and Wales No. 8502723

Compliance with relevant health and safety regulations (including avoidance of, or reduction of risk to, exposure to Legionella) is the sole responsibility of the statutory duty holder, being the person in control of the premises or systems where any relevant risk is present. The Legionella Control Association (LCA) Code of Conduct is designed to help service providers establish appropriate management systems to control the risk from Legionella. The LCA assesses the systems of LCA members upon initial registration, reviews annually upon re-registration, and re-assesses by periodic company audits. The LCA cannot and does not carry out other regular supervision of its members' commitments to the Code of Conduct nor their compliance with other LCA guidelines. A valid LCA certificate of registration only confirms that a service provider has satisfied LCA requirements for registration and re-registration. It does not confirm the service provider's actual compliance with their commitments to the LCA Code of Conduct and/or other LCA guidelines. The LCA does not approve specific products or services as being effective in controlling Legionella or verify the competence of service providers' staff and sub-contractors. The LCA accepts no liability for any omission or any act carried out in reliance on the LCA Code of Conduct or other LCA guidelines, or any loss or damage resulting from non-compliance with such documents.

DELIVERY NOTES REGISTER

D/N No.	Date	Customer & Site	Product	Taken By
01196	7/4/15	[redacted]	T14 x1 M80 x1 C3i x1	[redacted]
01197	–		–	
01198			N/A.	
01199	8/4/15		L& DISCS - WKS mar & WK1 Apr	
01200	13/4/15		RA Drawings	
01201	14/4/15		RA's & Drawings (emergy Stock)	
01202	14/4/15		L& sheets & DISC Week 2- Apr 201	
01203	15.04.15		Y-48 Risk Assessments	
01204	17.04.15		2x Boxes DISCIDES	
01205	20/4/15		L& monitoring & Sampling Discs Mar	
01206	21/4/15		1x M80	
01207	21/4/15		L& DISCS - Weeks April 2015.	
01208	22/4/15		L& RA Recs DISC	
01209	24/4/15		1x DRUM B10X 1x DRUM P10	
01210	24/4/15		1x DRUM B10X 1x DRUM P10	
01211	24/4/15		1 x KINDER	
01212	28/4/15		L& DISCS - Wk 4 April 2015	
01213	01/05/15		1x 2897 (B20) 3x 0034 (BOILER	
01214	6/5/15		2x L& RA's	
01215	6/5/15		L& DISCS - Weeks. April 2015	
01216	12/5/15		PARTICIPATION AS PER MK.	
01217	13/05/15		1 x KINDER.	
01218	13/5/15		L& sheets & DISC Wk 2 may 2015	
01219	14/5/15		1x B10X 1x P10	
01220	18/5/15		L& Sheets Apr 205	

PURCHASE ORDER: GFSG489184

Buyer	Order Date: 09-Jan-2015	Invoice To:
NHS Greater Glasgow & Clyde Please Refer To Order Contact Details .,		Payments Dept. PO Box 7388 Glasgow, G51 9BS
Supplier	**Order Contact**	**Delivery**
DMA Water Treatment Ltd 14 Canyon Road Netherton WISHAW, ML2 0EG Fax: 01698360211	Name: Angela Jackson Phone: [redacted] Fax: [redacted]	Angela Jackson Estates Department (Behind Multi Storey Car Park) Southern General Hospital 1345 Govan Road Glasgow, G51 4TF

Delivery Information

Order Type:	Direct Ship
Carrier:	Not Selected -Not Selected
FOB - Delivery Terms:	Not Selected -Not Selected

Payment Information

Customer Number:	GGC2584-0139
Payment Terms:	Not Selected

Line	Item Type	Item No	Manufacturer No	UoM	Qty	Unit Price	VAT Type	Extended Amt
	Description						Est. VAT	
1	Non-Catalog	unknown		EA	1	[redacted]	NSI	[redacted]
	PREPARATION & PRODUCTION OF LEGIONELLA RISK ASSESSMENT/WRITTEN SCHEME FOR ASSOCIATED SYSTEMS WITHIN NEW SOUTH GLASGOW UNIVERSITY HOSPITAL BUILDINGS IN COMPLIANCE WITH BS 8580 SHTM 04-01 L8/HSG 274" AS PER QUOTE 15TH DEC 2014 REF Q33553/DW".						[redacted]	

Total Extended Amount:	[redacted]
Total Estimated VAT:	[redacted]
Estimated Gross Amount:	[redacted]

VAT Types

Key	Description	Estimated VAT
NSI	NSI - STD IRRECOVERABLE	[redacted]

The Conditions of Contract for this Purchase Order are available at [redacted] unless pre-agreed in Contract

14 Canyon Road
Wishaw
ML2 0EG

T: [redacted]
F: [redacted]

www.dmawater.co.uk

15th December 2014

DMA Ref: Q33553/DW

Mr Ian Powrie
NHS Greater Glasgow & Clyde
Estates Department
Southern General Hospital
1345 Govan Rd
Glasgow
G51 4TF

RE: Legionella Risk Assessment
Southern General Hospital (New Building)

Dear Mr Powrie,

Thank you for taking the time to meet Allan and I last week. As requested please find following our proposals for carrying out the legionella risk assessment for the new hospital building. All assessment works shall be carried out in accordance with BS 8580, SHTM 04-01 and L8/HSG 274 (Part 2).

As discussed we are proposing to carry this out in three phases:

- Phase 1 being the desktop assessment based on the design drawings submitted to DMA and assessment of the calorifiers and CWSTs as currently fitted
- Phase 2 being a review of the commissioning documentation
- Phase 3 being an assessment of the water services as actually fitted

Phase 1 Desktop Assessment

Due to the quantities of drawings for this project and the timescales for returning the initial phase of the risk assessment DMA shall review the drawings covering the plantrooms containing CWSTs and calorifiers (in addition to a site based assessment of the plant items as currently fitted), along with drawings covering the main pipework runs throughout the hospital.

More localised drawings shall be reviewed by assessing "typical installation" drawings for wards and "typical outlet arrangements". Where wards or areas are fitted out in a way that varies from the "typical installation" then these drawings should be submitted to DMA for review.

Drawings covering "high risk/augmented care" units should be submitted for assessment as these should be reviewed for pseudomonas.

As part of the assessment DMA shall provide guidance documentation to assist in the formulation of the planned preventative maintenance programme and written scheme for the handover period covering 26th January until area occupation.

Phase 2 Commission Records Review

All commissioning records submitted to DMA shall be reviewed and commented on. DMA are able to comment and make recommendations on legionella specific commissioning only (e.g. disinfection procedures, contact times, flushing schedules, etc.). As DMA do not employ commissioning engineers we are unable to comment on the technical aspects of the system commissioning reports (e.g. flow rates, system balancing etc.) – rather we shall comment on which records are present to allow for any gaps in the records to be corrected.

Phase 3 Site Assessment of Installed Services

A risk assessment of the water services fitted shall be carried out on the water services upon completion of the system commissioning and prior to building occupation, when access to pipework, TMVs etc. can be obtained without the requirement for infection control procedures to be implemented.

Due to the large numbers of outlets within the building and the fact that many wards and areas should be installed to the same design layout/specification as agreed DMA shall assess all accessible "non-repeating" areas and approximately 10% of outlets/services in "repeating areas" (as permitted within BS 8580 paragraph 7.3). Outlet locations to be assessed shall be agreed between DMA and Estates prior to site survey being carried out.

Where issues are highlighted in the "repeating areas" then further investigative works may be required and further areas may require to be assessed to determine if the issue is localised or recurs throughout the installation. Where required, any additional investigative works shall be chargeable.

Pseudomonas assessments for the "high risk/augmented care" areas as designated by infection control/estates shall be carried out as part of this process (Generated as a separate assessment from the legionella assessment).

As part of the assessment DMA shall provide guidance documentation to assist in the formulation of the on-going planned preventative maintenance programme and written scheme.

Additional Systems

Details, and drawings where appropriate, of any other potential risk systems should be forwarded to DMA for comment and review. Systems which requires a separate bespoke assessment may incur additional charges and may necessitate further specialist advice from manufacturers, suppliers/installers, infection control, microbiologists, estates, and clinical staff.

Access to site

DMA shall require access to plantrooms containing calorifiers and CWSTs in order to complete the Phase 1 assessment.

DMA shall work in conjunction with NHS Estates to create a programme of works for access to the water services in order to complete the Phase 3 assessment to minimise disruption and, as far as practical, combine the assessment with other works which are being carried out behind the IPS panels. Wherever possible/practical DMA would request assistance from an engineer who is familiar with the system layout/operation and who can assist with removing panels where appropriate.

All of our operators/assessors hold CSCS cards.

Total Cost [redacted]

A49585984

I trust this is satisfactory but if you require any further information please do not hesitate to contact the office.

Yours faithfully
for **DMA Water Treatment Ltd**

[redacted]

David Watson
Director

All prices are exclusive of vat & delivery. Costs based on work being carried out during normal office hours unless otherwise stated. Quote valid for 30 days from date of issue. Terms and Conditions apply.
DMA Water Treatment Ltd is ISO 9001 and OHSAS 18001 accredited and are approved by the Legionella Control Association. All our engineers have been Disclosure Scotland Checked.

This quotation only covers the aspects of Legionella control specifically detailed. For your full Legionella control responsibilities for all water systems you should refer the following legislation.

Current legislation which client may have duties under:

L8 - ACoP and Guidance – Legionnaires' disease: The control of legionella bacteria in water systems (L8) and HSG 274 Parts 1, 2 & 3
The Health and Safety at Work Act 1974
SHTM 04-01 (Healthcare premises only)
The Management of Health and Safety at Work Regulations 1999
The Control of Substances Hazardous to Health Regulations 2002
The Notification of Cooling Towers and Evaporative Condensers Regulations 1992
Water Regulations Guide & Water Byelaws 2000/2004 (Scotland)
RIDDOR - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
Other relevant standards as applicable to site/system (e.g. BS EN 806, BS 8558, BS 8580)

A49585984

Requirements to allow effective risk assessment referring to BS 8580:2010

1. The findings and recommendations presented in our reports shall be based on information made available and inspection of areas made accessible by site staff during the survey. DMA are only able to assess areas/systems, which they have been given access to and using information supplied by site personnel. The survey will be undertaken only on pipework/areas that are accessible and visible, and it is possible that some sections will remain hidden during the survey. Schematic drawings, where produced, and how services link up, have been assumed to run as indicated using basic engineering principles and our experience. However, no responsibility can be accepted for systems and/or areas, which DMA have not been provided access to, or as a result of incorrect, misleading information supplied or information not provided. No guarantees as to the completeness of the information within the report is provided.

2. Safe and reasonable access must be provided to all areas where there are water services and/or services pipework/plant items etc. requiring assessment.

3. Any areas which cannot be accessed during the assessment for safety and/or any other reasons outwith the control of DMA shall be classed as unable to be assessed. Prior to the site survey commencing, it must be agreed which areas can be accessed and those which cannot – i.e. is assessment to be invasive or non-invasive.

4. Where DMA cannot safely and reasonably access services then only visible services will be assessed, pipework layouts may be referenced according to likely layout but no guarantees are given as to the accuracy or completeness of schematics or assessment ratings as they cannot be accessed for survey. In such instances further action will be required by the client to attempt to provide access for survey and assessment.

5. Should any specific procedures be required for gaining access to any particular area (e.g. permits to work, long length ladders etc.) then details of this should be forwarded to DMA prior to works commencing on site to minimise delays.

6. Revisits or delays incurred due reasons outwith the control of DMA may incur surcharges on the assessment costs unless otherwise agreed prior to the work commencing.

7. Unless otherwise agreed prior to works commencing, DMA shall be attending site during normal office hours. Should any areas require to be assessed on an out of hours basis then costs for this can be supplied.

8. Ideally all assessment works should be carried out when the building is operating under normal conditions. Should any assessment work, for any reason, be required to be carried out when building is empty, or during periods of low occupancy, then this can affect the temperature distribution of water at services and outlets throughout the building, and this should be taken into account when interpreting risk ratings and remedial actions being undertaken. DMA are only able to comment on conditions found/temperature noted at time of survey.

9. Systems being risk assessed shall normally cover the domestic water systems only, unless otherwise agreed in writing prior to works commencing on site.

10. Client/site management should appoint or provide a member of the building management or maintenance staff who is familiar with the water services for the site to assist the assessor in locating relevant systems, pipework, plant and services.

11. A full, suitable and up to date asbestos survey will be required for examination prior to start and DMA will not assess plant in areas which is or may be suspected to contain asbestos until the areas are made or are proven safe.

12. BS 8580:2010 States - "Where the system being assessed consists of several repeated units, such as multiple storeys or pods in a commercial building, the assessor should decide on representative examples to be assessed." Client must decide, based on the above statement and knowledge of the domestic water system on site, and how it "repeats" throughout the building, that only a representative number of rooms and/or floors require to be assessed then this would require to be agreed prior to works commencing. DMA would advise that as a minimum at least 20% of each rooms type must be assessed, along with all unique or non-repeating rooms/units (e.g. kitchens, bars, toilets etc), plus the plant items as would normally be carried out. Alternatively and as advised by DMA, it may be decided that all rooms/units require to be assessed, wherever possible, and the risk assessment proceeds on this basis.

13. Prior to works commencing, DMA should be provided with access to review and audit all records pertaining to the management and control of the water systems on site. These records shall include the management structure, written scheme, L8 monitoring records, training records, schematic drawings, previous L8 risk assessments/reviews, microbiological sampling records and any other records pertaining to the control of the water system(s) on site. DMA would advise that the duty holder or responsible person meets with the risk assessor at this stage to provide input into how the legionella control program, and other management and Health & Safety procedures are managed on site.

14. Schematic drawings of the water system shall not be produced as part of the L8 risk assessment unless agreed in writing prior to risk assessment commencing on site. Schematic drawings on site should be supplied for review/comment as part of the assessment if available.

15. Calorifiers and pressure vessels should wherever possible be opened for inspection as part of the L8 Risk Assessment. Where this is not possible at the time of the assessment, inspection reports from vessels being opened previously should be available and/or Risk Assessor should be requested to return to site when vessels can be opened. Additional charges may apply for additional visits. Unless otherwise agreed in writing, DMA are not responsible for opening and/or closing and sealing of vessels after inspection. This is to be carried out by site or other contractor.

16. Microbiological (Legionella) sampling can assist in determining risk in specific parts of a system or plant. Prior to risk assessment commencing on site client should instruct DMA as to whether or not microbiological samples should be taken during the site survey. Should DMA be instructed to proceed with sampling, the exact numbers of samples taken during the survey shall be relayed to the client prior to submitting to laboratory for analysis, for final approval and instruction to proceed with analysis provided. Costs for sampling shall be provided within risk assessment quote.

17. For healthcare premises, DMA shall require input with regards to which specification the assessment should be carried out to (i.e. L8, HTM 04-01, SHTM 04-01, 2040 etc). This would be especially relevant, for example, with regards to hot water temperatures at sentinel outlets and TMV inlets, where the HTM/SHTM 04-01 advises these temperatures should be a minimum of 55°C. This should be established prior to assessment commencing on site. For the purposes of this assessment the assessments will be carried out as per the specification for the previously tendered GG&C works with review of the assessments and L8 monitoring being used to highlight the out of specification temperatures.

18. The risk assessment is carried out first and foremost to aid compliance with the relevant legislation and to assist the client in drawing up suitable and sufficient control measures via a written a scheme and identifying non-compliant issues on site for corrective actions to be implemented. The L8 Risk Assessment produced by DMA shall be based entirely on information supplied by the client, records inspected and evaluated by the assessor and site conditions at time of survey. This document shall be independent of any other works which DMA either carryout on site or are requested to carry out at a future date.

19. No costs or proposals for works highlighted or advised in this report are included as this is not the function of this document. The client is to refer to this document in formulating their response to the findings and in drawing up the written scheme and assess what external assistance is required and from what organizations this may be sourced from if required.

David Watson

Experience

2017 – Present Director – DMA Canyon Ltd

The responsibility for the day to day management of supervisory staff within DMA. Overseeing compliance Manager to ensure compliance with relevant guidelines (L8, HSG 274, SHTM 04-01, COSHH, HASAW 1974 etc.) and Legionella Code of Conduct requirements.

Liaising with Mechanical Director in relation to plumbing remedial works to ensure compliance with appropriate water treatment standards.

Water treatment and legionella control and consultancy encompassing industrial, commercial and domestic water systems as well as cooling towers and closed water systems.

Experience with DMA and other leading water treatment companies resulting in wide and varied experience of client requirements and providing management systems and solutions to meet and exceed these requirements.

Ensuring DMA Canyon retain a high quality standard of services and consultancy by liaising with colleagues and industry bodies and experts to ensure the most up to date and effective programmes are made available to our clients.

Workplace Inspections on staff/operators as part of the company's auditing process as well as carrying out technical proofing of risk assessments and other consultancy documents, ensuring the document is correct for the clients and maintaining a high standard of work. Identifying training issues for staff to improve the service provided.

- Legionella consultancy & Risk Assessments
- NHS specific consultancy (e.g. pseudomonas, (S)HTM 04-01 Risk Assessments)
- Pseudomonas Risk Assessments
- Specialist investigative works and consultancy services provided to clients as well as bespoke remedial action packages and programs.
- Legionella Risk assessments of domestic water systems
- Risk assessments of Cooling Towers
- Cleaning & disinfection of Cold Water Storage Tanks, water heaters, pipework and systems
- Cleaning and Disinfection of Cooling Towers and Evaporative Condensers
- Temperature monitoring of sentinel points, representative outlets, calorifiers, water heaters and Cold Water
- Storage Tanks
- Microbiological (Legionella, Potable, Pseudomonas) sampling
- Cleaning & disinfection of showerheads
- Technical editing of risk assessments
- Creating schedules for staff/technicians
- Client meetings
- Chemical Cleaning of closed water systems (LTHW/Chilled)
- Implementation of ISO 9001 Quality Management System
- Implementation of OHSAS 18001 Safety Management System

1999 – 2017 Director – DMA Water Treatment Ltd

The responsibility for the day to day management of supervisory staff within DMA. Overseeing compliance Manager to ensure compliance with relevant guidelines (L8, HSG 274, SHTM 04-01, COSHH, HASAW 1974 etc.) and Legionella Code of Conduct requirements.

Water treatment and legionella control and consultancy encompassing industrial, commercial and domestic water systems as well as cooling towers and closed water systems.

Experience with DMA and other leading water treatment companies resulting in wide and varied experience of client requirements and providing management systems and solutions to meet and exceed these requirements.

Ensuring DMA Water Treatment retained high quality standard of services and consultancy by liaising with colleagues and industry bodies and experts to ensure the most up to date and effective programmes are made available to our clients.

Workplace Inspections on staff/operators as part of the company's auditing process as well as carrying out technical proofing of risk assessments and other consultancy documents, ensuring the document is correct for the clients and maintaining a high standard of work. Identifying training issues for staff to improve the service provided.

- Legionella consultancy
- NSH specific consultancy (e.g. pseudomonas)
- Specialist investigative works and consultancy services provided to clients as well as bespoke remedial action packages and programs.
- Legionella Risk assessments of domestic water systems
- Risk assessments of Cooling Towers
- Cleaning & disinfection of Cold Water Storage Tanks, water heaters, pipework and systems
- Cleaning and Disinfection of Cooling Towers and Evaporative Condensers
- Temperature monitoring of sentinel points, representative outlets, calorifiers, water heaters and Cold Water
- Storage Tanks
- Microbiological (Legionella, Potable, Pseudomonas) sampling
- Cleaning & disinfection of showerheads
- Technical editing of risk assessments
- Creating schedules for staff/technicians
- Client meetings
- Chemical Cleaning of closed water systems (LTHW/Chilled)
- Implementation of ISO 9001 Quality Management System
- Implementation of OHSAS 18001 Safety Management System

1996 to 1999 Operations Supervisor - Lothian Water Treatment

Operations Supervisor responsible for day to day works carried out by site operators. Duties included scheduling of site visits and ensuring the requirement of clients on site were carried out in accordance with contractual and legal obligations.

- Legionella Risk assessments of domestic water systems
- Risk assessments of Cooling Towers
- Cleaning & disinfection of Cold Water Storage Tanks, water heaters, pipework and systems
- Cleaning and Disinfection of Cooling Towers and Evaporative Condensers
- Temperature monitoring of sentinel points, representative outlets, calorifiers, water heaters and Cold Water
- Storage Tanks
- Microbiological (Legionella, Potable, Pseudomonas) sampling
- Cleaning & disinfection of showerheads
- Technical editing of risk assessments
- Creating schedules for staff/technicians
- Client meetings
- Chemical Cleaning of closed water systems (LTHW/Chilled)

1995 – 1996 ES Technician - Deveron Environmental Services

Environmental Services Technician responsible for carrying out routine legionella and water hygiene monitoring works, legionella risk assessments, cleaning and disinfection works and microbiological sampling.

- Legionella Risk assessments of domestic water systems
- Cleaning & disinfection of Cold Water Storage Tanks, water heaters, pipework and systems
- Cleaning and Disinfection of Cooling Towers and Evaporative Condensers
- Temperature monitoring of sentinel points, representative outlets, calorifiers, water heaters and Cold Water
- Storage Tanks
- Microbiological (Legionella, Potable) sampling
- Cleaning & disinfection of showerheads
- Chemical Cleaning of closed water systems (LTHW/Chilled)

Accreditations

M.W.M.Soc - Full Member of the Water Management Society (since 2018)
MIHEEM - Member of The Institute of Healthcare Engineering and Estate Management (Since 2020)

Training

Training Organisation	Course Title
Pro Lp	Microbiological Awareness and Risk Assessment in Healthcare Building Water Systems Advanced Course
Pro Lp	Legionella Advanced Understanding Training
Pro Lp	Pseudomonas Awareness in NHS Water Systems
Pro Lp	Hospital Water Systems Microbiology
Legionella Control International	Legionella Awareness Hot and Cold Water Services & Other Risk Systems Systems (LCA 9000) (9950-05)
Legionella Control International	Legionella Awareness Hot and Cold Water Services & Evaporative Cooling Systems (LCA 9001) (9950-05)
BPEC	The Water Supply (Water Fittings) (Scotland) Byelaws 2014 (WB2014)
Develop	Legionella Water Systems Refresher Update (City & Guilds) (BS8)
Develop	Legionella HSG 274 Part 1 Update and Interpretation (City & Guilds) (BS8/SP)
BRIO Group	Spa Pool Legionella Awareness
Horne Engineering	Maintenance Seminar Thermostatic Mixing Valves and Optitherm Tap
Eastwood Park	Managing Legionella in Building Water Systems (City & Guilds)
David Harper Associates	The Appreciation of the Maintenance and Management of a Building's Water System's, with regards to Legionnaires Disease, to include Cooling Towers and Logbooks
St Andrews First Aid	First Aid at Work
IOSH	Managing Safely
IOSH	Working Safely
UKATA	Asbestos Awareness
CN Safety	Confined Space Safety
CN Safety	Working at Height
CN Safety	Hazard Identification
CN Safety	Asbestos Awareness
CN Safety	Manual Handling
CN Safety	COSHH Awareness

From: Allan McRobbie
To: David Watson; Powrie, Ian
Subject: RE: Risk Assessment
Date: 06 May 2015 12:00:25
Attachments: image005.jpg
image006.jpg
image007.jpg
image008.jpg
image009.jpg
image010.jpg
image011.jpg

Ian
Have you had any response to the commissioning queries we sent over last month prior to us submitting our final commissioning report?
My colleague Darren will deliver a draft copy of the Legionella Risk Assessment and Pseudomonas Report to you this afternoon.
The information and recommendations reflect our recent conversations and meetings with you, Jim and Mel but if you require clarification on any issues raised or wish to meet to discuss further please do not hesitate to call.
As requested we are now pulling together costs to aid your L8/HSG 274/SHTM 04-01 compliance regime and will send these over as soon as possible.
Best regards
Allan McRobbie
Compliance Manager

Mob: [redacted]

DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

From: David Watson
Sent: 09 April 2015 17:46
To: Powrie, Ian
Cc: Allan McRobbie
Subject: Risk Assessment
Ian

as discussed last week please find attached a list of queries and issues highlighted as we have gone through the risk assessment and review of the commissioning records.
We have kept this very informal so you can deal with it as formally or informally as you see fit with the appropriate parties (we don't want this to look like we are just here to pick fault and criticise especially when queries be as simple as information not yet loaded onto Zutec as we realise this must be a mammoth task for this size of project)
no doubt as we continue the process of compiling all the information we have a few other issues or points requiring clarification will come to light. We will email them across as necessary.
If anything doesn't make sense or you need more info on what we are looking for give me or Allan a call

Regards
David Watson
Director

[redacted]
DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

From: David Watson
To: Powrie, Ian
Cc: Mike Kinghorn; Allan McRobbie
Subject: MRI Chillers
Date: 22 April 2015 17:06:00
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

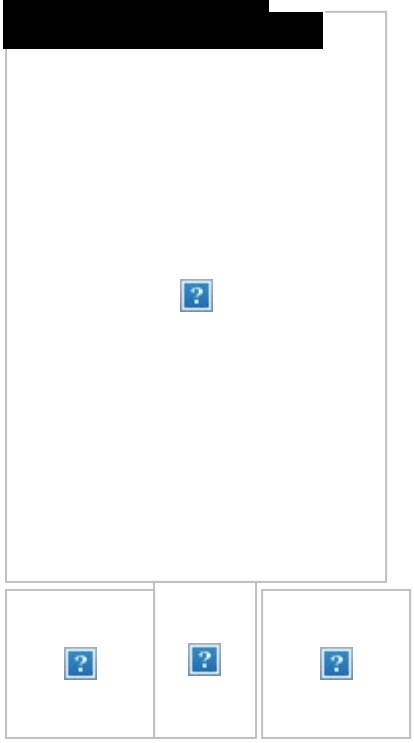
Ian

Just to follow up on a point we raised at out meeting we located the chillers for the MRI on the 3rd floor roof
These have a domestic cold water supply to them feeding into the units. We have checked on Zutec and we don't have access to any information regarding these chillers.
The domestic water supply to these chillers we would assume is for additional cooling at times of high demand which would classify the chillers as dry/wet cooling (or hybrid or Adiabatic depending on engineering terminology).
Depending on the actual design and operation of these units they may require to be registered with the local authority under the NCTEC Notification Requirements (See HSG 274 Part 1 Para 1.18 – 1.21 inclusive of Figure 1.4 and Info Box 1.1)

These may also require ongoing treatment or monitoring programmes to be implemented.

Without any additional information though we can't really comment any further.
If you require any further information or assistance regarding this please do not hesitate to contact us at the office
Regards
David Watson
Director

[redacted]




Help the environment - do you need to print this e-mail?

From: David Watson
To: Powrie, Ian
Cc: Allan McRobbie; Mike Kinghorn
Subject: Calorifiers
Date: 22 April 2015 17:06:00
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

Ian
We are sure you are aware already but whilst on site yesterday we noted that some calorifiers temperatures had dropped significantly (approx. 40 – 45°C when recorded in the afternoon).

As this would constitute a significant break in the control parameters we would advise that suitable remedial actions (e.g. system disinfection or pasteurisations as highlighted under the written scheme guidance) be carried out.
It was also noted that calorifier 32-03 was still offline (as originally noted by us during our initial site visit in January). We would advise that suitable remedial actions are taken i.e. calorifier being thoroughly flushed, disinfected/pasteurised and brought up to full temperature prior to this calorifier being reinstated.
If you require any further information or assistance regarding this please do not hesitate to contact us at the office
Regards
David Watson
Director

[redacted]
DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

From: David Watson
To: "Powrie, Ian"
Cc: Allan McRobbie
Subject: Risk Assessment
Date: 09 April 2015 18:45:00
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg
DMA Commissioning Queries 150409.docx

Ian
as discussed last week please find attached a list of queries and issues highlighted as we have gone through the risk assessment and review of the commissioning records.
We have kept this very informal so you can deal with it as formally or informally as you see fit with the appropriate parties (we don't want this to look like we are just here to pick fault and criticise especially when queries be as simple as information not yet loaded onto Zutec as we realise this must be a mammoth task for this size of project)
no doubt as we continue the process of compiling all the information we have a few other issues or points requiring clarification will come to light. We will email them across as necessary.
If anything doesn't make sense or you need more info on what we are looking for give me or Allan a call
Regards
David Watson
Director

[redacted]

Help the environment - do you need to print this e-mail?

Point 1

The commissioning records (CWS/DHWS OUTLET REPORTS) appear to vary across plantrooms/zones with differing information recorded on sheets with no corresponding method statement or guidance p[parameters provided to allow for interpretation of the results

Most sheets have temperatures recorded for “Multifix” and “Multitherm” locations on the “Hot Water Return”. However there are large variances on the other temperatures recorded for “Hot Water Flow”, “Cold Water Flow”, “Mixed Water Flow” and “Anti Scald Operational”.

Many sheets have no temperatures other than “Multifix” and “Multitherm” recorded on the “Hot Water Return”. (e.g. Plantroom 21 Critical Care Ward – Riser M6, 1st Floor)

Others have temperatures recorded across all columns (e.g. Plantroom 22 Basement FM & Kitchen Riser M30).

However, even when all columns filled in there appears to be discrepancies between “Hot Water Flow” temps. Many would appear to be a mixture of direct hot temps (i.e. 50 – 55°C) and those taken from TMVs (i.e. 38 - 41°C), with “Mixed Water Flow” being very difficult to determine what the temperatures reflect (i.e. 24 – 39°C) (e.g. Plantroom 31 Ground Floor Acute Assessment Riser M21)

“Anti-Scald Operational” completed in very few sheets (ticked when completed).

“Design temperatures” very rarely completed on any sheets.

There are no temperature monitoring records for any period after systems being filled other than the commissioning records referenced here.

Example of the info provided.

Outlet/Room Ref. No.	Hot Water Return		Hot Water Flow		Cold Water Flow		Mixed Water Flow		Anti-Scald
	Multitherm Temp. (°C)	Multifix Temp. (°C)	Design (°C)	Temp (°C)	Design (°C)	Temp (°C)	Design (°C)	Temp (°C)	Operational
MT	50.6								
45				41.1	<20	15.6		24.1	
46 WHB								39.3	
46 SH				41.8	<20	15.7			
46 Bath									
61				41.7	<20	164		23.7	

Point 2

Further to the type of information provided on the sheets described in Point 1, in many instances the temperatures recorded in the “Hot Water Return” and “Hot Water Flow” fall out-with those which we understand to be the hot water system control parameters (i.e. >55°C at all points).

Also in some instances “Cold Water Flow” temperatures were recorded above 20°C.

There are no mitigating circumstances recorded or remedial actions noted on the information DMA have access to on Zutec or details of steps taken (or considered) to minimise the potential for biofilm formation within the system when control measures/parameters were out of specification..

Point 3

There are no obvious records of the cold water “dump system” being commissioned.

Point 4

There is no method statement for the microbiological sampling procedure or an explanation of the choice of sample locations for both potable and legionella samples (would appear to be sentinel outlets for potable) or the pass/fail criteria applied (assumed to be 300 cfu/ml for TVCs).

Additionally there are no remedial actions or re-sampling procedures recorded after “failed” and multiple “failed” samples (i.e. samples which have “failed on the resample”.

The time period between disinfection being completed and the sampling being carried out (varying from 1 day to 3 days) SHTM 04-01 Part C advises “A period of at least three days – and preferably five – should be allowed for the system to settle prior to sampling activities commencing”

Point 5

There is no method statement for the cleaning and disinfection of the water tanks and hot/cold services. There are certificates attached to the smapling results referring to plantrooms and individually CWSTs 1, 2 3 & 4. However this does not make it clear if they are referring to Raw Water or Bulk water tanks and there is no reference to tanks being cleaned.

Also there were no notes of any areas omitted or disinfected separately or disinfections repeated after access issues or other problems completing a full system disinfection in one go. (We assume here that access to all areas in a building project of this size for a one off disinfection would be logistically demanding and we would normally expect to see some omissions for practical reasons – or a statement that there were no omissions).

Point 6

There are no leachate flushing method statements or records available on Zutec to DMA (though there have been signs noted within the building highlighting leachate flushing has been carried out).

Point 7

There are no flushing method statements or records available though we are aware that this has been carried out. DMA cannot confirm when flushing began and the exact frequency of this flushing in each areas as we assume the systems were filled in staged/systematic process with flushing being required immediately after first fill.

Point 8

There are no records of manufacturers commissioning procedures and the implementation of these procedures for the TMVs.

Point 9

There are no records of the training/competency of the companies (and/or individuals) who have undertaken the disinfection and sampling works e.g. LCA accreditation.

Point 10

Sentinel outlets have not been separated into hot and cold and there do not appear to be any listed for the trades system. For on-going monitoring and sampling requirements these should be separated to assist in identifying any localised issues e.g. heat gain/loss, high microbial counts to determine if occurring only in local run or more widespread throughout the floor (particularly given that many hot samples are being taken via TMV)

Notes on Assessment so far (very brief Summary!)

Many hot temperatures between 50 – 55°C (this is in line with commissioning reports though the majority of these have been via contact probes so there may be some margin for interpretation that could be applied given that the majority of direct hot temperatures are in excess of 55°C)

Many cold temperatures are higher than 20°C (and almost invariably a minimum of 5°C higher than tank temperatures) which would indicate a high level of heat gain in the cold system throughout the building

Raw water tank 1A was valved off and is showing signs of stagnation (film on water surface). We would advise this is cleaned and disinfected prior to be reinstated.

Bulk Water tanks 2A and 2B were almost completely empty when DMA inspected them. Jim Guthrie was present at the time and reconfigured bypass valves etc to allow the system to be fed from the full tanks (1Aand 1B).

Trades water tank (RHS) offline though full and showing signs of stagnation when DMA inspected them. We would advise this is cleaned and disinfected prior to be reinstated.

There was a MDPE bypass on the mains water (Hardgate Road) to the main booster pumps which appeared to be open and live at time of survey. Unable to confirm what the reason for this was. Also a short deadleg on this bypass.

In many areas (Department receptions etc.) there are connections for vending machine/water dispensers which are not in use and many have capped ends. Are these included in the flushing regime (and included in the disinfection)?

In many areas, particularly wards on the higher floors, the wet room floor drain was not sealed. Are the showers being included in the flushing regime?

There are flexible hoses fitted in some areas e.g. Double level sinks in facilities rooms and Arjo baths (connection onto the system as well as those internally on the bath) and on the zone pressure reducing valves.

Copper tails evident in some areas - mostly infra red taps (small final connection pieces) and also in the Endoscopy wash sinks.

There is a deadleg in the hydrotherapy pool plant area

Expansion vessels are not flow through type as recommended by SHTM

From: Allan McRobbie
To: ian.powrie[redacted]
Cc: David Watson
Subject: SGUH L8 RA
Date: 17 March 2015 15:46:57
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

Ian
David and I intend to be on site at the beginning of next week to carry out the next stage of the L8 Risk Assessment.
Are you free at all Monday-Wednesday and we will come in and review the implementation of the written scheme during the initial handover phase?
Best regards
Allan McRobbie
Compliance Manager

[redacted]
DMA Logo Email Signature

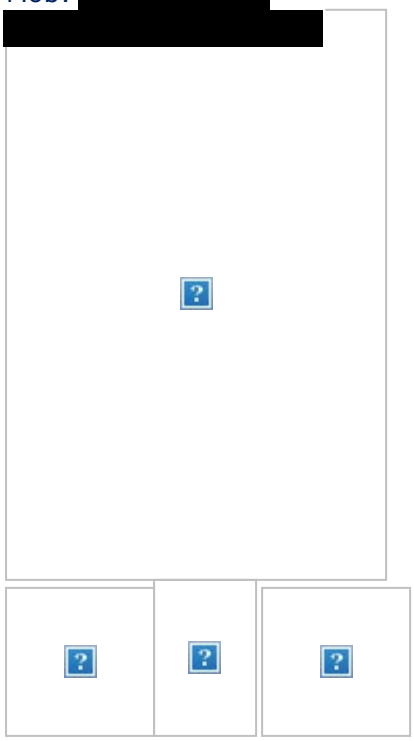
Help the environment - do you need to print this e-mail?

From: David Watson
To: "Powrie, Ian"
Cc: Allan McRobbie; Mike Kinghorn
Subject: Written Scheme Guidance
Date: 16 January 2015 17:02:00
Attachments: SGUH 10 WScheme 2015 (D1).pdf
image001.jpg
image002.jpg
image003.jpg
image004.jpg

Ian
copy of the Written Scheme Guidance
Issued in draft format at present until you have had a chance to review and comment.
I finish up tonight for 2 weeks holiday but should you require any further information in the meantime or wish us to come to site to discuss then please contact Allan or Mike Kinghorn
Also if you require hard copy please let Allan or Mike know and they will get a copy to you.

Regards
David Watson
Director

Mob: [redacted]



LEGIONELLA RISK ASSESSMENT

Section 10

Written Scheme Guidance

LEGIONELLA RISK ASSESSMENT

This section of the document sets out in writing guidance to assist the NHS Trust to create a written scheme to manage and control the risks from exposure to legionella bacteria within the South Glasgow University Hospital complex (Adult and Children's hospitals), from the handover date on 26th January until the phased occupancy starts on 26th April.

The guidance includes domestic hot and cold water systems and other systems as identified by NHS Estates to DMA Water Treatment guided by SHTM 04-01 and L8/HSG 274.

Risk Assessment

The risk assessment is to be carried out in 3 phases by DMA Water Treatment, assisted by NHS Estates.

Risk Assessment Phase 1 - Desktop Assessment & Site Assessment of Major Plant Items:

Risk Assessment Phase 2 - Commission Records Review: (Not completed at time of writing)

Risk Assessment Phase 3 - Site Assessment of Installed Services: (Not completed at time of writing)

The assessment of risk is an ongoing process and not merely a paper exercise. The Dutyholder should arrange to review the assessment regularly and specifically when there is reason to suspect it is no longer valid e.g. during the phased occupation starting in April 2015 through to July 2015.

Upon full occupation the Risk Assessment should be further reviewed to ensure it remains relevant to the fully functioning hospital rather than the simulated water usage conditions of the pre and phased handover periods.

Ongoing assessment reviews shall be required. An indication of when to review the assessment and what to consider should be recorded and this may result from, e.g.:

- a change to the water system or its use (e.g. during the handover and phased occupation period);
- a change to the use of the building/ward/clinical etc. areas;
- new information available about risks or control measures (e.g. updated legislation/SHTMs);
- the results of checks indicating that control measures are no longer effective;
- changes to key personnel;
- a case of legionnaires' disease/legionellosis associated with the system.

Greater Glasgow and Clyde Health Board Written Scheme provides further guidance on this matter.

Management structure:

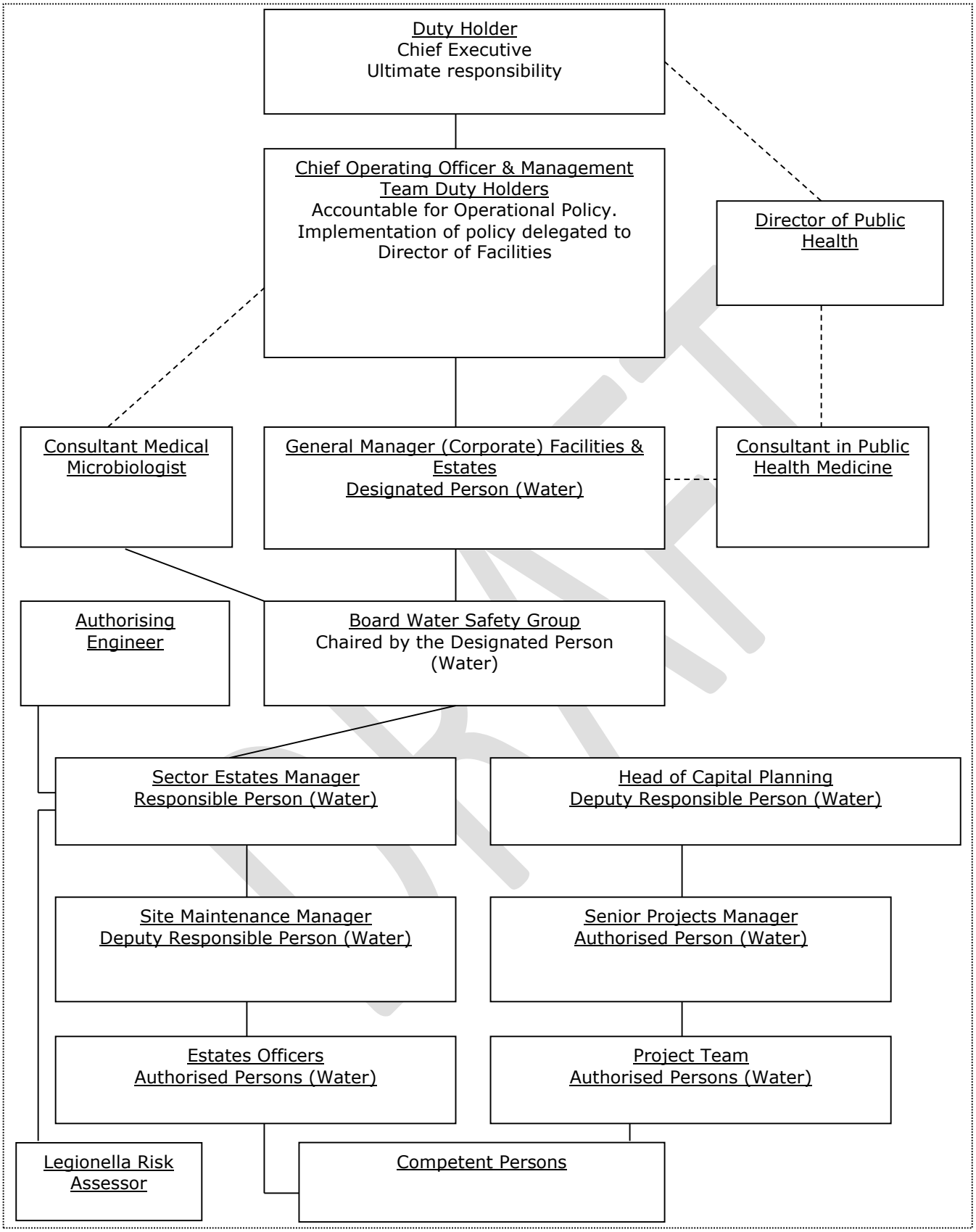
SHTM 04-01 Part B Section 2 gives guidance on Management Responsibilities and Section 6 provides guidance on hierarchy and designated staff functions along with definitions of individual positions and responsibilities. This is mirrored in Greater Glasgow and Clyde Health Board Written Scheme. These should be used when assigning specific job roles and populating the Legionella Management Hierarchy.

Management should implement a programme of staff training to ensure that those appointed to devise strategies and carry out control measures are appropriately informed, instructed and trained, and should be assessed as to their competency. It is also essential that they have an overall appreciation of the practices affecting water hygiene and safety and that they can interpret the available guidance and perform their tasks in a safe and technically competent manner. The rate of change in building service technology is not great, but knowledge of harmful bacteria continues to grow and management should review the competence of staff on a regular basis, and refresher training should be given; records of training attendance would need to be maintained. Although training is an essential element of ensuring competence, it should be viewed within the context of experience, knowledge and other personal qualities that are needed to work safely. Competence is dependent on specific needs of individual installations and the nature of risks involved.

A training matrix for all person involved in the management and/or carrying out control measures (e.g. flushing, maintenance/ppm tasks) should be created and maintained.

LEGIONELLA RISK ASSESSMENT

Greater Glasgow and Clyde Written Scheme Hierarchy Diagram



LEGIONELLA RISK ASSESSMENT

Greater Glasgow and Clyde Written Scheme Hierarchy Appointment Table

Legionella Role	Name	Appointment	Generic Title	Phone
The Duty Holder			Chief Executive	
Duty Holders			Chief Operating Officer	
			Director of Facilities	
Designated Person (Water)		In writing by CEO for CE on xx	General Manager (Corporate)	
Authorising Engineer (Water)		In writing by DoF or GM (Corporate)		
Responsible Person (Water)		In writing by DoF or GM (Corporate)	Sector Estates Manager	
Deputy Responsible Person (Water)		In writing by DoF or GM (Corporate)	Site Maintenance Manager	
Deputy Responsible Person (Water)		In writing by DoF or GM (Corporate)	Head of Capital Projects	
Authorised Person (Water)		In writing by DoF or GM (Corporate)	Estates Officer, Supervisor, Water Technician	
Competent Person (water)		In writing by AP	Plumber	
Legionella Risk Assessor		In writing by Responsible Person (Water)	Sector Estates Manager	

N.B. All persons appointed should be named in the above table. Where there are more than one member of staff nominated for a Legionella Role (e.g. Authorised and Competent Persons) each of these should be named along with the appropriate escalation pathway.

LEGIONELLA RISK ASSESSMENT

Additional roles and responsibilities during the handover and phased occupancy period

Legionella Role	Name	Appointment	Title/Organisation	Phone	Reporting to
e.g. Estates Management	Ian Powrie		NHS Sector Estates Manager		
e.g. Role of Brookfield Multiplex					
e.g. System Designer					
e.g. System Installer	Cairan Kellegher		Mercury Engineering		
Flushing of outlets (Non-"High Risk" Areas)	TBC		NHS Facilities (Domestics)		Please see example table(s) regarding flushing responsibilities for individual areas in Appendix A
Flushing of outlets ("High Risk" Areas)	TBC		NHS Estates		
Written Scheme Guidance and Legionella Risk Assessment	Allan McRobbie David Watson	Appointed by Ian Powrie 6th January 2015	DMA Water Treatment Ltd	[redacted]	Ian Powrie NHS GG&C Sector Estates Manager

N.B. All persons appointed should be named in the above table.

LEGIONELLA RISK ASSESSMENT

Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Regular check to ensure that legislation and guidance has not changed	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 Management Structure to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of communication lines to ensure still accurate and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of escalation & emergency procedures to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties allocated to site staff and ensure accurate and recorded	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties of sub-contractors and ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered)	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of staff training requirements and update training matrix	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of method statements and risk assessments to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of site documentation to ensure all records up to date and present	L8 HSG 274 Pt 2 SHTM 04-01	
Regular update of "Patient Risk Rating" register for all areas of hospital.	SHTM 04-01 Part B	
Regular review of sentinel outlet locations register.	SHTM 04-01 Part B	
Regular review of primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	HSG 274 Pt 2	
Regular review of plant and equipment maintenance schedules.	Manufacturer's Instructions	
Regular review of BEMS temperature sensor locations to reflect any system alterations	HSG 274 Pt 2	
Regular review of schematic/as-fitted drawings to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 risk assessment (particularly as the handover and phased occupation process progresses) with a maximum period of two years between updates. (e.g. if change of use or changes in legislation or any other factor which could affect validity of current assessment)	L8 STHM 04-01 Part B	

N.B. By "Regular" DMA would advise a Quarterly or 6 monthly review of all tasks above or as and when there are changes in system operation, management or other control parameters which would warrant a review of any particular task. (e.g. if change of use or changes in legislation or any other factor which could affect validity any of the current documentation)

LEGIONELLA RISK ASSESSMENT

Drawings

The availability of accurate as-fitted drawings is essential for the safe operation of hot and cold water service systems. Schematic drawings of the system with numbered and labelled valves will reduce confusion and save time in trying to identify appropriate isolating valves and other system components.

The locations of as-fitted drawings and schematics should be recorded in the water system logbook(s) along with instruction on how to access them should these only be held electronically. Any alterations to the system should be recorded on all copies drawings (e.g. paper and electronic copies).

Separate schematic drawings should be prepared and displayed in in a frame in the relevant plantroom, complete with valve schedule such that all plant items, control valves etc. can be identified.

Correct and safe operation of the system

Mercury Engineering have provided documentation relating to General Start-up and Shut Down procedures for both the domestic hot and cold water systems, along with fault finding procedures and a PPM schedule for the system which should be followed. This documentation should be retained and included within the site logbook.

Water temperature, system design/installation, frequency of use, water turnover and cleanliness of the system are the most significant factors in determining the risk potential.

Incoming mains water should be delivered to site into the CWSTs at less than 20°C

The water stored within the tanks should be no more than 2°C higher than the incoming mains, and less than 20°C

Cold water should be delivered to outlets (and cold feed to thermostatic mixing valves) at less than 20°C within 2 minutes of outlet being run, and not more than 2°C above outlet water source temperature.

Hot water should be stored at a minimum of 60°C, with the entire body of the calorifier achieving this temperature for a minimum period of 1 hour per day. Hot water return temperatures should maintain a minimum temperature of 55°C at all times.

Hot water should be delivered to outlets (and hot feed to thermostatic mixing valves) at more than 55°C, within 1 minute of outlet being run.

All plant should be maintained in accordance with the relevant manufacturers, and installers instructions and the appropriate guidance documents (e.g. SHTM 04-01, L8/HSG 274).

Where deficiencies are found in the control parameters required the suitable escalation and remedial/corrective action procedures should be implemented.

All other uses of water should also be considered and appropriate action taken, as these may not be appropriate in an augmented care setting (e.g. use of ice machines, drinking water fountains, bottled water dispensers etc.). Where required, they should be considered as part of the risk assessment as there is an increased risk in compromised patients for legionella infection to occur following aspiration of ingested water contaminated with legionella.

LEGIONELLA RISK ASSESSMENT

Initial tasks required to aid compilation of PPM schedules/registers within site written scheme	**Guidance Documents**	**Allocated to**
Identify, label and record all plant, valves and services	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Identify, label and record sentinel outlets on hot and cold water services.[1]	SHTM 04-01 (Part B)	System Designer/NHS Estates
Identify, label and record all "drinking" and "non-drinking" water outlets	SHTM 04-01 (Part B)	System Designer/NHS Estates
Identify, label and record all primary, sub-ordinate and tertiary flow and return loops and their access points for temperature profile/mapping	HSG 274 Pt 2	System Designer/NHS Estates
Identify, label and record all BEMS temperature sensor locations for temperature profile/mapping	HSG 274 Pt 2	System Designer/NHS Estates
Identify, label and log all mixing devices (TMVs) with a unique identification as well as identification of its type. Hot and cold water pressures also need to be measured and recorded for each mixing device together with all the test parameters from the in-service tests	SHTM 04-01 (Part B)	System Designer/NHS Estates
Identify, label and log all "other uses of water" (e.g. use of ice machines, drinking water fountains, bottled water dispensers etc.)	HSG 274 Pt 2	

[1] Sentinel outlets are normally those that – on a hot water service – are the first and last outlets on a recirculating system. On cold water systems (or non-recirculating hot water systems), they are the closest and furthermost from the storage tank (or water heater). The choice of sentinel taps should also include other outlets that are considered to represent a particular risk, for example those installed in accommodation in which particularly susceptible patients are treated, or others identified in the risk assessment and temperature mapping exercise as having the least satisfactory temperature performance.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Summary of ppm tasks required within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274	**Guidance Documents**	**Allocated to**
Daily water draw-off should form part of the daily cleaning process *(May not be required during initial handover period)*.	HSG 274 Pt 2 SHTM 04-01 (Part B)	Domestics?
Incoming Water Mains - maintain in accordance with installation/design guidelines, ensuring alteration of incoming mains lines to run at least daily. (DMA advised 9 hourly swap over).	Brookfield Maintenance Schedule	BEMS(?)
Cyclical alteration of CWST booster pumps (ensuring every pump runs at least weekly)	HSG 274 Pt 2 SHTM 04-01 (Part B)	BEMS?
Daily check to ensure entire body of calorifier(top, middle, base) reaches 60°c for a period of 1 hour each day (generally at a time of low use e.g. Early morning/late evening)	HSG 274 Pt 2 SHTM 04-01 (Part A)	BEMS?
Twice-weekly flushing of all outlets in unoccupied areas and low use/sporadically used outlets. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile.[2]	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Weekly flushing of deadlegs/blind ends where these cannot be removed. All deadlegs should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile. [2]	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Weekly check to ensure that non-return valves shut off tightly. Remove covers and examine further if they do not.	Brookfield Maintenance Schedule	
Weekly check of water levels within water tanks	Brookfield Maintenance Schedule	
Check spray taps for satisfactory spray, where necessary remove spray orifice and clean, remove any accumulation of scale. *(DMA understands no spray taps fitted though this is to be confirmed)*	Brookfield Maintenance Schedule	
Monthly (minimum) manual test to confirm water system pumps operating correctly	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Monthly calorifier storage temperatures checks at top (flow) and return pipework Flow temperature – min 60°C, return temperature – min 55°C[3]	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Monthly temperature checks on hot outlets at sentinel, little-used & selected outlets. >55°c within 1 minute. (also note potential scald risks and out of spec TMVs)[4]	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Monthly temperature checks on hot outlets at sentinel, little-used & selected outlets. >55°c within 1 minute to create a temperature profile of building and monitor flow and return system with all primary flow and return loops being monitored monthly, sub-ordinates quarterly and tertiary loops annually.	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Monthly temperature checks on cold outlets at sentinel, little-used & selected outlets. <20°c within 2 minutes to create a temperature profile of building and monitor heat gain within the cold water system.[4]	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Monthly check to ensure CWST overflows are unobstructed	Brookfield Maintenance Schedule	

Task frequencies described above are for guidance only. Frequencies may vary dependent on system conditions highlighted during routine monitoring or as risk assessment is updated.

[2] Ensure aerosol creation is kept to a minimum when flushing of low use outlets and deadlegs.

[3] 55°C being the control parameter DMA advised as being the design return temperature to the calorifiers on domestic hot water. SHTM 0401 requiring 50°C though this is HSG 274 Part 2 is contradictory, requiring 50°C in paragraph 2.156 and 55°C in Table 2.1.

[4] Representative outlets include conventional and mixed-temperature taps; 20% of the total number installed throughout the premises would be tested annually on a rotational basis: that is, all taps checked every five years.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Summary of ppm tasks required within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274 (cont…)	**Guidance Documents**	**Allocated to**
Quarterly descaling, cleaning and disinfection of showerheads & hoses & spray outlets (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Quarterly arrange for samples to be taken from hot water calorifiers/water heaters in order to note condition of drain water. Flushing of calorifier bases (until water runs clear)	SHTM 04-01 (Part B)	
Six monthly CWST condition inspection noting appearance of water, stagnation, odour, rust, scale, sediment, debris, paint/liner condition and bio film accumulation and tank lid fitting ok and insulation condition	Industry Good Practice	
Six monthly CWST temperature checks on tank supply and stored water at opposite side from tank inlet if possible (inlet and stored water should be <20°C, with stored water no more than 2°C warmer than make-up water.)	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Six monthly servicing TMV's or mixer valves, including fail safe tests and cleaning/disinfection of strainers. (more frequently if manufacturer recommends – Documentation not available on Zutec at time of writing, or if 'drift' in excess of 1°C at mixed outlet temperature highlighted during temperature monitoring or other maintenance)	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Six monthly flushing of emergency/deluge shower for a minimum of 3 minutes and the water temperature stabilises in line with current temperature profile.	HSG 274 Pt 3	
Six monthly chemical and microbiological water samples from water tanks which feed drinking water outlets	BS 8558	
Annual cleaning and disinfection CWST *and downservices* (more frequently if required dependant on CWST inspection & sample results). **Please Note:** *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained.*	SHTM 04-01 (Part B)	
[A] Annual descaling, cleaning and disinfection of strainers (including angle valve strainers) (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	HSG 274 Pt 2 SHTM 04-01 (Part B)	
[B] Annual internal inspection and cleaning/descaling of the calorifier/water heater with disinfection/pasteurisation upon completion	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Annual inspection of vibration coupling on pumps/plant, replacing as necessary (more frequently if recommended by manufacturer)	HSG 274 Pt 2	
Annual inspection of plant and pipework insulation, repairing where necessary.	SHTM 04-01 (Part B)	
All plant items should be maintained in accordance with manufacturer's instructions and maintenance schedules, with tasks/duties allocated and recorded.	Manufacturer's Instructions	

Task frequencies described above are for guidance only. Frequencies may vary dependent on system conditions highlighted during routine monitoring or as risk assessment is updated.

Notes:
[A] – Brookfield Maintenance Schedule advises this task is carried out on a monthly basis.
[B] – Brookfield Maintenance Schedule advises this task is carried out on a six monthly basis.

LEGIONELLA RISK ASSESSMENT

Summary of ppm tasks required within site written scheme to aid compliance with SHTM 04-01 and L8/HSG 274 (cont…)	Guidance Documents	Allocated to
Arrange for microbiological samples to be taken from water system which represent the complexity of the water system(s) and particularly in areas of concern. All sampling should be carried out in accordance with BS 7592:2008 and all analysis by a UKAS accredited laboratory.[5]	HSG 274 Pt 2 SHTM 04-01 (Part C) GG&C Written Scheme	
[c] Pasteurisation/disinfection of calorifier/water heaters carried out as and when required dependent on temperature monitoring and sample results	HSG 274 Pt 2 SHTM 04-01 (Part B)	
Turnover test on cold water storage system. Checks should be carried out to ensure that volume of water stored is no more than would generally be used in a normal 12 hour period. **N.B.** This should be reviewed as part of the handover and phased occupancy period with volume of sorted water adjusted as the building use alters during this process.	HSG 274 Pt 2 SHTM 04-01 (Part B)	
As required descaling of taps/outlets (including aerators and flow straighteners) (frequency dependent on inspection results and hardness of water on site)	Industry Good Practice	
All EPDM flexi hoses (where fitted to articulated taps/outlets e.g. assisted baths) should be WRAS approved and should be replaced every 2 years if alternative materials cannot be used.	Industry Good Practice	
Filtration equipment (Elga) – maintain in accordance with manufacturers guidelines, ensuring alteration of filtration sets to run at least daily. (DMA advised 9 hourly swap over).	Elga Brookfield Maintenance Schedule	BEMS(?)

Task frequencies described above are for guidance only. Frequencies may vary dependent on system conditions highlighted during routine monitoring or as risk assessment is updated.

Notes:
[c] – Brookfield Maintenance Schedule advises this task is carried out on a monthly basis.

[5] Sampling regime should be formulated by site/client based on the known history of the water systems and the details included within this risk assessments, with assistance of specialist legionella consultant (e.g. DMA) if necessary. Although L8 does not specifically request legionella sampling, in cases where there are incorrect distribution or supply temperatures, water quality issues or other factors which may increase the likelihood of legionella proliferation and dissemination sampling should be carried out. For further guidance please refer to HSG 274 Part 2, SHTM 04-01 and BS 7592:2008

LEGIONELLA RISK ASSESSMENT

Other Risk Systems Identified to DMA

System/service	Task	Minimum Frequency
Spray humidifiers *DMA understands humidification on site is steam only and therefore SHTM Sir Conditioning Guidance should be applied.*	Clean and disinfect spray humidifiers and make-up tanks, including all wetted surfaces, descaling as necessary	Six monthly
	Confirm the operation of non-chemical water treatment (if present)	Weekly
Water softeners (See Hydrotherapy and Renal(?))	Clean and disinfect resin and brine tank – check with the manufacturer what chemicals can be used to disinfect resin bed	As recommended by manufacturer
Emergency/Deluge showers	Flush through and purge to drain ensuring three to five times the volume of water in the stagnant zone is drawn off	At least every six months
	Clean and disinfect shower heads, nozzles, roses, 'Y' strainers,	Quarterly
Sprinkler system	When witnessing testing or maintaining sprinkler system ensure that there is minimum risk of exposure to aerosols	As works carried out.
Whirlpool baths	Clean, flush and disinfect air channels Remove, flush and clean jets	After each use.
Horticultural misting systems *DMA have not seen the irrigation system in operation and so cannot comment at time of writing*.	Clean and disinfect distribution pipework, spray heads and make-up tanks including all wetted surfaces, descaling as necessary	Quarterly or as indicated by risk assessment
Dental equipment	Drain down, clean, flush and disinfect all system components, pipework and bottles	Twice daily (typically at the start and finish of each working day). Disinfectant contact time as recommended by the manufacturer –
	Clean storage bottles, rinse with distilled or Reverse Osmosis (RO) water, drain, and leave inverted overnight	Daily *(TBC if relevant)*
	Take microbiological measurements – refer to *Decontamination Health Technical Memorandum 01-05: Decontamination in primary care dental practices*[5]	As indicated by bespoke risk assessment *(to be carried out by others)*
Medical Equipment (e.g. nebulisers, medical gases, incubators, birthing pools)	Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system and Infection Control/Clinical staff where appropriate. Devise a control scheme based on this risk assessment	Monitoring, inspection, and testing frequencies to be determined as indicated by bespoke risk assessment *(to be carried out by others)*

Task frequencies described above are for guidance only. Frequencies may vary dependent on system conditions highlighted during routine monitoring or as risk assessment is updated..

LEGIONELLA RISK ASSESSMENT

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the Southern General Hospital served by the same mains lines[6]) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as "out-of-specification" mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:
    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);
    - any water sampling results;
    - system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
    - recent maintenance history; recent alterations, changes or additions to the water system;
    - any other changes made by Duty Holders or users of the water system;
    - On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Water Safety Log Book.

[6] Should other buildings within the Southern General not fall under the remit of the same Authorised Person (Water) then corresponding SGH Authorised Person (Water) should be notified of the issue to allow actions to be carried out. This escalation chain should be recorded in Greater Glasgow and Clyde Written Scheme Hierarchy Appointment Table.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

LEGIONELLA RISK ASSESSMENT

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment.

Stage 3 - water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.
    Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;
  - thereafter the tank/local area being disinfected shall be brought back into service;
  - finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

LEGIONELLA RISK ASSESSMENT

Hot Water Services

When hot water storage or distribution temperatures fall below those required (60°C storage, 55°C at outlets and returning to calorifier) these will almost inevitably be caused a mechanical fault. Appropriate maintenance procedures, including the Mercury Fault Finding guidance documents, should be created and referenced to assist in timely rectification.

Guidance for System Disinfections

SHTM 04-01 Part A Table 3: Water systems cleaning and disinfection

System/ Service	Circumstance Requiring Cleaning and Disinfection	Frequency
Domestic Cold Water and Domestic Hot Water Tanks	New installations. Re-commissioning empty/unused tanks. Tank temperature exceeds 25°C. (Check with Risk Assessment). Tank contains moderate sediment, i.e. a complete covering of the tank base. Evidence of tank corrosion (check with Risk Assessment). Any contamination of tank (by organic, by vermin or vermin faeces or similar). Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc. Regular programme for high-risk healthcare category, with disinfection* where identified in the local Written Scheme (check with Risk Assessment). Regular programme for medium risk healthcare category, with disinfection* where identified in the local Written Scheme (check with Risk Assessment). Regular programme for non-healthcare premises, with disinfection where identified in the local Written Scheme (check with Risk Assessment).	As required As required As required As required As required As required As required Annually 2 Yearly 5 Yearly
Domestic Cold Water Distribution System	New installations and modifications or additions. Temperature exceeds 25°C. (Check with Risk Assessment). Any contamination of tank (by organic, by vermin or vermin faeces or similar). Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required As required As required As required
Domestic Hot Water Calorifier, Storage/Buffer Vessels	New installations and modifications or additions. Temperature has fallen below 45°C. Re-commissioning of empty/unused plant. Any contamination of header tank (by organic, by vermin or vermin faeces or similar). Regular programme.	As required As required As required As required Annually
Domestic Hot Water Distribution System	New installations and modifications or additions. Temperature has fallen below 45°C. Any contamination of header tank (by organic, by vermin or vermin faeces or similar).	As required As required As required
Air Handling Units	Any contamination (by organic, by vermin or vermin faeces or similar). Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc. Chiller battery, drip trays and drainage pipework.	As required As required 6 monthly

Notes:

- Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained.
- NHS/HFS Confined Spaces policies, procedures and guidance should be considered when preparing safety risk assessments and method statements for disinfection works where applicable.
- Please note that disinfectant chemical and the concentration/contact times may impact on plant and equipment warranties. This should be considered as part of any disinfection procedures.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

LEGIONELLA RISK ASSESSMENT

Microbiological Sampling (Legionella)[7]

Sampling requirements and frequency are to be formulated by NHS and written scheme should be updated as appropriate.

Legionella testing may be required:

- In systems where the temperature control regimes are not consistently achieved, frequent testing e.g. Weekly should be carried out to provide early warning of loss of control. Once the system is brought back under control as demonstrated by monitoring, the frequency of testing should be reviewed
- Weekly checks are recommended until the system is brought under control;
- When an outbreak is suspected or has been identified;
- In wards with at-risk patients – for example those who are immuno-compromised ("high risk patient" areas stil to be confirmed to DMA).

As a minimum, samples should be taken as follows:

- From the cold water storage and the furthermost outlet from the tank, on every loop;
- From the calorifier flow, or the closest tap to the calorifier, and the furthermost tap on the hot water service circulating system (these should be identified on sentinel outlet register);
- Additional samples should be taken from the base of the calorifier via drain valves;
- From areas where the target control parameters are not met (ie where temperatures are below 55°c for hot water systems or ≥20°c for cold water systems);
- From areas subject to low usage, stagnation, excess storage capacity, dead legs, excessive heat loss, crossflow from the water system or other anomaly.
- High Risk Patient Areas
- Additional random samples may also be considered appropriate where systems are known to be susceptible to colonisation.

The temperature control regime is the preferred strategy for reducing the risk from *Legionella* and other waterborne organisms in water systems. This will require monitoring on a regular basis. The recommended test frequencies for various outlets are set out in Table 2 in Section 7.

HSG 274 Part 2 Table 2.3 Actions to be taken following legionella sampling in hot and cold water systems in healthcare premises with susceptible patients

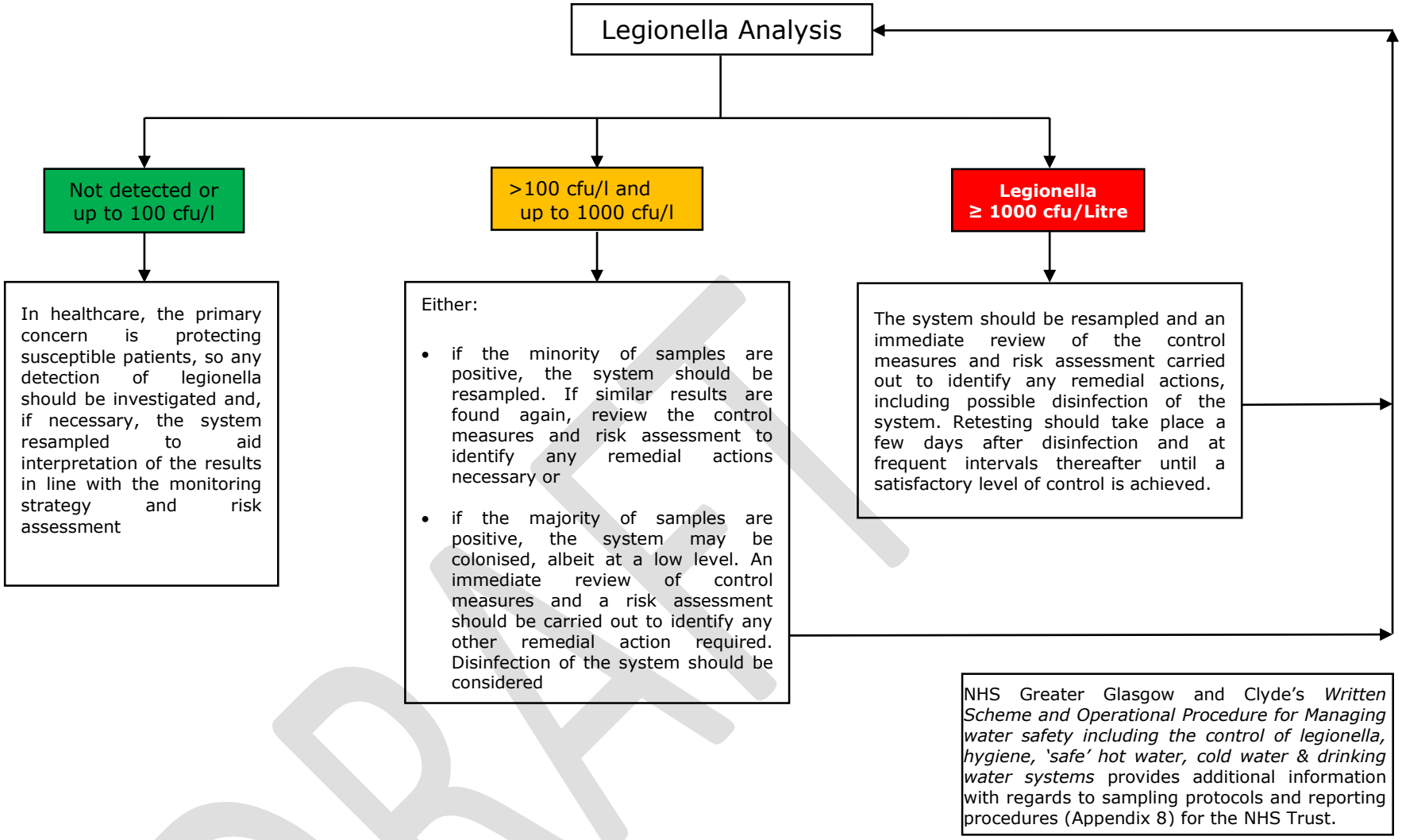
Legionella bacteria (cfu/l)	Recommended actions
Not detected or up to 100 cfu/l	In healthcare, the primary concern is protecting susceptible patients, so any detection of legionella should be investigated and, if necessary, the system resampled to aid interpretation of the results in line with the monitoring strategy and risk assessment
>100 cfu/l and up to 1000 cfu/l	Either: • if the minority of samples are positive, the system should be resampled. If similar results are found again, review the control measures and risk assessment to identify any remedial actions necessary or • if the majority of samples are positive, the system may be colonised, albeit at a low level. An immediate review of control measures and a risk assessment should be carried out to identify any other remedial action required. Disinfection of the system should be considered
>1000 cfu/l	The system should be resampled and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection of the system. Retesting should take place a few days after disinfection and at frequent intervals thereafter until a satisfactory level of control is achieved

[7] Sampling regime should be formulated by site/client based on the known history of the water systems and the details included within this and previous risk assessments, with assistance of specialist legionella consultant (e.g. DMA) if necessary. For further guidance please refer to HSG 274 Part 2, SHTM 04-01 Parts 2 & 3, Greater Glasgow and Clyde Written Scheme and Operational Procedure and BS 7592:2008

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

LEGIONELLA RISK ASSESSMENT

Legionella Sample Out-Of-Spec Results Escalation Procedure (L8/HSG 274 Part 2 and SHTM 04-01)

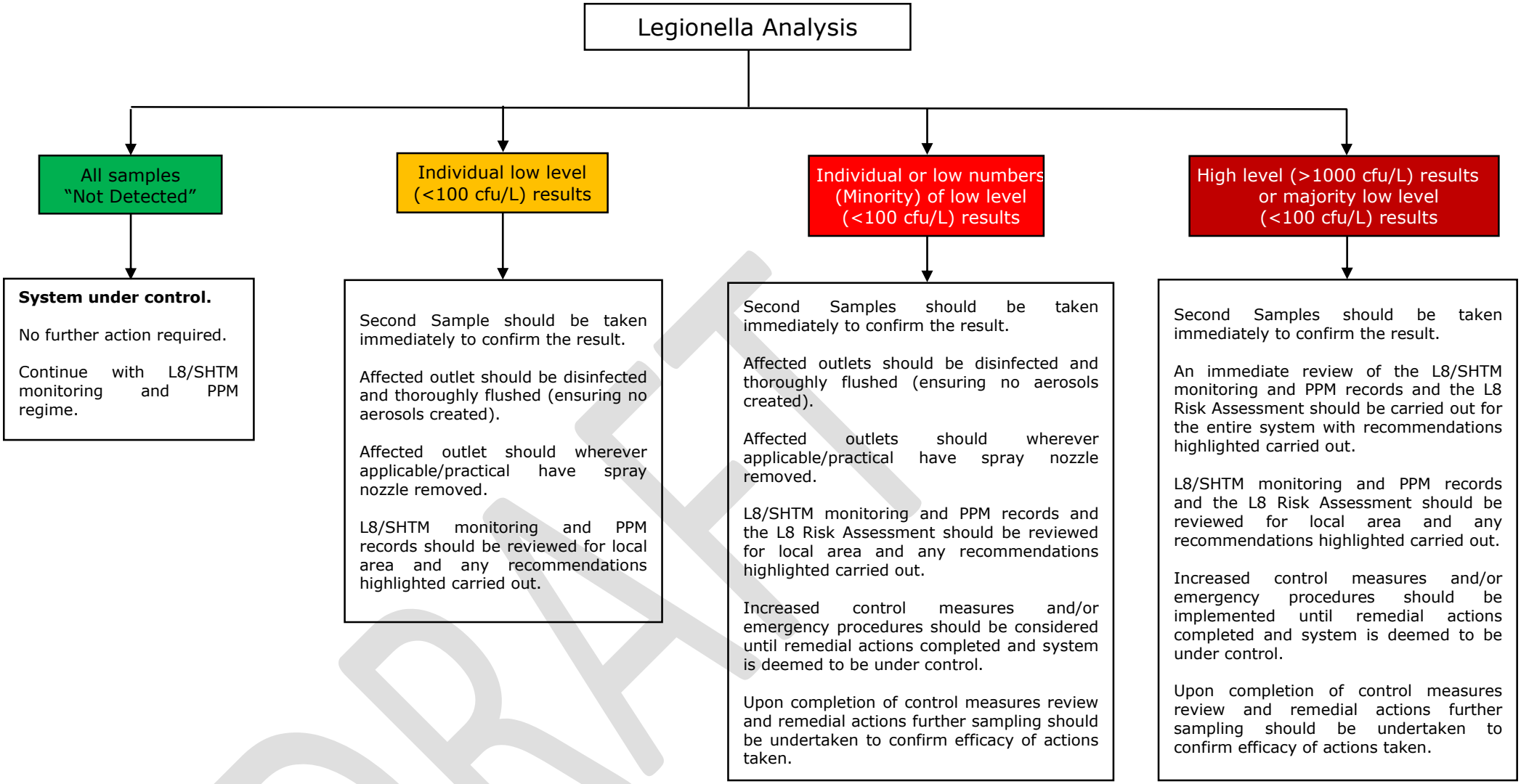


N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Legionella Sample Out-Of-Spec Results Escalation Procedure (Practical Guidance)

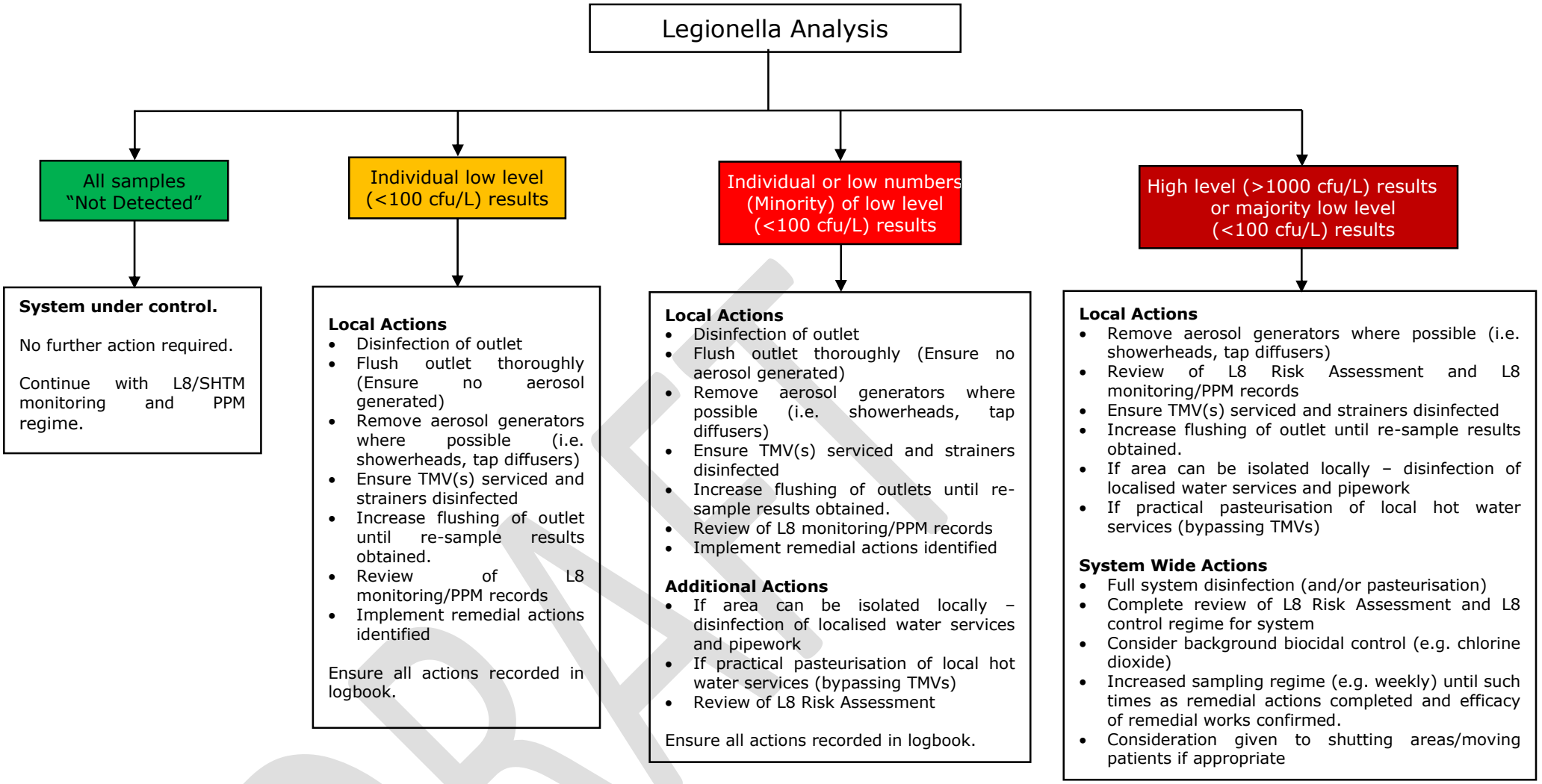


N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Legionella Sample Out-Of-Spec Results Remedial Actions Guidance



N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Microbiological (Potable/TVC) and Chemical Sampling

SHTM 04-01 Part C states:

Although TVCs are in themselves innocuous the testing procedures are intended to provide an early warning system whereby elevated TVCs should trigger some form of action to determine the identity of the organism and implement the appropriate treatment.

From BS 8558:2011

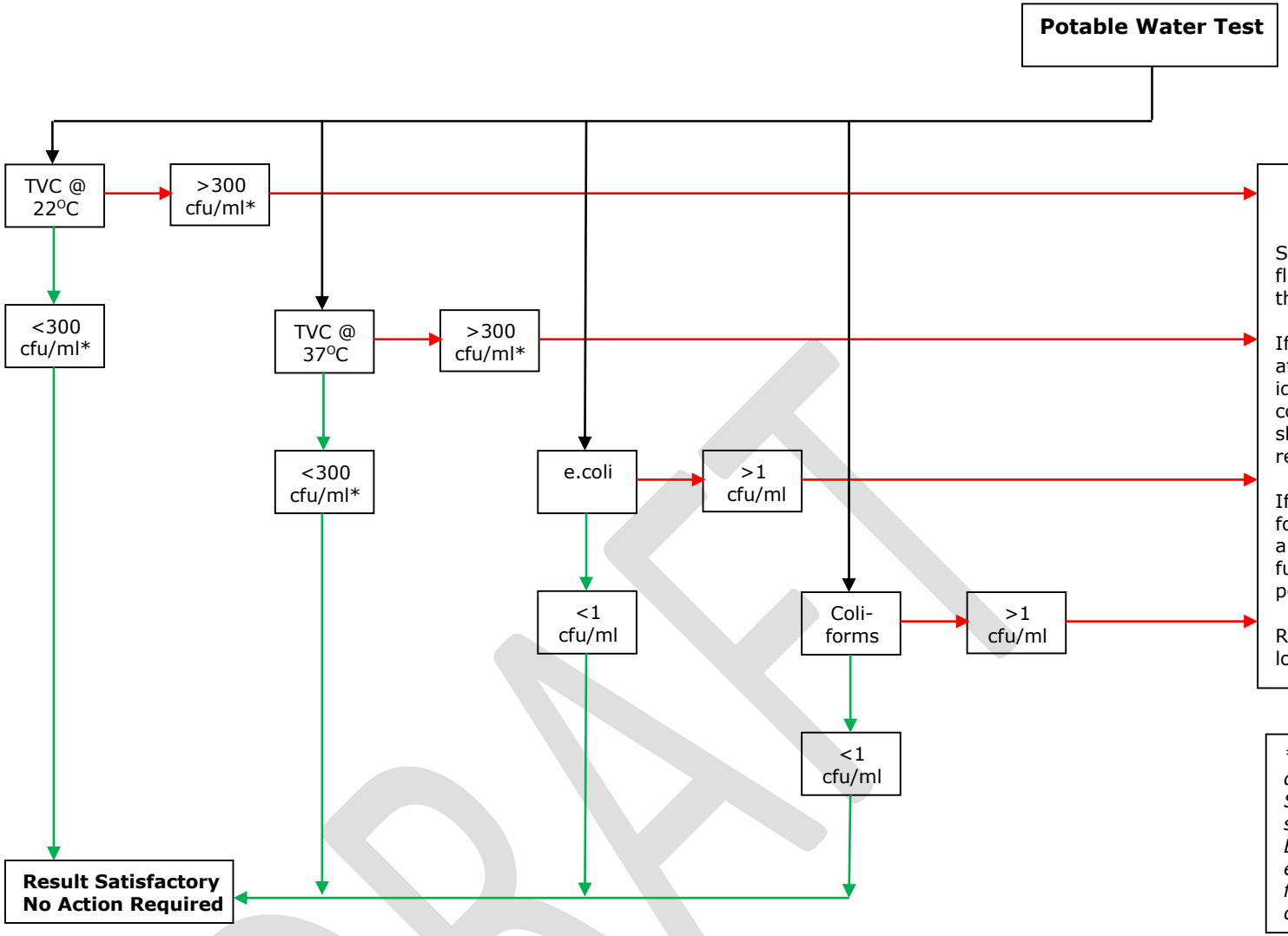
Regular analyses of water samples at intervals not exceeding six months should be carried out wherever drinking water is stored.

Periodic chemical and bacteriological analysis of water samples is a useful guide to the condition of an installation. For new installations in large buildings or complexes and where extensive repairs or alterations have been carried out to such installations, water samples should be collected and analysed.

Sampling requirements and frequency are to be formulated by NHS and written scheme should be updated as appropriate.

LEGIONELLA RISK ASSESSMENT

Potable Water Sample Out-Of-Spec Results Escalation Procedures



Result(s) Out of Specification

Sample point should be thoroughly flushed and cleaned/disinfected and then sample point re-sampled.

If 2nd Resample then area around the affected outlet should be inspected to identify potential problems, and control measures and risk assessment should be consulted to identify any remedial actions required.

If multiple out of specification results for a single system are identified then a full system disinfection in addition to further investigation to ascertain potential contamination issues.

Record actions and findings in site logbook.

** Please note that there are no definitive guidance limits for TVC. Scottish water advise that there should be "no abnormal change" and BS 8558 states "e.g. TVC results in excess of a 2 log difference above that found in incoming mains water, corrective action should be taken"*

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

LEGIONELLA RISK ASSESSMENT

Action in the event of an outbreak of legionellosis

Example Guidance from SHTM 04-01 Part B

Legionnaires' disease is notifiable in Scotland under public health legislation.

2 The Public Health Laboratory Service (PHLS) (now subsumed under the Health Protection Agency) defined an outbreak as two or more confirmed cases of Legionellosis occurring in the same locality within a six-month period. Location is defined in terms of the geographical proximity of the cases, and requires a degree of judgement. It is the responsibility of the Public Health Doctor for the declaration of an outbreak. The Public Health Doctor is appointed by the local authority under public health legislation.

3 Local authorities will have established incident plans to investigate major outbreaks of infectious diseases such as legionellosis. These are activated by the proper officer, who evokes an outbreak committee, whose primary purpose is to protect public health and prevent further infection. This will normally be convened to manage the incident and will involve representatives of the agencies involved. The Health & Safety Executive (HSE) or the local EHO may be involved in the investigation of outbreaks, their aim being to pursue compliance with health and safety legislation.

4 The local authority, Public Health Doctor or EHO acting on their behalf (often with the relevant officer from the enforcing authorities – either HSE or the local authority) may make a visit.

5 As part of the outbreak investigation and control, the enforcing authority may make the following requests and recommendations:

- *to shut down any processors that are capable of generating and disseminating air-borne water droplets and keep them shut down until sampling procedures and any remedial cleaning or other work has been done. Final clearance to restart the system may be required;*
- *to take water samples from the system before any emergency disinfection is undertaken. This will help the investigation of the cause of illness. The investigating officers from the local authority/authorities may take samples, or require them to be taken;*
- *to provide staff records to discern whether there are any further undiagnosed cases of illness, and to help prepare case histories of the people affected;*
- *to cooperate fully in an investigation of any plant that may be involved in the cause of the outbreak. This may involve, for example:*
- *tracing of pipework runs;*
- *detailed scrutiny of all operational records;*
- *statements from plant operatives and managers;*
- *statements from water treatment contractors or consultants.*

Any infringements of relevant legislation may be subject to a formal investigation by the appropriate enforcing authority.

Emergency cleaning and disinfection of water systems

If a water system, other than a cooling system, is implicated in an outbreak of Legionnaires ' disease, emergency treatment of that system should be carried out as soon as possible. This will involve disinfection as set out in Section 17 of SHTM 04-01 Part A and site method statements.

LEGIONELLA RISK ASSESSMENT

Appendix 1

Example Low Use (Sporadically Used) Outlet Flushing Responsibility Structure

Document Review Date	
Reviewed By	

Area/Ward	Location	Outlets Identified as Requiring Flushing	Locally Nominated Responsible Person (LNRP)	Person(s) Flushing Tasks Delegated To	Frequency of Flushing Required	Last update from LNRP (Date)
e.g. Higher Acuity Renal Wards	Fourth Floor North West Wing		Ward Sister(?)		Twice Weekly	
e.g. Haemo-oncology Ward	Fourth Floor South West Wing		Ward Sister(?)		Twice Weekly	
e.g. Restaurant and Visitor Dining	First Floor North		Domestics(?)		Twice Weekly	
e.g. Main Kitchen	Third Floor		Domestic(?)		Twice Weekly	
e.g. Roof Garden	Third Floor		Estates(?)		Twice Weekly	

N.B. This register is in addition to the daily water draw-off from all outlets which should form part of the daily cleaning process.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Appendix 2

Example Register of 'Little' or 'Sporadically' Used Outlets and Showers

Area/Ward			**Location**		**Document Completion Date**	
					Completed By	
Room	**Outlets Identified as Requiring Flushing**	**Dates Outlet(s) identified as requiring flushing**	**Reason**	**Frequency of Flushing Required**	**Dates Outlet(s) confirmed as no longer requiring flushing**	**Reason**
e.g. 7	Toilet WHB, WC & Shower	01/01/15	Bedridden user	Twice Weekly		
e.g. DSR	All	01/01/15	Used as Store	Twice Weekly		
e.g. 12	All Outlets	01/01/15	Room Empty	Twice Weekly		

N.B. This register is in addition to the daily water draw-off from all outlets which should form part of the daily cleaning process.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

A49585984

LEGIONELLA RISK ASSESSMENT

Appendix 3

Example Method Statements

Method statements for mechanical tasks (e.g. checks to ensure pumps operating correctly, water tank level checks, TMV servicing) should be referenced or inserted into this section.

All record sheets should be signed by person carrying out the task with date and time of operation recorded.

Sentinel Outlets and Outlet Temperature Monitoring

Equipment required: Calibrated Thermometer with surface and immersion probe, Sentinel & Outlet Register
Method of identifying and recording outlet locations/asset number (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. At each sentinel outlet location, inspect outlet and note any issues (e.g. out of order outlets, scale build-up, damaged diffusers).
2. Run cold tap for 2 minutes and monitor temperature throughout.
3. Record temperature after 2 minutes and any observations (e.g. heat gain/spike, temperature slow to fall, discoloured water etc.)
4. If temperature is 20°C or above (or anomalous with current temperature profile) record along with any noticeable reason for high temperature.
5. Run hot tap in first sentinel location for 1 minute and monitor temperature throughout.
6. Record temperature after 1 minute and any observations (e.g. heat loss, temperature slow to rise, discoloured water etc.) If temperature is 55°C or below (or anomalous with current temperature profile) record along with any noticeable reason for low temperature.
7. Repeat procedures 1 - 6 for each sentinel outlet location
8. Repeat procedures 1 - 6 for subsample of other outlets, aiming to cover 20% of outlets over the course of 12 months, with all outlets being monitored over a 5 year period (or a pre-defined period of time).
9. If unused outlets or unrecorded deadlegs or other issues are observed these should be recorded to allow remedial actions to be taken and appropriate registers to be updated.

Hot Flow and Return Loop Temperature Monitoring

Equipment required: Calibrated Thermometer with surface contact probe, Register of primary, sub-ordinate and tertiary hot flow and return loops
Method of identifying and recording flow and return locations (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. Using contact probe record temperature at flow and return principle loops (monthly), sub-ordinate loops (Quarterly) and tertiary loops (annually) to create a temperature profile of building and monitor flow and return system. If temperature is 55°C or below record any noticeable reason for low temperature.

Where appropriate temperatures should be compared to those from BEMS to identify any discrepancies.

LEGIONELLA RISK ASSESSMENT

Calorifiers Temperature Monitoring

Equipment required: Calibrated Thermometer with surface contact probe, Calorifier Register
Method of identifying and recording calorifier locations/asset number (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. At each calorifier inspect pipework & plant and note any relevant issues.
2. Record temperature of hot water flow as close to each calorifier as possible. If temperature is below 60°C record any obvious reason for low temperature and follow appropriate escalation procedures.
3. Record temperature of hot water return as close to each calorifier as possible. If temperature is below 55°C record any obvious reason for low temperature and follow appropriate escalation procedures.

Where appropriate temperatures should be compared to those from BEMS to identify any discrepancies.

Flushing Calorifier Drain/Base

Equipment required: Calibrated Thermometer with immersion probe, Calorifier Register, Suitable PPE
Method of identifying and recording calorifier locations/asset number (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. At each calorifier inspect pipework & plant and note any issues, and ensure safe to proceed.
2. Attach hose to drain of calorifier and run to drain in plantroom or place suitable container under calorifier drain.
3. Suitable isolation should be carried out to ensure calorifier base is purged and not supply/distribution pipework only (e.g. isolate cold feed supply valve)
4. Test drain to ensure working correctly and will open/close safely. Record and escalate any faults as appropriate.
5. Calorifier drains should be opened and water flushed to drain until water runs clear.
6. Record temperature of water running from the calorifier base.
7. Close calorifier drain and dispose of collected water (if applicable)
8. Record water quality discharged from drain (e.g. clear, dirty for 10 seconds). Where water quality is poor and/or temperature indicates potential legionella control problems this should be escalated as appropriate.

Cold Water Storage Tank Inspection

Equipment required: Calibrated Thermometer with immersion probe, CWST Register, Suitable PPE, Camera, Torch
Method of identifying and recording calorifier locations/asset number (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. At each CWST inspect pipework & plant and note any issues, and ensure safe to proceed.
2. Check security of tank lid and hatch(es).
3. Check integrity of rodent screens on overflow/warning pipes.
4. Check integrity of tank lid vents.
5. Open lid hatch(es) and inspect internal surfaces for signs of contamination/fouling and water clarity/quality within the tank. Record observations and escalate any faults as appropriate.
6. Take photographs of internal condition of tank, and any other relevant issues.
7. Record temperature of make-up water[8] noting which supply this relates to (e.g. Govan Road, Raw CWST 1A/B) and stored water as remote from inlet as possible - both should be below 20°C. Any variation of 2°C may indicate excess storage or low turnover and should be escalated as appropriate.

[8] This step should be repeated to ensure all supplies are recorded on each inspection cycle.

LEGIONELLA RISK ASSESSMENT

Cleaning, Descaling and Disinfection of Showerheads and Hoses (in-situ)

Equipment required: Outlet (or Shower) Register, Showerhead Plus Legionella specific descaler/degreaser, suitable lidded container, manual cleaning utensils (e.g. clean cloth, small soft brush) Method of identifying and recording outlet/shower locations/asset number (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. At each shower location, inspect outlet and record any issues (e.g. out of order outlets, scale build-up, damaged fittings, heads, hoses)
2. Remove shower head (and hose where applicable).
3. Dismantle removable parts (if possible) and physically clean.
4. Submerge the components in a solution of Showerhead Plus Legionella specific descaler/degreaser (maximum dilution 3-1) for a minimum time of 2 minutes ensuring colour is still yellow indicating active product present.
5. Remove components and flush disinfectant solution from external surfaces using fresh water.
6. Replace showerhead (and hose), purge vigorously with fresh water and return to normal service.
7. If adjustable showerhead is noted as present this should be recorded and escalated as appropriate for replacement.
8. Record actions and any issues and escalate as appropriate.
9. Where significant fouling is recorded frequency of cleaning, descaling and disinfection should be reviewed.

LEGIONELLA RISK ASSESSMENT

Flushing of Low Use/Sporadically Used Outlets

Equipment required: Calibrated Thermometer with surface and immersion probe, Register of 'Little' or 'Sporadically' Used Outlets and Showers (this will be "every outlet" for period 26th January to 26th April and should then be revised appropriately during phased occupation).
Method of identifying and recording outlet/shower locations/asset number (e.g. barcode, QR, IR) and data capture method to be confirmed.

1. At each outlet location, inspect outlet and note any issues (e.g. out of order outlets, scale build-up, damaged diffusers).
2. Each outlet(s) shall be opened and flushed for a minimum of 3 minutes and the water temperature stabilises in line with current temperature profile.
3. WCs (where fitted) should be flushed on entry to the room and again prior to leaving room, whilst the other outlets are being flushed.
4. Where connection points are fitted awaiting equipment installation (or other deadlegs) these should be flushed as per point 2.
5. Flushing of multiple outlets at the same time (and indeed may be advantageous) in a room/area is perfectly acceptable so long as all outlets are flushed as per Point 2.
6. Record actions and any issues and escalate as appropriate.

Flushing Notes:

- Minimise aerosol creation wherever possible (E.g. do not fit showerheads until rooms are to be occupied)
- If flushing multiple outlets simultaneously care should be to ensure sinks etc. do not overflow.

N.B. Ensure all actions are recorded and stored in the site L8 Legionella Logbook

From: David Watson
To: "Powrie, Ian"
Cc: Allan McRobbie; Mike Kinghorn
Subject: RE: sample draw off record
Date: 16 January 2015 11:11:00
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

Ian

Flushing sheet you have created would appear to be suitable for stage 1 and Yes there is an "example method statement" which covers flushing in documentation we will be sending you.

With regards to the flushing regime you will require to implement the SHTM makes numerous references to flushing procedures. Unfortunately we haven't found anything which directly describes the handover and phased occupancy period you are about to enter and would specifically permit dropping flushing frequency, certainly without creating other issues which could be more onerous.

Its also worth noting that the SHTM and HSG 274 provide no guidance to suggest that your building can be viewed as anything other than a "live building" (irrespective of whether healthcare or "other") and therefore the written scheme/ppm won't vary hugely at this stage to the final requirements once building is occupied.

Therefore things like temperature monitoring will be required and maintenance tasks on plant items would require to kick off now (Or at least the clock ticking on the countdown to the first "service" tasks).

Myself and Allan have completed the written scheme for stage 1 and have passed to our colleague Mike Kinghorn to proof read – should have it with you by close of play today.

In the meantime if we can be of any other assistance please do not hesitate to contact us.

Regards
David Watson
Director

Mob: [redacted]

DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

From: Powrie, Ian [redacted]
Sent: 15 January 2015 06:35
To: Allan McRobbie; David Watson
Subject: Fwd: sample draw off record

David/Allan
Please find attached the revise record sheet for the water flushing programme, can you confirm this meets with the stage 1 written scheme?
Have you confirmed the need for flushing every 3 days? From what Brookfeild are telling me they are flushing every 3 days to maintain the cold water temps below 20C.
I assume that the stage 1 written scheme will include an SOP for the staff carrying out this programme?
If you can let me know ASAP I will have the full schedule of record sheets produced and printed ready for the 26th.
Regards
Ian

I.Powrie
Sector Estates Manager (NSGH)
Project Team, New South Glasgow Hospitals,
Southern General Hospitals Construction Site,
2nd Floor, Modular Building, Off Hardgate Road, Glasgow,G51 4SX
[redacted]
Tel: [redacted]
Reception: [redacted]
Mob: [redacted]

From: Powrie, Ian
To: Allan McRobbie; David Watson
Subject: Fwd: sample draw off record
Date: 15 January 2015 06:35:12
Attachments: NSGH_DEPT-FLUSH.pdf
ATT00001.htm

David/Allan

Please find attached the revise record sheet for the water flushing programme, can you confirm this meets with the stage 1 written scheme?

Have you confirmed the need for flushing every 3 days? From what Brookfeild are telling me they are flushing every 3 days to maintain the cold water temps below 20C.

I assume that the stage 1 written scheme will include an SOP for the staff carrying out this programme?

If you can let me know ASAP I will have the full schedule of record sheets produced and printed ready for the 26th.

Regards

Ian

I.Powrie
Sector Estates Manager (NSGH)
Project Team, New South Glasgow Hospitals,
Southern General Hospitals Construction Site,
2nd Floor, Modular Building, Off Hardgate Road, Glasgow,G51 4SX
[redacted]
Tel: [redacted]
Reception: [redacted]
Mob: [redacted]

PLANTROOM :	21	LEVEL:	0	ZONE:	ZD	DEPARTMENT:	DAY CASE UNIT

ROOM NO.	SCHEDULE OF EQUIPMENT
NSGH-00-DCU-001	✓ WASH BASIN; clinical; with non touch panel mounted taps
NSGH-00-DCU-003	✓ DRENCH SHOWER chain operated; ceiling mounted ✓ WASH BASIN; wash room; with basin mounted taps
NSGH-00-DCU-004	✓ WASH BASIN; clinical; with non touch panel mounted taps
NSGH-00-DCU-005	✓ WASH BASIN; clinical; with non touch panel mounted taps

ACTIVITY		DATE	TIME	FLUSHED/COMMENTS	SIGNATURE
WEEK 1	DRAW 1				
	DRAW 2				
WEEK 2	DRAW 1				
	DRAW 2				
WEEK 3	DRAW 1				
	DRAW 2				
WEEK 4	DRAW 1				
	DRAW 2				
WEEK 5	DRAW 1				
	DRAW 2				
WEEK 6	DRAW 1				
	DRAW 2				

VERIFIED		
WEEK 1	NAME: NOMINATED EO	DATE:
WEEK 2	NAME: NOMINATED EO	DATE:
WEEK 3	NAME: NOMINATED EO	DATE:
WEEK 4	NAME: NOMINATED EO	DATE:
WEEK 5	NAME: NOMINATED EO	DATE:
WEEK 6	NAME: NOMINATED EO	DATE:

From: David Watson
To: "Ian.Powrie[redacted]
Cc: Allan McRobbie; Mike Kinghorn
Subject: Questions
Date: 12 January 2015 18:05:00
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

Ian
Allan and I have been working over the weekend and require some information to aid our risk assessment and written scheme guidance documentation.
we would appreciate if you could provide us with any information you have in relation to the following;
1 – List and location of identified “high risk/augmented care” areas
2 – Management Structure and communication pathways for all parties involved in legionella control (required for present, handover/occupancy period and ongoing legionella control after full occupancy if already established)
3 – Asset register (understand Mercury were going to provide you with this)
4 – Are any “point of use” filters going to be routinely used (i.e. legionella filters on showerheads – e.g. these are routinely used in the Schehallion ward at Yorkhill)
5 – Function of irrigation system (not running whilst we were on site) i.e. does it create an aerosol or just flow out slowly direct to ground
6 – Can you confirm the type of showerheads to be installed (i.e. are these adjustable flow pattern or not – hopefully not! or specifically low aerosol type)
7 – What is the official name of the hospital (does South Glasgow University Hospital cover the children’s hospital or does this have a separate name)
8 – Drawing 500-501 Z1 states “Renal Tanks TBC” and these weren’t shown to us when on site. Can you provide some detail particularly where they will be supplied from.
9 – Hydrotherapy Pool – we may just be missing something obvious on a drawing but can you confirm if this is fed from the trades tank or from the bulk water?
Any assistance would be appreciated.

Regards
David Watson
Director

[redacted]
DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

From: Allan McRobbie
To: Powrie, Ian
Cc: David Watson
Subject: RE: NSGH Water System Drawings
Date: 09 January 2015 16:49:16
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

Hi Ian
Yes yesterday's meeting and walk-round was extremely beneficial and at first look we were impressed by the general standard of installation.
We will be reviewing our findings over the weekend and will no doubt be in touch early next week when we look over the drawings with further questions.
We have received the PO this afternoon which will keep the office happy!
Best regards
Allan McRobbie
Compliance Manager

Mob: [redacted]
DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

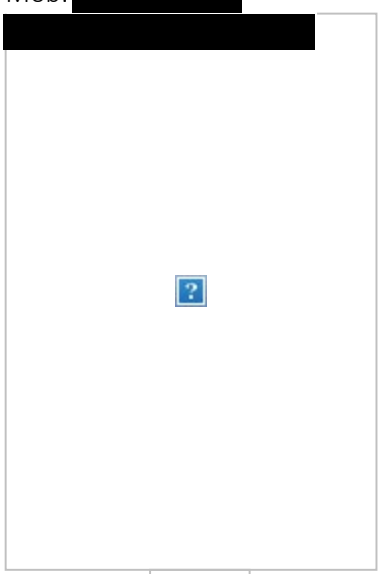
From: Powrie, Ian [redacted]
Sent: 09 January 2015 14:15
To: Allan McRobbie
Cc: David Watson
Subject: RE: NSGH Water System Drawings
Hi Alan
I hope yesterdays visit was of assistance in the delivery of your RA & written schemes, please let me know if you need any more support on site during this process.
I have also attached FYI a copy of the PO which you should receive shortly through normal channels.
Regards
Ian

[redacted]
Sector Estates Manager (NSGH)
Project Team, New South Glasgow Hospitals,
Southern General Hospitals Construction Site,
2nd Floor, Modular Building, Off Hardgate Road, Glasgow,G51 4SX
[redacted]
Tel: [redacted]
Reception: [redacted]
Mob: [redacted]

From: Allan McRobbie [redacted]
Sent: 06 January 2015 14:11
To: Powrie, Ian
Cc: David Watson
Subject: RE: NSGH Water System Drawings

Thanks Ian, sorry I missed your call earlier I was in a meeting.
This is fine for us, we have received emails from Zutec and set up the accounts.
Will call you after the inductions tomorrow and proceed from there.
Best regards
Allan McRobbie
Compliance Manager

Mob: [redacted]
[redacted]



Help the environment - do you need to print this e-mail?

From: Powrie, Ian [redacted]
Sent: 06 January 2015 12:24
To: Allan McRobbie
Cc: David Watson
Subject: RE: NSGH Water System Drawings

Hi Allan\David
The drawing produced below are construction phase drawing, which until this week where all that was available to me, however I now have access to the as fitted drawings via a document management system called Zutec, which is a web hosted system.

I would therefore propose to have you both provide with access rights to the fitted drawings and system description & equipment information for the relevant services namely:

- Water services
- Hydrotherapy pool
- Ventilation

In order to support your effective access to the required documentation I have arranged for Zutec user training for you both tomorrow after your site induction, if you call me on my mobile when the induction is complete I will come and introduce you to Garreth Tackney from Zutec who will provide your user training. This can be tailored to your available time but 30 – 60 mins.
Please confirm that you are comfortable with this approach and that your availability for training after site induction tomorrow.
Regards
Ian

[redacted]
Sector Estates Manager (NSGH)
Project Team, New South Glasgow Hospitals,
Southern General Hospitals Construction Site,
2nd Floor, Modular Building, Off Hardgate Road, Glasgow,G51 4SX
[redacted]
Tel: [redacted]
Reception: [redacted]
Mob: [redacted]

From: Allan McRobbie [redacted]
Sent: 06 January 2015 10:21
To: Powrie, Ian
Cc: David Watson
Subject: NSGH Water System Drawings

Ian
We have had a review of the drawings provided.
We found 7 of the drawings appear to be older versions which were superseded by other drawings provided. We would assume that the newer version is the most up-to-date drawing available. The following appear to be older versions:
ZBP-XX-XX-SC-500-021_01 (2)
ZBP-XX-XX-SC-500-021_01
ZBP-XX-XX-SC-500-022_03
ZBP-XX-XX-SC-500-031_03
ZBP-XX-XX-SC-500-032_03
ZBP-XX-XX-SC-500-033_03
ZBP-XX-XX-SC-500-041_03
G1313-P(53)01_0[1] is a drawing from the laboratory medicine building.
The drawing review at present will be based on the following:
ZBP XX XX PL 500 050 02[1] Typical Ward Layout
ZBP ZA 04 PL 500 151 02[1] Plantroom 41 4th floor
ZBP ZB 04 PL 500 153 02[1] Plantroom 41 4th floor
ZBP-FM-B1-PL-500-061_F[1] Basement FM and Kitchen Area
ZBP-FM-B1-PL-500-065_02 Basement Tank Layout
ZBP-FM-B1-SC-500-001_01 Primary Water Services Schematic
ZBP-XX-XX-SC-500-021_B[1] Plantroom 21 Secondary Water Services Schematic
ZBP-XX-XX-SC-500-022_C[1] Plantroom 22 Secondary Water Services Schematic
ZBP-XX-XX-SC-500-031_B[1] Plantroom 31 Secondary Water Services Schematic

ZBP-XX-XX-SC-500-032_C[1] Plantroom 32 Secondary Water Services Schematic
ZBP-XX-XX-SC-500-033_C[1] Plantroom 33 Secondary Water Services Schematic
ZBP-XX-XX-SC-500-041_C[1] Plantroom 41 Secondary Water Services Schematic
ZBP-XX-XX-SC-509-001_02[1] Renal Water Services Schematic
ZBP-ZA-03-PL-500-031_C[1] NCH 3rd floor In Patient Ward and Renal
ZBP-ZB-00-PL-500-002_E[1] NCH Ground floor OPD
ZBP-ZB-01-PL-500-012_C[1] NCH 1st floor Cardiology, PICU Support and MDU
ZBP-ZB-02-PL-500-022_C[1] NCH 2nd floor Asecptic Unit, Day Case & Ward Sup
ZBP-ZB-03-PL-500-032_C[1] NCH 3rd floor In Patient Ward and Ward Support
ZBP-ZC-01-PL-500-013_D[1] NCH 1st floor 23 Hours Unit

We will proceed with the assessment based on these and would also request the following if available:

- Can the drawings be provided in colour
- The 'Symbology Key' DT 590 001
- Sanitary Ware Installation Arrangements for 'typical ward', 'non typical ward', 'clinical' area and 'non clinical' areas (including for both types of TMV taps being used in clinical/non clinical) – possibly on drawings ZBP XX XX DT 581-006 and 007 though this should be confirmed
- Drawings from a selection of ward areas which are deemed to be 'higher risk' or 'non typical' to provide a representative sample
- Drawings from a selection of other clinical areas (non-wards) to provide a representative sample

We will be on site tomorrow morning at 8am for the induction so can collect any discs or hard copies then.

Best regards

Allan McRobbie

Compliance Manager

[redacted]

DMA Logo Email Signature


Help the environment - do you need to print this e-mail?

From:	Garreth Tackney
To:	Allan McRobbie; David Watson
Cc:	Powrie, Ian
Subject:	DMA - Zutec Online O and M Access.
Date:	06 January 2015 12:41:16
Attachments:	NSGH_User_Guide_End_Users_Zutec_rev3.pdf

Hi Allan / David

Ian Powrie has requested that I set you up on our online O and M system.

It would be good if you have time tomorrow to run through the system. Should only take about 30/40 mins. If it doesnt suit, i can assist you online or over the phone either. Just let me know.

To get you set up on the system you will receive a system generated email from zutec shortly with a link to create a password.(link expires after 3 hours) When you have your password created you simply go to www.zutec.com and login with your email and password.
If you do not receive link , check your spam folder.

Navigating Zutec

- Once logged in successfully , simply navigate to top left of page and expand folders as required
- See attached user guide if needed in future also

Regards,

Garreth Tackney | ZuTec |

Phone: Mobile [redacted] / Office [redacted]
| Email: [redacted] |

Visit us online at | www.zutec.com |

New South Glasgow Hospital
ZUTEC – USER GUIDE – End Users

Presented by:

Contact - Handover Manager (Zutec) – Garreth Tackney
Tel – [redacted]
Email - garreth.tackney[redacted]
Contact - Handover Manager (Brookfield) – David Wilson
Tel – [redacted]
Email - david.wilson[redacted]

ZuTec – Training / User Guide –

Table of Contents

Table of Figures

1. Login / Viewing Data.

The ZuTec system can be accessed from www.zutec.com and click on the Login button on top right of the page.
The login screen will appear (as per figure 1).

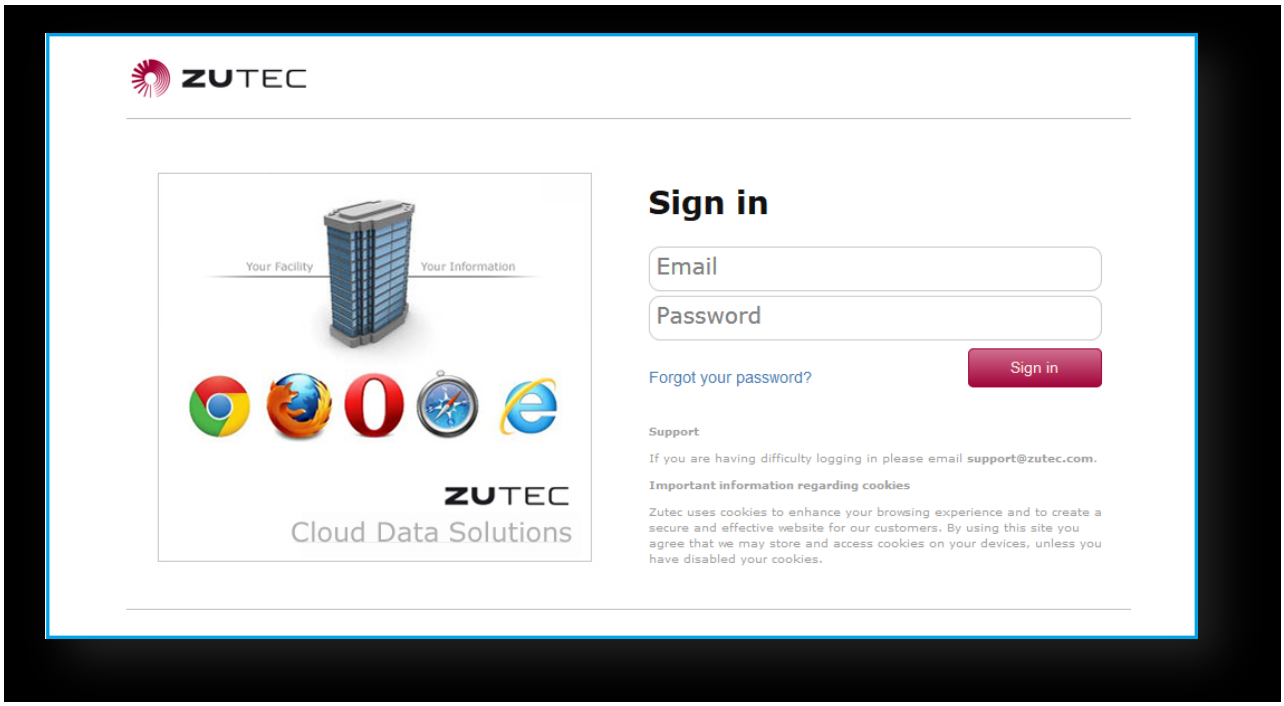


Figure 1 – Login Screen

Simply type your user name and password into the login box, and click login. Please note that both username and password are case sensitive..

You will then be taken to the Zutec system – this screen allows you to view your projects (those that you have access to) in the folder tree, on the left hand side of the screen (Figure 2).

Depending on your level of access you may also have the ability to see other options – i.e. change your password/ messages / personalize your account etc.

To obtain user access for the NSGH project please contact "**Garreth Tackney** "
garreth.tackney[redacted]

In Figure 2 below we have access the NSGH Project.

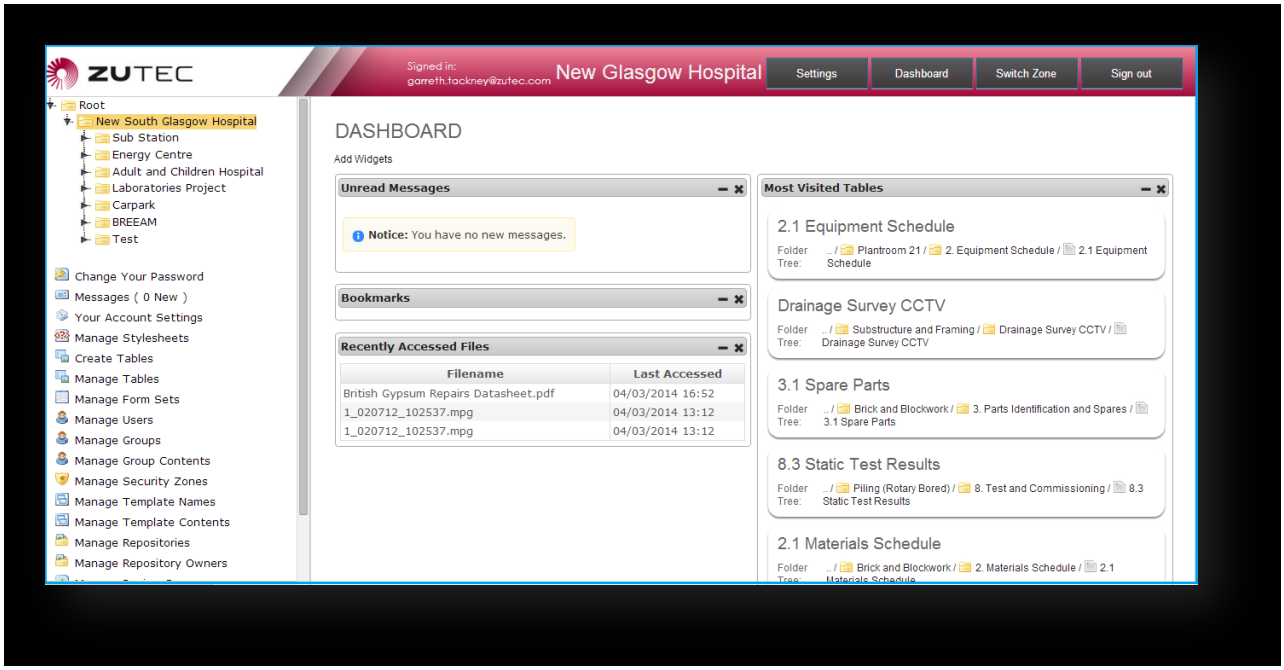


Figure 2 – Home Page

Clicking on the project you wish to view, will allow the folder to expand and contract, giving you access to the information inside that folder as shown in Figure 3

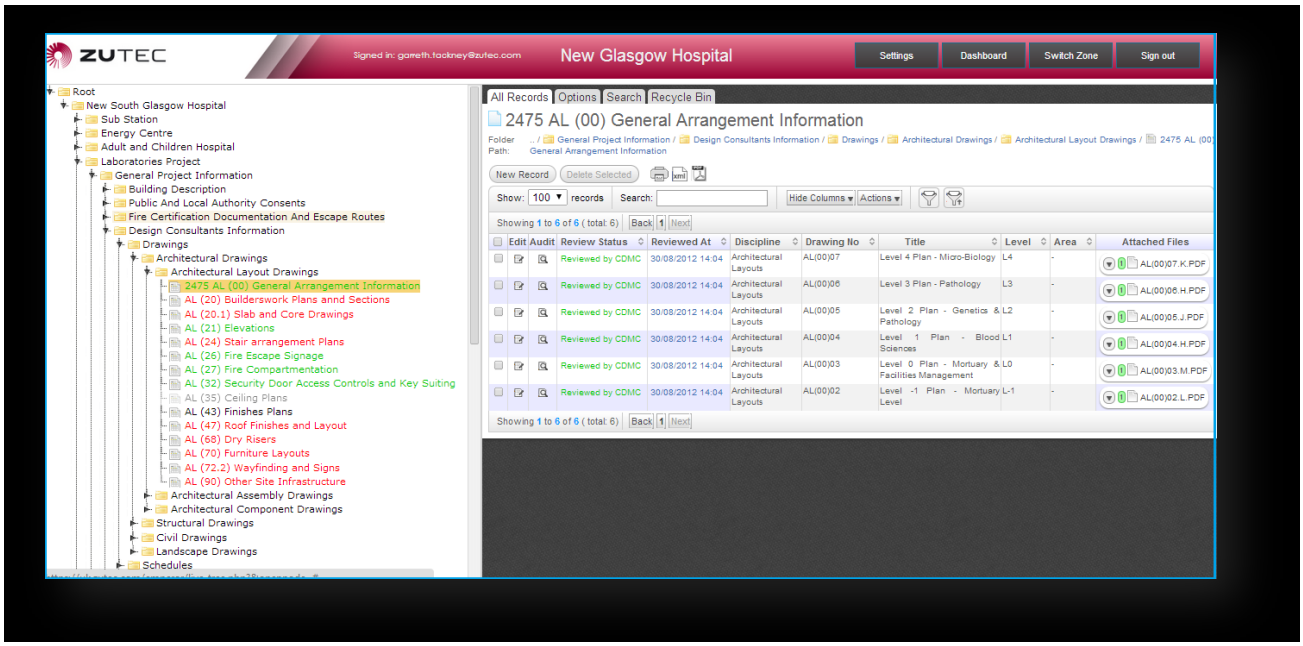


Figure 3 – Expanding Folders and Viewing Data

Clicking on each of the sections will open the required data (it is important to click on the text and not the folder).

2. The O&M Templates

Both the Building Services sub contractors and Building Fabric sub contractors have a pre-defined template for their O&M Manuals. This template has been set up for each sub contractor for each trade discipline. The following screen-shot shows the O&M template for the Building Services.

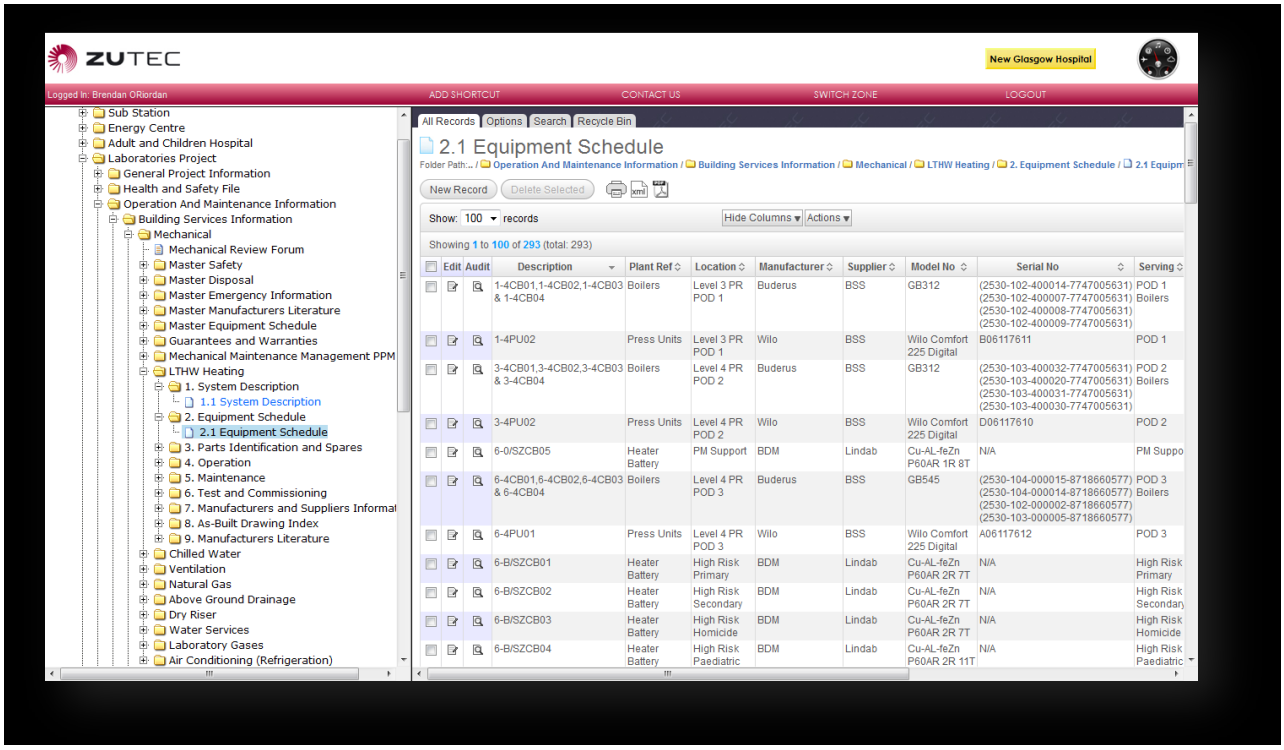


Figure 4 – O&M Template Structure.

2. Adding / Modifying Data.

The “Adding and Modifying of Data” depends upon your user access level. Many levels of access exist within the ZuTec system. Your system Administrator can advise as to what your level of access is. If you wish to upgrade your access level please contact David Wilson or Brendan O’Riordan

2.1 Adding a Record

To Add a record, simply click the “new record” button, in the section you wish to add a record to. In this instance we are adding a new As Built drawing (Project Record Drawing). (See Figure 5)

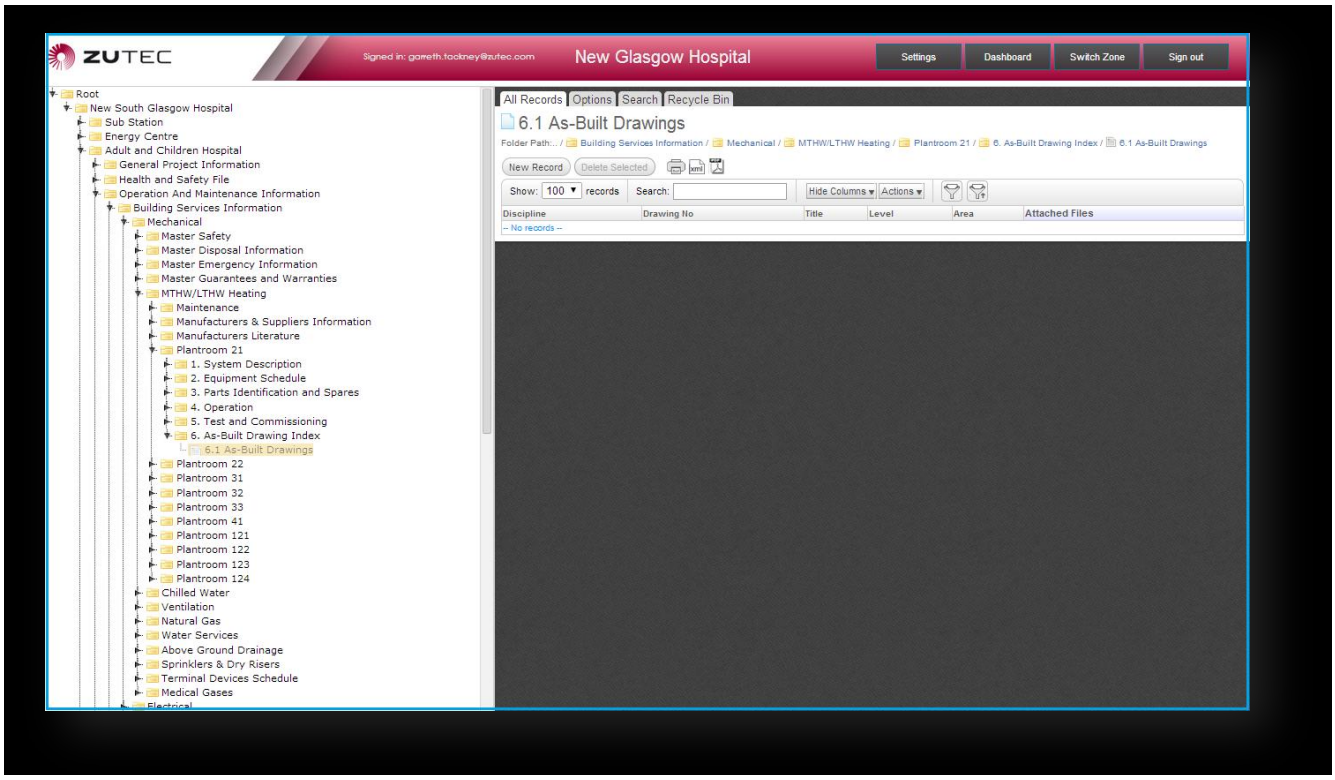


Figure 5 - Adding a Record - Part 1

Clicking on the “New Record” Button, opens the “Add Record” table, as shown in Figure 6.

Simply fill in the Fields as required and click the browse button to locate and attach the required drawing – click “save record”. This drawing file will then be linked to the record.

If you wish to attach multiple files you can do this - up to three at a time. If you wish to attach more than three files, you will have to re-open the record using the edit record option and attach the additional files. We would suggest that a .pdf copy of the drawing and a CAD version, be attached to each record.

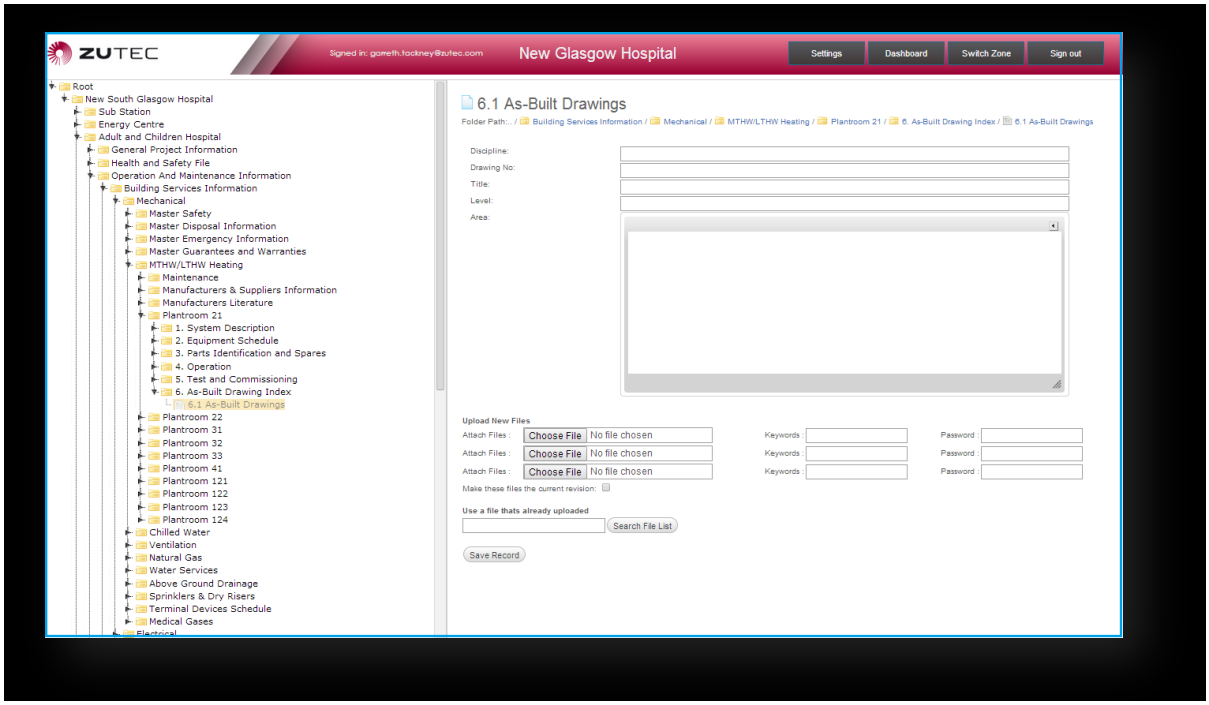


Figure 6 - Adding a New Record - Part 2

2.2 Editing Records

To edit a record click on the “edit record” icon - this will allow you to attach additional files or edit the text of the record in any way. This option is only available to you if you have “modify data” access – if you have read only access you cannot edit records. See Figure 7 Below.

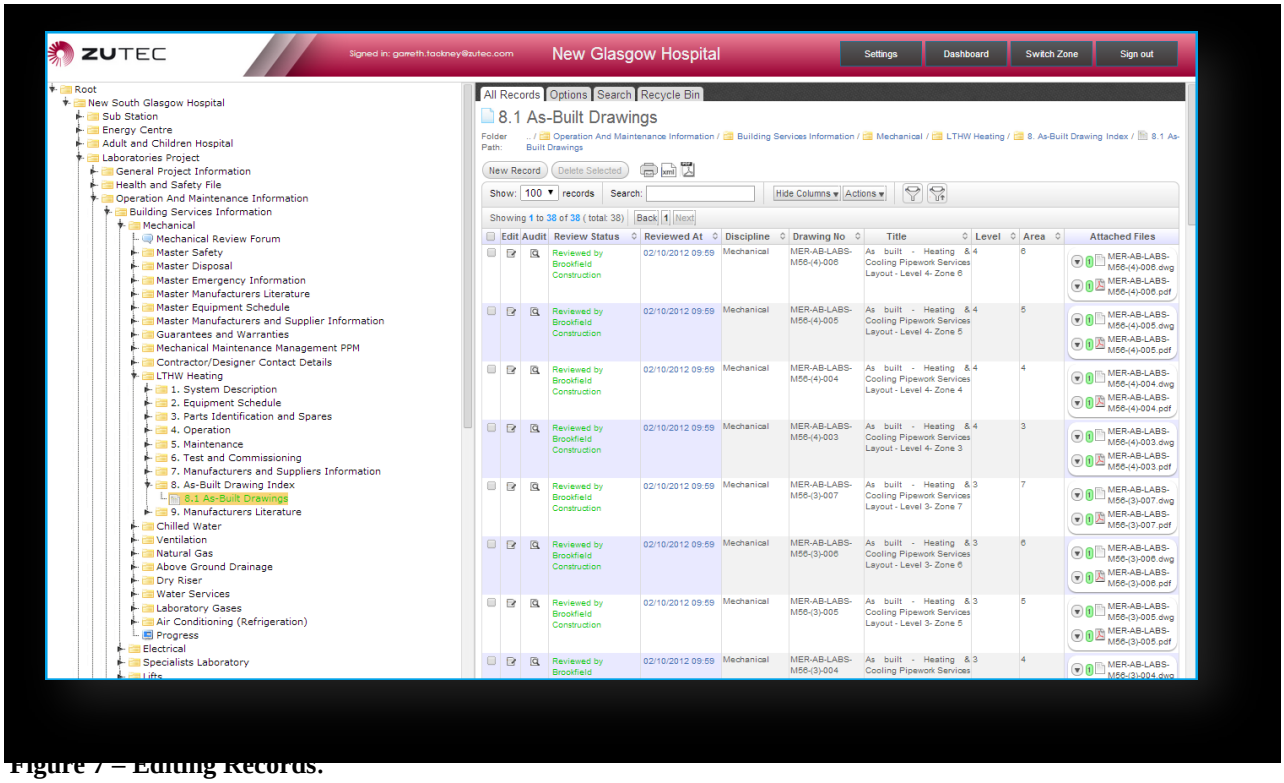


Figure 7 – Editing Records.

It is also possible to copy and paste text into the fields to speed up the inputting process – another option to speed up the process is to import your drawing registers from Excel.

2.3 Importing Data from Excel

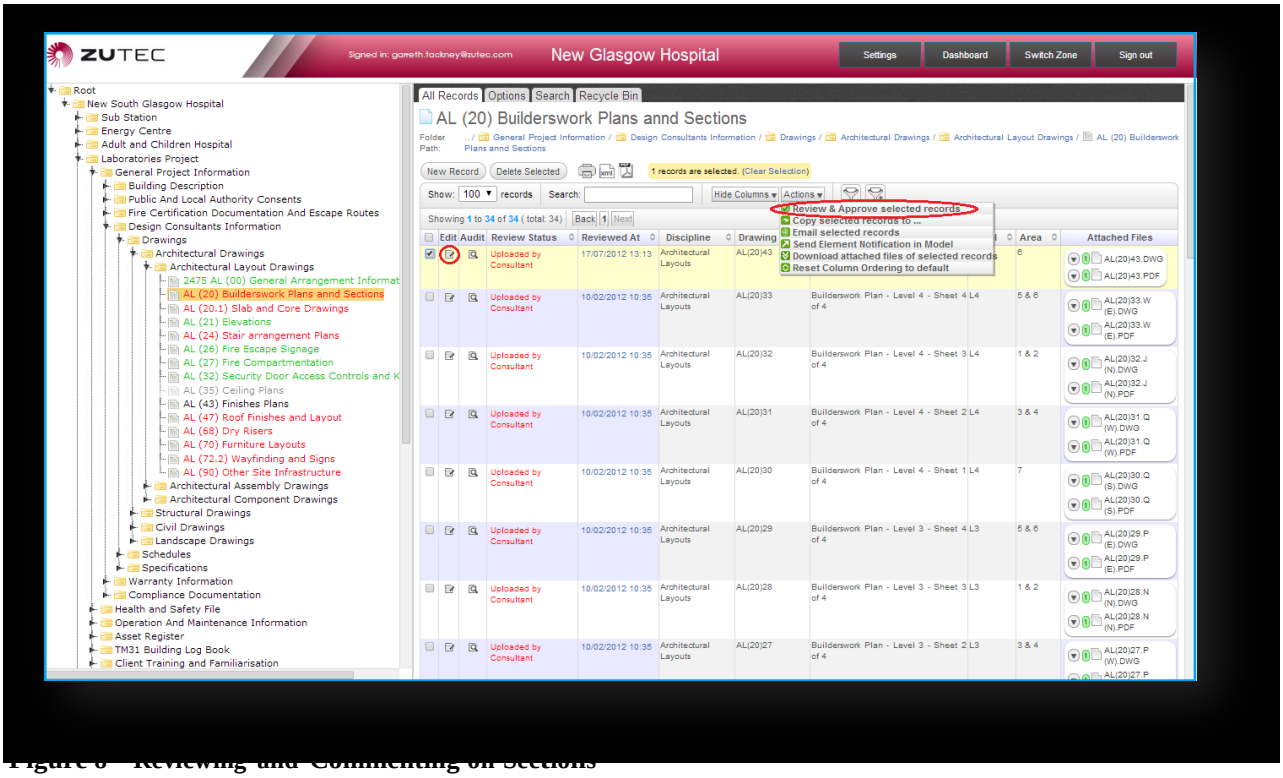
In some instances you may be adding a large number of records to the database. These are usually As Built (Project Record drawings), which you will have as a drawing register in excel format. The Zutec database allows for the importing of drawing registers using excel and thus you do not have to type all the records individually.

To import from Excel, the Excel columns must match the columns of the ZuTec database section into which you are importing.
To import from Excel please discuss this in advance with your system administrator.

3. Reviewing and Approving Sections.

The ZuTec system incorporates a “review and approve” procedure, for sign off. This is totally customizable and can be designed to suit the project requirements.

For the NSGH Project there are a number of different Review processes depending on the package/ documents in review; When a section of the manual is complete you must set that section to draft, to do this click on the records you wish to set to review. To Draft this Section click Review and Approve Item – see the screen shot below.



To review a Draft document open the required item set to Draft and click on the record that you wish to review and select “review and approve” screen from the drop down “Actions” again. When you select this you will see the following screenshot, complete it as follows

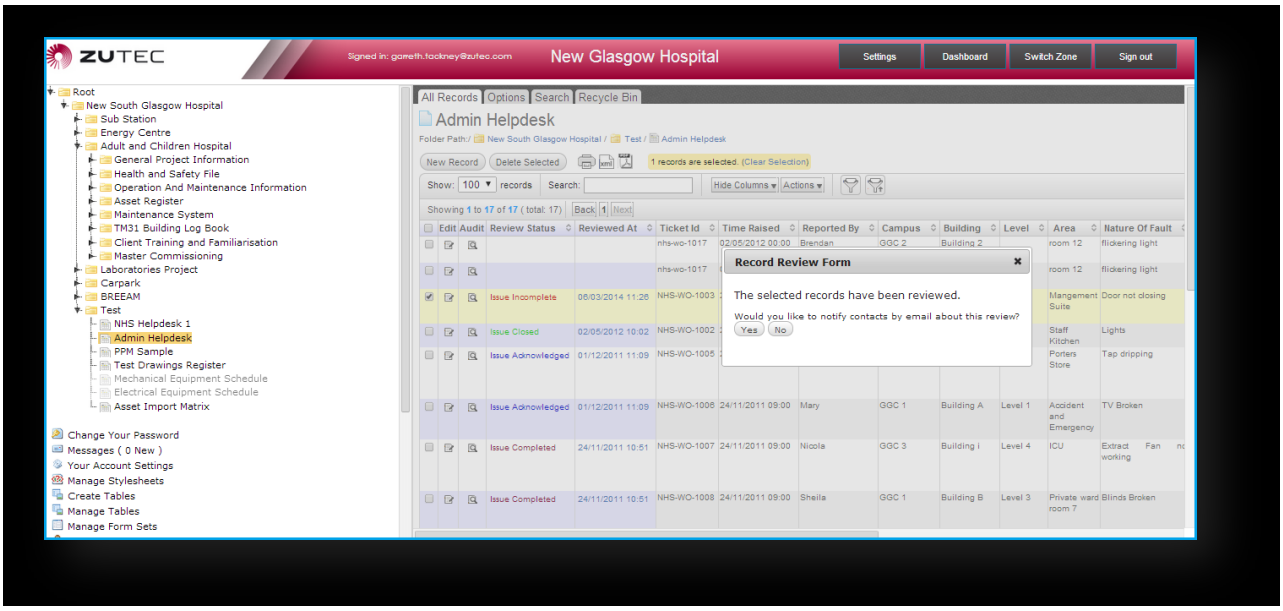


Figure 9 – Reviewing and Commenting on Sections

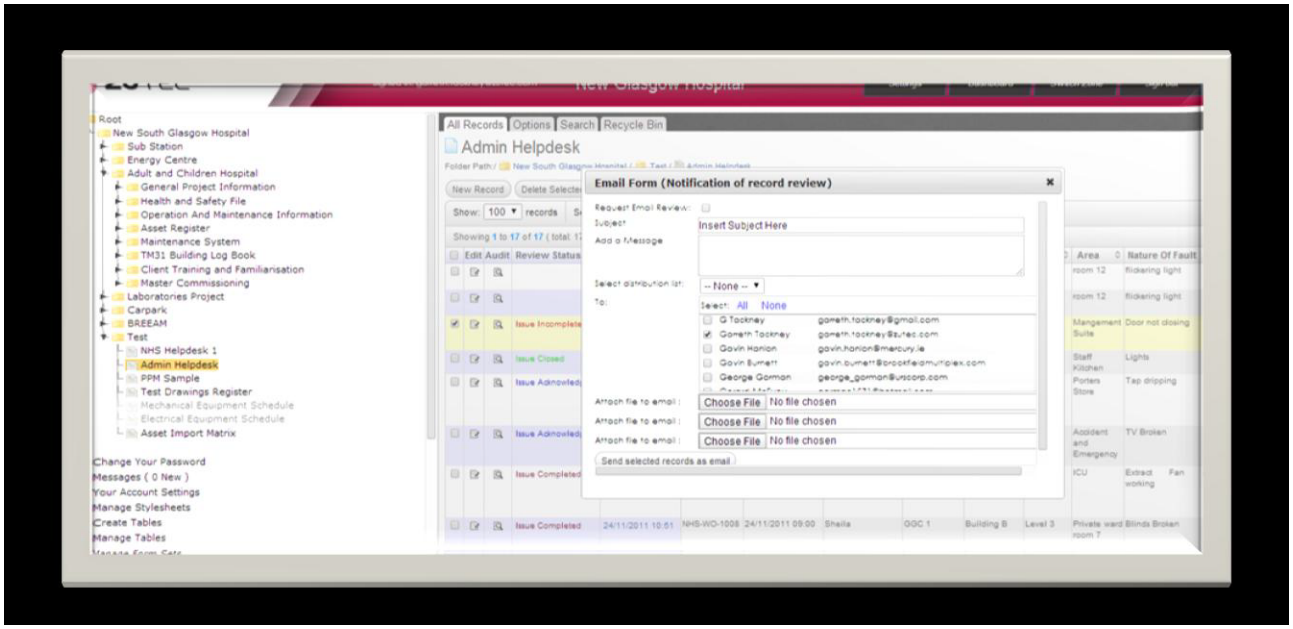


Figure 10- Sending Notifications

When you have drafted the section – An email notification is sent to your relevant package manager that the section is available for review**.**
Your corresponding reviewer will then make comments on that section and those comments will be available to you to address.
When comments are made, they are logged on the system and can be seen by anyone who logs in with the correct access level. The History is kept on the review and approval Table.
When all the comments have been addressed to the satisfaction of the reviewers, the Section can be **Approved** by the Person with the responsibility and authority to do so.

4. Search and Filter Functions

When the project is completed the Zutec system will house a large amount of information, whether it be drawings or asset details. Finding the information you require quickly and easily is essential. There are 2 ways to achieve this.

4.1 Search Function

The search function is a very simple way to find where a particular piece of information is located. In figure 11 below you can see the search page. You can search a particular folder or the whole zone.

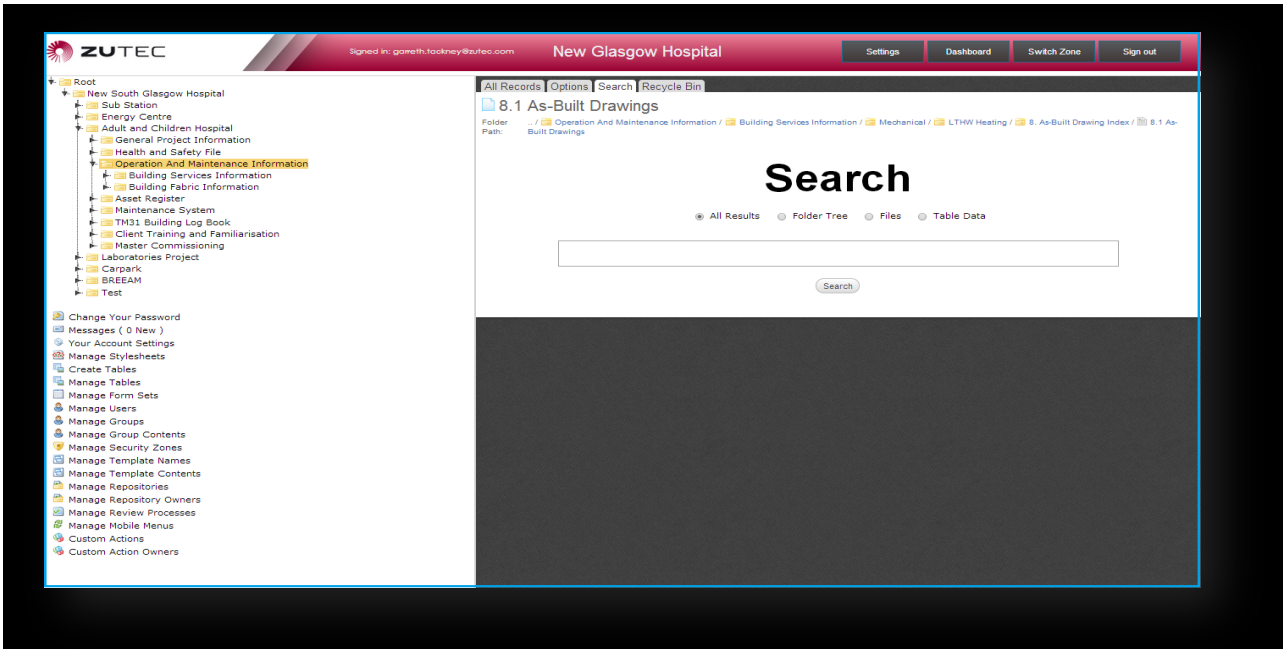


Figure 11 – Search Function

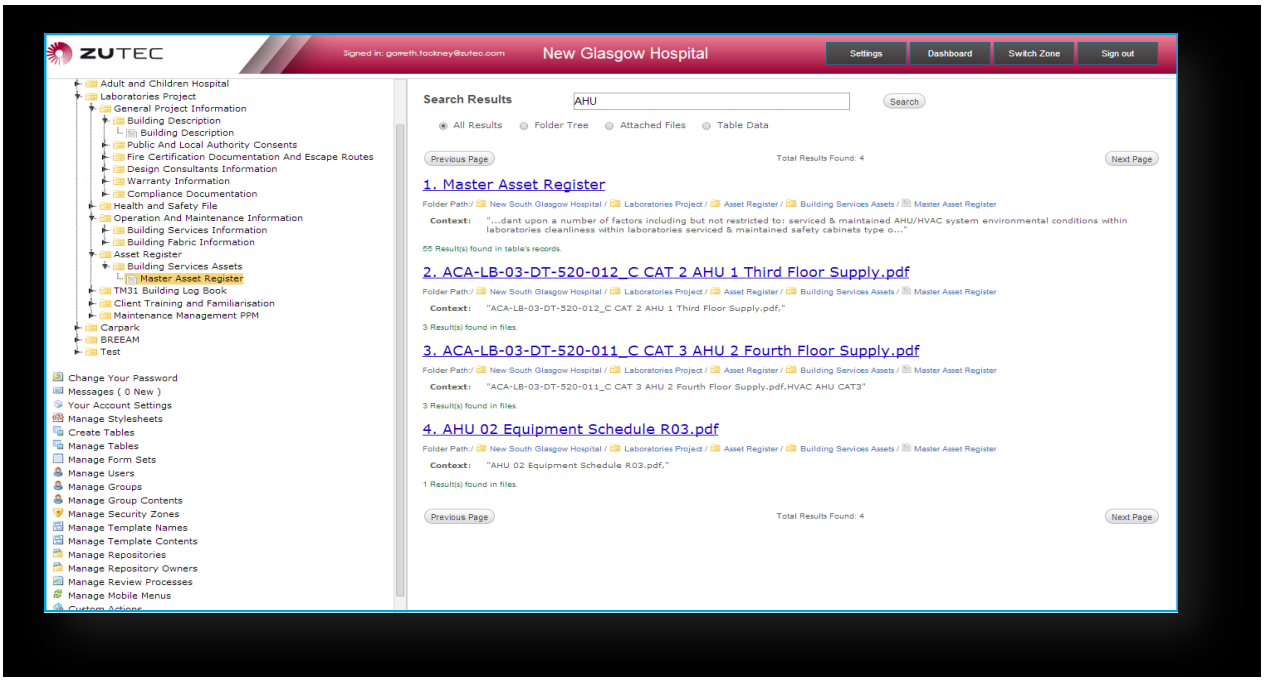


Figure 12 - Above you will see how the search results are delivered.

4.2 Filter Function

The filter function is useful for narrowing down the information within a particular table, some tables can have as many as 30,000 entries so being able to display just information you want is very important. In figure 13 below you can see how you can select one variable to narrow down the table results.

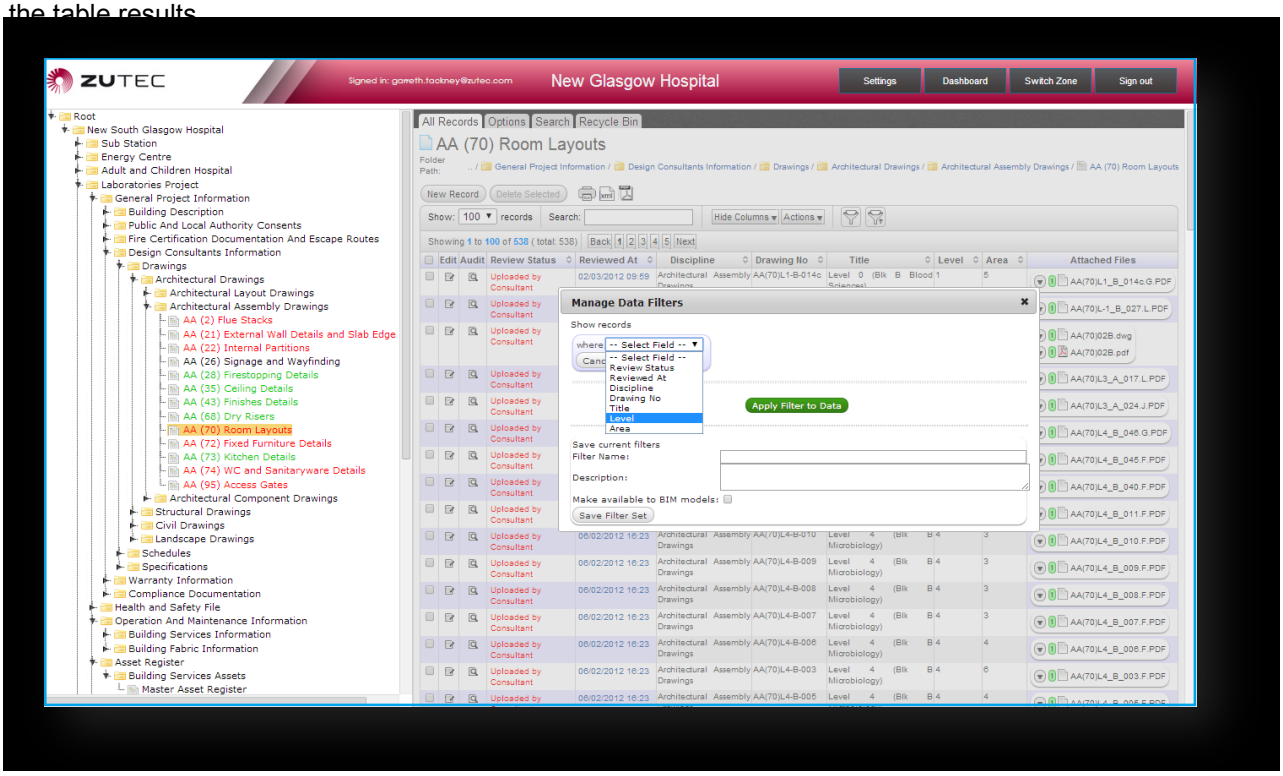


Figure 13 – Filter Function

As you can see in figure 14 below the table contents are now showing only information pertaining to Level 1.

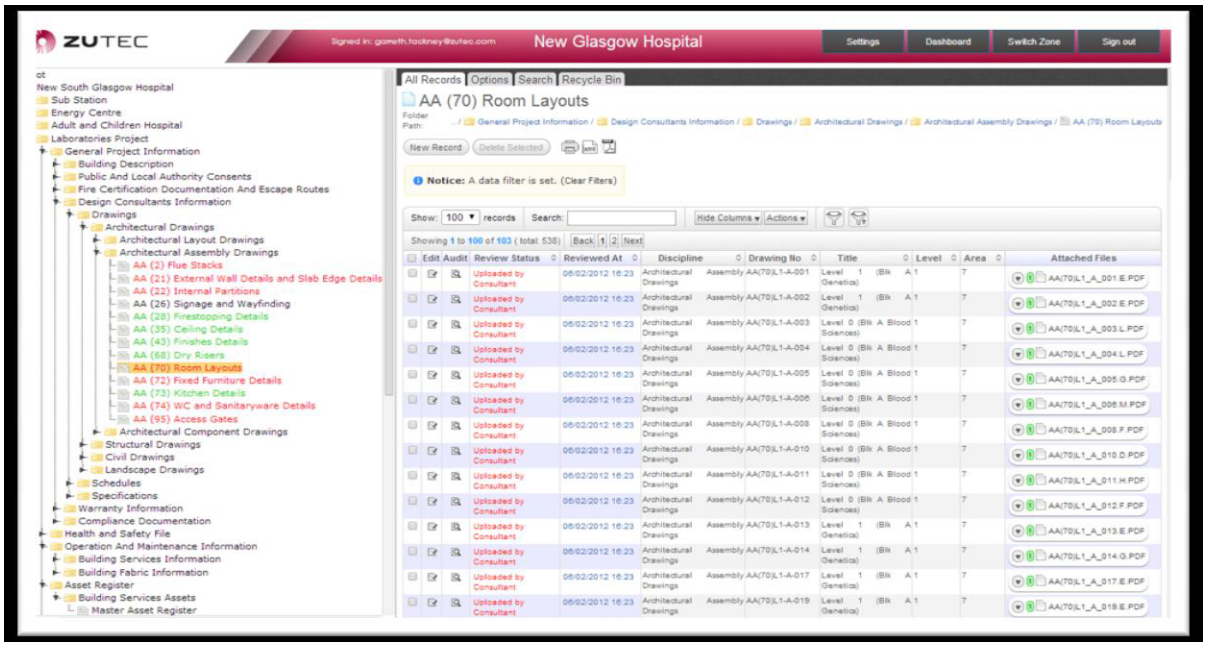


Figure 14 – Filter Function

From: Allan McRobbie
To: ian.powrie[redacted]
Cc: David Watson
Subject: NSGH Legionella Risk Assessment and Written Scheme
Date: 30 December 2014 14:05:50
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg
NSGH L8 RA and Written Scheme Program of Works(D1).pdf

Ian
Please find attached our intended program of works.
I am sure you will be inundated after the holiday shut down but due to the tight timescales for the phase 1 assessment we need to press ahead as soon as possible. If you are able to provide further drawings by cob Tuesday 6th January that would be most helpful.
I trust this is suitable though if you require any further information please do not hesitate to call David or I.
Best regards
Allan McRobbie
Compliance Manager

Mob: [redacted]

DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

within this e-mail are not necessarily the opinions of DMA Water Treatment Limited.

		Phase 1 Risk Assessment				Phase 2 Commissioning Documentation Review		Phase 3 Site Assessment of Installed Services		
Task	**Allocated to**	**Period up to 26/01/2015**				**From 27/01/15 - 06/03/15**		**From 07/03/15 - 24/04/15**		
Detailed drawings for plantrooms, main pipework runs, high risk/augmented care units, "typical" ward layout/outlet configuration (repeating units) and any "non-typical" areas to be provided by NHS to DMA	NHS	Required by 06/01/15								
Risk Assessment Phase 1	DMA	06/01/2015 to 16/01/2014								
Induction and walkround with suitably informed staff, assessing plantrooms, main pipework runs, and "typical" ward layout/outlet configuration (repeating units) areas where possible	DMA / NHS / Brookfield	Proposed dates 08/01/15 & 09/01/14								
Confirmation and drawings/operational information of all 'other risk systems' on site to be provided by NHS to DMA	NHS		Required by 13/01/14							
Risk Assessment Phase 1 Completion	DMA		**Proposed Completion Date: 16/01/15**							
Written Scheme Phase 1 Completion	DMA			**Proposed Completion Date: 21/01/15**						
Commissioning Documentation to be supplied to DMA for review.	NHS					Required by 13/02/15				
Completion of Commissioning Documentation Review	DMA						**Proposed Completion Date: 06/03/14**			
Site assessment, aided by suitably informed staff, assessing plantrooms, main pipework runs, and "typical" ward layout/outlet configuration (repeating units) areas and augmented care/high risk areas and "non-typical" areas.	DMA							09/03/15 to 10/04/15		
Risk Assessment Phase 3 Completion	DMA									**Proposed Completion Date: 24/04/15**
Written Scheme Phase 3 Completion	DMA									**Proposed Completion Date: 24/04/15**

From: Allan McRobbie
To: ian.powrie[redacted]
Cc: David Watson; Mike Kinghorn
Subject: Legionella Risk Assessment and Written Scheme
Date: 16 December 2014 16:34:17
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg
Q33553 GG&C New SGH Building L8 RA.pdf

Ian

Please find attached our proposals for Legionella/Pseudomonas Risk Assessment and Written Scheme for the new Southern General Hospital building.

We trust this meets your requirements though should you require any further information or clarification on any points raised please do not hesitate to call David or I.

Best regards

Allan McRobbie
Compliance Manager

Mob: [redacted]

DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

14 Canyon Road
Wishaw
ML2 0EG

T: [redacted]
E: [redacted]
www.dmawater.co.uk

15th December 2014

DMA Ref: Q33553/DW

Mr Ian Powrie
NHS Greater Glasgow & Clyde
Estates Department
Southern General Hospital
1345 Govan Rd
Glasgow
G51 4TF

RE: Legionella Risk Assessment
Southern General Hospital (New Building)

Dear Mr Powrie,

Thank you for taking the time to meet Allan and I last week. As requested please find following our proposals for carrying out the legionella risk assessment for the new hospital building. All assessment works shall be carried out in accordance with BS 8580, SHTM 04-01 and L8/HSG 274 (Part 2).

As discussed we are proposing to carry this out in three phases:

- Phase 1 being the desktop assessment based on the design drawings submitted to DMA and assessment of the calorifiers and CWSTs as currently fitted
- Phase 2 being a review of the commissioning documentation
- Phase 3 being an assessment of the water services as actually fitted

Phase 1 Desktop Assessment

Due to the quantities of drawings for this project and the timescales for returning the initial phase of the risk assessment DMA shall review the drawings covering the plantrooms containing CWSTs and calorifiers (in addition to a site based assessment of the plant items as currently fitted), along with drawings covering the main pipework runs throughout the hospital.

More localised drawings shall be reviewed by assessing "typical installation" drawings for wards and "typical outlet arrangements". Where wards or areas are fitted out in a way that varies from the "typical installation" then these drawings should be submitted to DMA for review.

Drawings covering "high risk/augmented care" units should be submitted for assessment as these should be reviewed for pseudomonas.

As part of the assessment DMA shall provide guidance documentation to assist in the formulation of the planned preventative maintenance programme and written scheme for the handover period covering 26th January until area occupation.

Phase 2 Commission Records Review

All commissioning records submitted to DMA shall be reviewed and commented on. DMA are able to comment and make recommendations on legionella specific commissioning only (e.g. disinfection procedures, contact times, flushing schedules, etc.). As DMA do not employ commissioning engineers we are unable to comment on the technical aspects of the system commissioning reports (e.g. flow rates, system balancing etc.) – rather we shall comment on which records are present to allow for any gaps in the records to be corrected.

Phase 3 Site Assessment of Installed Services

A risk assessment of the water services fitted shall be carried out on the water services upon completion of the system commissioning and prior to building occupation, when access to pipework, TMVs etc. can be obtained without the requirement for infection control procedures to be implemented.

Due to the large numbers of outlets within the building and the fact that many wards and areas should be installed to the same design layout/specification as agreed DMA shall assess all accessible "non-repeating" areas and approximately 10% of outlets/services in "repeating areas" (as permitted within BS 8580 paragraph 7.3). Outlet locations to be assessed shall be agreed between DMA and Estates prior to site survey being carried out.

Where issues are highlighted in the "repeating areas" then further investigative works may be required and further areas may require to be assessed to determine if the issue is localised or recurs throughout the installation. Where required, any additional investigative works shall be chargeable.

Pseudomonas assessments for the "high risk/augmented care" areas as designated by infection control/estates shall be carried out as part of this process (Generated as a separate assessment from the legionella assessment).

As part of the assessment DMA shall provide guidance documentation to assist in the formulation of the on-going planned preventative maintenance programme and written scheme.

Additional Systems

Details, and drawings where appropriate, of any other potential risk systems should be forwarded to DMA for comment and review. Systems which requires a separate bespoke assessment may incur additional charges and may necessitate further specialist advice from manufacturers, suppliers/installers, infection control, microbiologists, estates, and clinical staff.

Access to site

DMA shall require access to plantrooms containing calorifiers and CWSTs in order to complete the Phase 1 assessment.

DMA shall work in conjunction with NHS Estates to create a programme of works for access to the water services in order to complete the Phase 3 assessment to minimise disruption and, as far as practical, combine the assessment with other works which are being carried out behind the IPS panels. Wherever possible/practical DMA would request assistance from an engineer who is familiar with the system layout/operation and who can assist with removing panels where appropriate.

All of our operators/assessors hold CSCS cards.

Total Cost [redacted]

A49585984

I trust this is satisfactory but if you require any further information please do not hesitate to contact the office.

Yours faithfully
for **DMA Water Treatment Ltd**

[redacted]

David Watson
Director

All prices are exclusive of vat & delivery. Costs based on work being carried out during normal office hours unless otherwise stated. Quote valid for 30 days from date of issue. Terms and Conditions apply.
DMA Water Treatment Ltd is ISO 9001 and OHSAS 18001 accredited and are approved by the Legionella Control Association. All our engineers have been Disclosure Scotland Checked.

This quotation only covers the aspects of Legionella control specifically detailed. For your full Legionella control responsibilities for all water systems you should refer the following legislation.

Current legislation which client may have duties under:

L8 - ACoP and Guidance – Legionnaires' disease: The control of legionella bacteria in water systems (L8) and HSG 274 Parts 1, 2 & 3
The Health and Safety at Work Act 1974
SHTM 04-01 (Healthcare premises only)
The Management of Health and Safety at Work Regulations 1999
The Control of Substances Hazardous to Health Regulations 2002
The Notification of Cooling Towers and Evaporative Condensers Regulations 1992
Water Regulations Guide & Water Byelaws 2000/2004 (Scotland)
RIDDOR - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
Other relevant standards as applicable to site/system (e.g. BS EN 806, BS 8558, BS 8580)

A49585984

Requirements to allow effective risk assessment referring to BS 8580:2010

1. The findings and recommendations presented in our reports shall be based on information made available and inspection of areas made accessible by site staff during the survey. DMA are only able to assess areas/systems, which they have been given access to and using information supplied by site personnel. The survey will be undertaken only on pipework/areas that are accessible and visible, and it is possible that some sections will remain hidden during the survey. Schematic drawings, where produced, and how services link up, have been assumed to run as indicated using basic engineering principles and our experience. However, no responsibility can be accepted for systems and/or areas, which DMA have not been provided access to, or as a result of incorrect, misleading information supplied or information not provided. No guarantees as to the completeness of the information within the report is provided.

2. Safe and reasonable access must be provided to all areas where there are water services and/or services pipework/plant items etc. requiring assessment.

3. Any areas which cannot be accessed during the assessment for safety and/or any other reasons outwith the control of DMA shall be classed as unable to be assessed. Prior to the site survey commencing, it must be agreed which areas can be accessed and those which cannot – i.e. is assessment to be invasive or non-invasive.

4. Where DMA cannot safely and reasonably access services then only visible services will be assessed, pipework layouts may be referenced according to likely layout but no guarantees are given as to the accuracy or completeness of schematics or assessment ratings as they cannot be accessed for survey. In such instances further action will be required by the client to attempt to provide access for survey and assessment.

5. Should any specific procedures be required for gaining access to any particular area (e.g. permits to work, long length ladders etc.) then details of this should be forwarded to DMA prior to works commencing on site to minimise delays.

6. Revisits or delays incurred due reasons outwith the control of DMA may incur surcharges on the assessment costs unless otherwise agreed prior to the work commencing.

7. Unless otherwise agreed prior to works commencing, DMA shall be attending site during normal office hours. Should any areas require to be assessed on an out of hours basis then costs for this can be supplied.

8. Ideally all assessment works should be carried out when the building is operating under normal conditions. Should any assessment work, for any reason, be required to be carried out when building is empty, or during periods of low occupancy, then this can affect the temperature distribution of water at services and outlets throughout the building, and this should be taken into account when interpreting risk ratings and remedial actions being undertaken. DMA are only able to comment on conditions found/temperature noted at time of survey.

9. Systems being risk assessed shall normally cover the domestic water systems only, unless otherwise agreed in writing prior to works commencing on site.

10. Client/site management should appoint or provide a member of the building management or maintenance staff who is familiar with the water services for the site to assist the assessor in locating relevant systems, pipework, plant and services.

11. A full, suitable and up to date asbestos survey will be required for examination prior to start and DMA will not assess plant in areas which is or may be suspected to contain asbestos until the areas are made or are proven safe.

12. BS 8580:2010 States - "Where the system being assessed consists of several repeated units, such as multiple storeys or pods in a commercial building, the assessor should decide on representative examples to be assessed." Client must decide, based on the above statement and knowledge of the domestic water system on site, and how it "repeats" throughout the building, that only a representative number of rooms and/or floors require to be assessed then this would require to be agreed prior to works commencing. DMA would advise that as a minimum at least 20% of each rooms type must be assessed, along with all unique or non-repeating rooms/units (e.g. kitchens, bars, toilets etc), plus the plant items as would normally be carried out. Alternatively and as advised by DMA, it may be decided that all rooms/units require to be assessed, wherever possible, and the risk assessment proceeds on this basis.

13. Prior to works commencing, DMA should be provided with access to review and audit all records pertaining to the management and control of the water systems on site. These records shall include the management structure, written scheme, L8 monitoring records, training records, schematic drawings, previous L8 risk assessments/reviews, microbiological sampling records and any other records pertaining to the control of the water system(s) on site. DMA would advise that the duty holder or responsible person meets with the risk assessor at this stage to provide input into how the legionella control program, and other management and Health & Safety procedures are managed on site.

14. Schematic drawings of the water system shall not be produced as part of the L8 risk assessment unless agreed in writing prior to risk assessment commencing on site. Schematic drawings on site should be supplied for review/comment as part of the assessment if available.

15. Calorifiers and pressure vessels should wherever possible be opened for inspection as part of the L8 Risk Assessment. Where this is not possible at the time of the assessment, inspection reports from vessels being opened previously should be available and/or Risk Assessor should be requested to return to site when vessels can be opened. Additional charges may apply for additional visits. Unless otherwise agreed in writing, DMA are not responsible for opening and/or closing and sealing of vessels after inspection. This is to be carried out by site or other contractor.

16. Microbiological (Legionella) sampling can assist in determining risk in specific parts of a system or plant. Prior to risk assessment commencing on site client should instruct DMA as to whether or not microbiological samples should be taken during the site survey. Should DMA be instructed to proceed with sampling, the exact numbers of samples taken during the survey shall be relayed to the client prior to submitting to laboratory for analysis, for final approval and instruction to proceed with analysis provided. Costs for sampling shall be provided within risk assessment quote.

17. For healthcare premises, DMA shall require input with regards to which specification the assessment should be carried out to (i.e. L8, HTM 04-01, SHTM 04-01, 2040 etc). This would be especially relevant, for example, with regards to hot water temperatures at sentinel outlets and TMV inlets, where the HTM/SHTM 04-01 advises these temperatures should be a minimum of 55°C. This should be established prior to assessment commencing on site. For the purposes of this assessment the assessments will be carried out as per the specification for the previously tendered GG&C works with review of the assessments and L8 monitoring being used to highlight the out of specification temperatures.

18. The risk assessment is carried out first and foremost to aid compliance with the relevant legislation and to assist the client in drawing up suitable and sufficient control measures via a written a scheme and identifying non-compliant issues on site for corrective actions to be implemented. The L8 Risk Assessment produced by DMA shall be based entirely on information supplied by the client, records inspected and evaluated by the assessor and site conditions at time of survey. This document shall be independent of any other works which DMA either carryout on site or are requested to carry out at a future date.

19. No costs or proposals for works highlighted or advised in this report are included as this is not the function of this document. The client is to refer to this document in formulating their response to the findings and in drawing up the written scheme and assess what external assistance is required and from what organizations this may be sourced from if required.

From: McFadden, Jim
To: Mike Kinghorn; Brattey, David
Cc: Allan McRobbie; David Watson; Powrie, Ian
Subject: RE: GG+C Policy document/written scheme
Date: 10 December 2014 14:22:55
Attachments: image001.jpg
image002.jpg
image003.jpg
image004.jpg

Ian

The Water Management Policy is on the intranet and dated March'14 with a review date of April'15.

Some minor adjustments to be made but the Water Group are comfortable at this stage.

Regards

Jim

From: Mike Kinghorn [redacted]
Sent: 10 December 2014 10:33
To: McFadden, Jim; Brattey, David
Cc: Allan McRobbie; David Watson
Subject: GG+C Policy document/written scheme

Gents

Ian Powrie was looking for a copy of the GG+C Legionella/water quality policy.

Could you forward a copy onto Ian.

Regards
Mike Kinghorn
Director

Mob: [redacted]

DMA Logo Email Signature

Help the environment - do you need to print this e-mail?

From: Powrie, Ian
To: Allan McRobbie; David Watson
Subject: FW: NSGH Water system details: Transmission No 1
Date: 08 December 2014 11:29:37
Attachments: 141105_Dump Valve Schedule.xls
171105_End Of Line Sensors Schedule.xls
SHTM 04-01 Part G operational procedures & written scheme.pdf

---

Allan\David
As discussed please find attached plans for the NSGH water systems for use in the assessment of cost to carry out a full risk assessment and written scheme in compliance with SHTM 04-01, HSE L8 ACOP & & HSG 247 Technical Guide & Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of *Pseudomonas aeruginosa* infection from water.
Utilising the principles of the exemplar written scheme format Performa's detailed within the draft SHTM 04-01 Part G: "Operational procedures & exemplar written scheme" (copy attached), while recognising that the output will require to be reviewed in line with the final ratified version of this guidance document.
I attached FYI an copies of:

a) An outline water services presentation for the development provided by the M&E contractor.
b) Dump valve schedule
c) End of line BMS temperature sensor location schedule.

I will forward the as fitted plans on separate e-mails.
Once you have scoped and priced the production and delivery time scale I would like to sit down with you to review and fine tune to meet our requirements.
Regards
Ian

[redacted]
Sector Estates Manager (NSGH)
Project Team, New South Glasgow Hospitals,
Southern General Hospitals Construction Site,
2nd Floor, Modular Building, Off Hardgate Road, Glasgow,G51 4SX
[redacted]
Tel: [redacted]
Reception: [redacted]
Mob: [redacted]

any damage caused as a result of virus infection.

****

No.	Level	Zone	Distribution Board Zone	Room Ref.	Room Name	Physically Located On Drawing Y/N	Mercury Drawing Reference Located On	Physically Located On Drawing Y/N	Schneider KNX Drawing Reference	Panel Ref	Device Address
1	00	B	DB1AB-G-4	OPD-072	C.U	Y	ZBP-ZB-00-PL-500-002_D	Y	ME-ZB-00-SC-S660-002	DMV-01	1.2.52 1.2.53
2	00	B	DB1AB-G-6	OPD-103	Disabled Wc	Y	ZBP-ZB-00-PL-500-002_D	Y	ME-ZB-00-SC-S660-017	DMV-03	2.3.66 2.3.67
3	00	B	DB1AB-G-6	OPD-113	Disabled Wc	Y	ZBP-ZB-00-PL-500-002_D	Y	ME-ZB-00-SC-S660-017	DMV-02	2.1.63 2.1.64
4	00	B	DB1AB-G-7	OPD-120	Disabled Wc	Y	ZBP-ZB-00-PL-500-002_D	Y	ME-ZB-00-SC-S660-032	DMV-04	3.2.64 3.2.65
5	00	B	DB1AB-G-12	OPD-060	Disabled Wc	Y	ZBP-ZB-00-PL-500-002_D	Y	ME-ZB-00-SC-S660-047	DMV-05	4.1.53 4.1.54
6	00	D	DB6AB-G-5	DCU-003	Wet Room	Y	ZBP-ZD-00-PL-500-004_D	Y	ME-ZD-00-SC-S660-032	DMV-01	3.1.62 3.1.63
7	00	J	DB4AB-G-5	ORT-045	Wc	Y	ZBP-ZJ-00-PL-500-009_C	Y	ME-ZJ-00-SC-S660-002	DMV-01	1.1.61 1.1.62
8	00	J	DB4AB-G-6	ORT-015_2	Wc	Y	ZBP-ZJ-00-PL-500-009_C	Y	ME-ZJ-00-SC-S660-017	DMV-02	2.1.63 2.1.64
9	00	J	DB4AB-G-6	ORT-017	Disabled Wc	Y	ZBP-ZJ-00-PL-500-009_C	Y	ME-ZJ-00-SC-S660-017	DMV-03	2.1.65 2.1.66
10	00	J	DB4AB-G-7	ODP0-067	D.U.	Y	ZBP-ZJ-00-PL-500-009_C	Y	ME-ZJ-00-SC-S660-032	DMV-04	3.1.52 3.1.53
11	00	J	DB4A/B-G-9	DLO-019	WC	Y	ZBP-ZJ-00-PL-500-009_D	Y	ME-ZJ-00-SC-S660-047	DMV-05	4.2.47 4.2.48
12	00	J	DB4A/B-G-9	OPD0-074	WC Pub	Y	ZBP-ZJ-00-PL-500-009_D	Y	ME-ZJ-00-SC-S660-047	DMV-06	4.1.49 4.1.50
13	01	A	DB1AB-1-1	CCW-093	Meds	Y	ZBP-ZA-01-PL-500-011_C	Y	ME-ZA-01-SC-S660-002	DMV-01	3.1.47 3.1.48
14	01	B	DB1AB-1-9	MDU-005	WC	Y	ZBP-ZB-01-PL-500-012_B	Y	ME-ZB-01-SC-S660-047	DMV-01	4.1.71 4.1.72

15	01	J	DB4AB-1-3	ODP1-102	Disabled Wc	Y	ZBP-ZJ-01-PL-500-019_A	Y	ME-ZJ-01-SC-S660-017	DMV-01	2.1.64 2.1.65
16	01	J	DB4AB-1-3	ODP1-107	Disabled Wc	Y	ZBP-ZJ-01-PL-500-019_A	Y	ME-ZJ-01-SC-S660-017	DMV-02	2.1.66 2.1.67
17	01	J	DB4AB-1-4	ODP1-005	Wc	Y	ZBP-ZJ-01-PL-500-019_A	Y	ME-ZJ-01-SC-S660-032	DMV-03	3.2.65 3.2.66
18	01	J	DB4AB-1-4	ODP1-007	Wc	Y	ZBP-ZJ-01-PL-500-019_A	Y	ME-ZJ-01-SC-S660-032	DMV-04	3.1.71 3.1.72
19	01	J	DB4AB-1-5	ODP1-050	Wc	Y	ZBP-ZJ-01-PL-500-019_A	Y	ME-ZJ-01-SC-S660-047	DMV-05	4.1.57 4.1.58
20	02	B	DB1AB-2-8	DCU-005	WC	Y	ZBP-ZB-02-PL-500-022_B	Y	ME-ZB-02-SC-S660-047	DMV-01	4.1.68 4.1.69
21	02	G	DB5AB-2-4	THE-115	WC	Y	ZBP-ZG-02-PL-500-027_A	Y	ME-ZG-02-SC-S660-017	DMV-01	2.1.64 2.1.65
22	02	J	DB4AB-2-2	DOPD-025	MOHS tech	Y	ZBP-ZJ-02-PL-500-029_A	Y	ME-ZJ-02-SC-S660-002	DMV-02	1.1.73 1.1.74
23	02	J	DB4AB-2-2	DOPD-029	Dis WC	Y	ZBP-ZJ-02-PL-500-029_A	Y	ME-ZJ-02-SC-S660-002	DMV-01	1.2.60 1.2.61

Schneider Electric

Combined End Of Line Schedule

Project Title: NSGH A&C Building
Client: Mercury Engineering Limited
Project No: N1.00566
Prepared by: Simon Camm

Document No: ME-XX-XX-SH-S660-001
Revision: A
Date:
Checked by:

No.	Level	Zone	Distribution Board Zone	Room Ref. Located On	Room Name Located On	Room Ref. Supplied From	Room Name Supplied From	Cold	Hot	End Of Line Sensor Reference	Supplies Zone	Supplies Dept	Full Dep Name	Physically located On Drawing Y/N	Mercury Drawing Reference Located On	Physically located On Drawing Y/N	Schneider KNX Drawing Reference	Device Address	Channel	Notes
1	2	A	DB1_AB_2_2	ARU-084	Park Bay	ARU-121	Mech Riser M18	1	1	EOL 01	ZA/ZB	ARU	Acute Receiving Ward	N	ZBP-ZA-02-PL-500-021	Y	ME-ZA-02-SC-S660-002	1.1.70		
2		B	DB1_AB_2_7	AFD-012	Work Stations	CC2-051	Mech Riser M36	1	1	EOL 01	ZB	AFD/SCH	Anasthetic Offices	N	ZBP-ZB-02-PL-500-022	Y	ME-ZB-02-SC-S660-032	3.2.62		
3			DB1_AB_2_8	CC2-020	Hospital Street	CC2-021	Riser M39	1	1	EOL 02	ZZC	SCH	Shiehallion Ward	N	ZBP-ZB-02-PL-500-022	Y	ME-ZB-02-SC-S660-047	4.2.50		
4		C	DB1B-2-6	SCH-039	Corridor	CC2-051	Mech Riser M36	1	1	EOL 01	ZC	SCH	Shiehallion Ward	N	ZBP-ZC-02-PL-500-023	Y	ME-ZC-02-SC-S660-017	2.1.64		
5			DB1B-2-6	SCH-039	Corridor	CC2-051	Mech Riser M36	1	1	EOL 02	ZC	TCT	Teenage Cancer Trust	N	ZBP-ZC-02-PL-500-023	Y	ME-ZC-02-SC-S660-017	2.1.74		
6		D	DB2_AB_2_6	Adj THE-223	Riser M12	THE-223	Riser M12	1	1	EOL 01	ZD	THE	Theatres	N	ZBP-ZD-02-PL-500-024	Y	ME-ZD-02-SC-S660-002	1.2.61		
7		E	DB2_A_2_3	Adj MP-010	Paediatric Workshop	?	?	1	1	EOL 01	ZE	MP	Medical Physics	N	ZBP-ZE-02-PL-500-025	Y	ME-ZE-02-SC-S660-002	1.1.46		
8			DB2_AB_2_4	END-001	Reception Office	RENO-086	Riser T13	1	1	EOL 01	ZE	END/DCT	Endoscopy/Decomtamination	N	ZBP-ZE-02-PL-500-025	Y	ME-ZE-02-SC-S660-017	2.2.59		
9			DB2_AB_2_4	END-001	Reception Office	RENO-086	Riser T13	1	1	EOL 02	ZE	THE	Theatres	N	ZBP-ZE-02-PL-500-025	Y	ME-ZE-02-SC-S660-017	2.2.60		
10		F	DB4_AB_2_1	Adj DMW-061	Mech Riser M12	DMW-061	Riser T12	1	1	EOL-01	ZF	DMW	Dermatology Ward	N	ZBP-ZF-02-PL-500-026	Y	ME-ZF-02-SC-S660-002	1.3.60		
11		G	DB5_AB_2_4	THE-359	Riser M7	THE-359	Riser M7	1	1	EOL 01	ZH	THE	Theatres	N	ZBP-ZH-02-PL-500-028	Y	ME-ZG-02-SC-S660-017	2.2.62		
12		J	DB4_AB_2_4	Adj RENO-068	Chair Bay	?	?	1	1	EOL 02	ZJ	RENO	Renal Dialysis	N	ZBP-ZJ-02-PL-500-029	Y	ME-ZJ-02-SC-S660-032	3.2.73		
13		F	DB2 P22-1/2	CA2-006	Corridor	?	?	1	1	EOL 01	ZF	CA2	Public Core A	N	ZBP-ZK-02-PL-500-030	Y	ME-ZF-02-SC-S660-017	2.2.34		
14		J	DB4_AB_2_3	Adj CA2-026	Core D Lobby	?	?	1	1	EOL 01	ZJ	DOPD	Dermatology OPD	N	ZBP-ZK-02-PL-500-030	Y	ME-ZJ-02-SC-S660-017	2.1.49		
							Total HWC/BCWS Points	28												
1	3	A	DB1_AB_3_1	Adj GW1-074	Single Bed	GSW-013	Mech Riser M18	1	1	EOL 02	ZA	GW1	Inpatient Ward	N	ZBP-ZA-03-PL-500-031	Y	ME-ZA-03-SC-S660-002	3.1.55		
2			DB1_AB_3_1	Adj GW1-080	Renal Store	GSW-013	Mech Riser M18	1	1	EOL 01	ZA	GW1	Renal	N	ZBP-ZA-03-PL-500-031	Y	ME-ZA-03-SC-S660-002	3.1.54		
3		B	DB1_AB_3_3	Adj GWS-013	Mech Riser M18	GSW-013	Mech Riser M18	1	1	EOL 01	ZB	GWS	Ward Support	N	ZBP-ZB-03-PL-500-032	Y	ME-ZB-03-SC-S660-002	1.2.45		
4		A	DB1_AB_3_2	Adj CC3-008	Riser M38	CC3-008	Riser M38	1	1	EOL 03	ZB	GW2	Inpatient Ward	N	ZBP-ZB-03-PL-500-032	Y	ME-ZA-03-SC-S660-017	4.1.59		
5		C	DB1_AB_3_7	Adj CC3-051	Riser M36	CC3-051	Riser M36	1	1	EOL 01	ZB	GWS	Ward Support	N	ZBP-ZB-03-PL-500-032	Y	ME-ZC-03-SC-S660-002	3.3.56		
6		B	DB1_AB_3_6	Adj GW2-019	Mech Riser M32	CC3-021	Riser M39	1	1	EOL 02	ZB	GW2	Inpatient Ward	N	ZBP-ZB-03-PL-500-032	Y	ME-ZB-03-SC-S660-047	4.1.52		
7		C	DB1_AB_3_8	Adj GW2-075	Mech Riser M33	CC3-021	Riser M39	1	1	EOL 02	ZC	GW3	Inpatient Ward	N	ZBP-ZC-03-PL-500-033	Y	ME-ZC-03-SC-S660-017	4.1.48		
8		D	DB2 P31-1/2/3	Adj CA3-001	Lobby Core A	-	PR31	1	1	EOL 01	ZF	CC3	Public Core A	N	ZBP-ZK-03-PL-500-040	Y	ME-ZD-03-SC-S660-002	2.2.49		
9		K	DB4_B_3_2	Adj HR-001	Mech Riser T12	HR-001	Mech Riser T12	1	1	EOL 01	ZK	CC3/HR	Health Records	N	ZBP-ZK-03-PL-500-040	Y	ME-ZK-03-SC-S660-002	1.1.51		
10		G	DB5 P31-1/2/3	-	PR31	-	PR31	1	1	EOL 02	ZE	FM3	Staff Accomodation/Change	N	ZBP-ZK-03-PL-500-040	Y	ME-ZG-03-SC-S660-002	1.3.26		
							Total HWC/BCWS Points	20												
1	4	C	DB1_AB_4_2	Adj DCFP-007	Hold	DCFP-002	Riser M33	1	1	EOL 01	ZC	DFCP	Dept Family Child Psychology	N	ZBP-ZC-04-PL-500-043	Y	ME-ZC-04-SC-S660-017	6.2.48		
2		E	DB3_AB_4_1	Adj RENW-193	Single Bed	RENW-207	Mech Riser T4	1	1	EOL 02	ZK	WS4	Ward Support (ZK)	N	ZBP-ZE-04-PL-500-045	Y	ME-ZE-04-SC-S660-002	2.2.67		
3			DB3_AB_4_1	Adj RENW-195	Single Bed	RENW-207	Mech Riser T4	1	1	EOL 01	ZE	HOW	Haematology Ward	N	ZBP-ZE-04-PL-500-045	Y	ME-ZE-04-SC-S660-002	2.2.66		
4		F	DB3_AB_4_2	Adj CA4-006	Mech Riser T1	CA4-006	Mech Riser T1	1	0	EOL 03	ZE	HOW	Haematology Ward	N	ZBP-ZF-04-PL-500-046	Y	ME-ZF-04-SC-S660-002	Merged Together 2.3.62		
5								1	0		ZF	RENW	Renal Ward (ZF)	N	ZBP-ZF-04-PL-500-046	Y	ME-ZF-04-SC-S660-002			
6			DB3_AB_4_2	Adj RENW-278	Riser T12	RENW-278	Riser T12	1	1	EOL 02	ZF	RENW	Renal Ward (ZF)	N	ZBP-ZF-04-PL-500-046	Y	ME-ZF-04-SC-S660-002	2.1.54		
7			DB3_AB_4_2	Adj RENW-278	Riser T12	RENW-278	Riser T12	1	1	EOL 01	ZK	RENW	Ward Support (ZK)	N	ZBP-ZF-04-PL-500-046	Y	ME-ZF-04-SC-S660-002	2.1.55		
8		H	DB4_AB_4_1	Adj RENW-212	Mech Riser T5	RENW-212	Mech Riser T5	1	1	EOL 01	ZH	RENW	Renal Ward (ZH)	N	ZBP-ZH-04-PL-500-048	Y	ME-ZH-04-SC-S660-002	2.1.60		
9		J	DB4_AB_4_2	Adj RENW-270	Riser T13	RENW-270	Riser T13	1	1	EOL 01	ZJ	RENW	Renal Ward (ZJ)	N	ZBP-ZJ-04-PL-500-049	Y	ME-ZJ-04-SC-S660-002	2.2.73		
10			DB4_AB_4_2	Adj CA4-014	Riser T2	CA4-014	Riser T2	1	0	EOL 02	ZJ	RENW	Renal Ward (ZJ)	N	ZBP-ZJ-04-PL-500-049	Y	ME-ZJ-04-SC-S660-002	Merged Together 2.3.54		
11								1	0		ZH	RENW	Renal Ward (ZH)	N	ZBP-ZJ-04-PL-500-049	Y	ME-ZJ-04-SC-S660-002			
							Total HWC/BCWS Points	18												
1	5	E	DB3_AB_5_1	Adj GENWD-060	Single Bed	GENWD-068	Riser T4	1	1	EOL 01	ZE	GENWD	General Ward D	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-05-SC-S660-002	4.2.74		
2			DB3_AB_5_1	Adj GENWD-062	Single Bed	GENWD-068	Riser T4	1	1	EOL 02	ZK	WS5	Ward Support 5	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-05-SC-S660-002	4.2.75		
3		F	DB3_AB_5_2	Adj GENWA-001	Single Bed	CA5-006	Mech Riser T1	1	0	EOL 03	ZE	GENWD	General Ward D	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-05-SC-S660-002	Merged Together 4.2.64		
4								1	0		ZF	GENWA	General Ward A	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-05-SC-S660-002			
5			DB3_AB_5_2	GENWA-061	Touch Down	GENWA-068	Mech Riser T12	1	1	EOL 01	ZF	GENWA	General Ward A	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-05-SC-S660-002	4.2.62		
6			DB3_AB_5_2	GENWA-061	Touch Down	GENWA-068	Mech Riser T12	1	1	EOL 02	ZK	WS5	Ward Support 5	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-05-SC-S660-002	4.2.63		
7		H	DB4_A_5_1	GENWC-061	Touch Down	GENWC-068	Mech Riser T5	1	1	EOL 01	ZH	GENWC	General Ward C	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-05-SC-S660-002	4.2.50		
8		J	DB4_AB_5_2	Adj CA5-009	Core Lobby	CA5-014	Mech Riser T2	1	0	EOL 02	ZJ	GENWB	General Ward B	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-05-SC-S660-002	Merged Together 4.2.63		
9								1	0		ZH	GENWC	General Ward C	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-05-SC-S660-002			
10			DB4_AB_5_2	GENWB-061	Touch Down	GENWB-068	Mech Riser T13	1	1	EOL 01	ZJ	GENWB	General Ward B	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-05-SC-S660-002	4.2.62		
							Total HWC/BCWS Points	16												
1	6	E	DB3_AB_6_1	Adj GENW4-060	Single Bed	GENW4-068	Riser T4	1	1	EOL 01	ZE	GENW4	General Ward 4	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-06-SC-S660-002	2.2.74		
2			DB3_AB_6_1	Adj GENW4-062	Single Bed	GENW4-068	Riser T4	1	1	EOL 02	ZE	WS6	Ward Support 6	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-06-SC-S660-002	2.2.75		
3		F	DB3_AB_6_2	Adj GENW1-001	Single Bed	CA6-006	Mech Riser T1	1	1	EOL 03	ZE	GENW4	General Ward 4	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-06-SC-S660-002	Merged Together 2.2.64		
4								1	0		ZF	GENW1	General Ward 1	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-06-SC-S660-002			
5			DB3_AB_6_2	GENW1-061	Touch Down	GENW1-068	Mech Riser T12	1	0	EOL 01	ZF	GENW1	General Ward 1	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-06-SC-S660-002	2.2.62		
6			DB3_AB_6_2	GENW1-061	Touch Down	GENW1-068	Mech Riser T12	1	1	EOL 02	ZF	WS6	Ward Support 6	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-06-SC-S660-002	2.2.63		
7		H	DB4_AB_6_1	GENW3-061	Touch Down	GENW3-068	Mech Riser T5	1	1	EOL 01	ZH	GENW3	General Ward 3	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-06-SC-S660-002	2.2.50		
8		J	DB4_AB_6_2	Adj CA6-009	Core Lobby	CA6-014	Mech Riser T2	1	0	EOL 02	ZJ	GENW2	General Ward 2	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-06-SC-S660-002	Merged Together 2.2.63		
9								1	0		ZH	GENW3	General Ward 3	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-06-SC-S660-002			
10			DB4_AB_6_2	GENWB-061	Touch Down	GENWB-068	Mech Riser T13	1	1	EOL 01	ZJ	GENW2	General Ward 2	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-06-SC-S660-002	2.2.62		
							Total HWC/BCWS Points	16												
1	7	E	DB3_AB_7_1	Adj GENW8-060	Single Bed	GENW8-068	Riser T4	1	1	EOL 01	ZE	GENW8	General Ward 8	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-07-SC-S660-002	4.2.74		
2			DB3_AB_7_1	Adj GENW8-062	Single Bed	GENW8-068	Riser T4	1	1	EOL 02	ZE	WS7	Ward Support 7	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-07-SC-S660-002	4.2.75		
3		F	DB3_AB_7_2	Adj GENW5-001	Single Bed	CA7-006	Mech Riser T1	1	0	EOL 03	ZE	GENW8	General Ward 8	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-07-SC-S660-002	Merged Together 4.2.64		
4								1	0		ZF	GENW5	General Ward 5	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-07-SC-S660-002			
5			DB3_AB_7_2	GENW5-061	Touch Down	GENW5-068	Mech Riser T12	1	1	EOL 01	ZF	GENW5	General Ward 5	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-07-SC-S660-002	4.2.62		
6			DB3_AB_7_2	GENW5-061	Touch Down	GENW5-068	Mech Riser T12	1	1	EOL 02	ZF	WS7	Ward Support 7	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-07-SC-S660-002	4.2.63		
7		H	DB4_AB_7_1	GENW7-061	Touch Down	GENW7-068	Mech Riser T5	1	1	EOL 01	ZH	GENW7	General Ward 7	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-07-SC-S660-002	4.2.50		
8		J	DB4_AB_7_2	Adj CA7-009	Core Lobby	CA7-014	Mech Riser T2	1	0	EOL 02	ZJ	GENW6	General Ward 6	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-07-SC-S660-002	Merged Together 4.2.63		
9								1	0		ZH	GENW7	General Ward 7	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-07-SC-S660-002			
10			DB4_AB_7_2	GENW6-061	Touch Down	GENW6-068	Mech Riser T13	1	1	EOL 01	ZJ	GENW6	General Ward 6	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-07-SC-S660-002	4.2.62		
							Total HWC/BCWS Points	16												
1	8	E	DB3_AB_8_1	Adj GENW12-060	Single Bed	GENW12-068	Riser T4	1	1	EOL 01	ZE	GENW12	General Ward 12	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-08-SC-S660-002	2.2.74		
2			DB3_AB_8_1	Adj GENW12-062	Single Bed	GENW12-068	Riser T4	1	1	EOL 02	ZE	WS8	Ward Support 8	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-08-SC-S660-002	2.2.75		
3		F	DB3_AB_8_2	Adj GENW9-001	Single Bed	CA8-006	Mech Riser T1	1	0	EOL 03	ZE	GENW12	General Ward 12	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-08-SC-S660-002	Merged Together 2.2.64		
4								1	0		ZF	GENW9	General Ward 9	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-08-SC-S660-002			
5			DB3_AB_8_2	GENW9-061	Touch Down	GENW9-068	Mech Riser T12	1	1	EOL 01	ZF	GENW9	General Ward 9	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-08-SC-S660-002	2.2.62		
6			DB3_AB_8_2	GENW9-061	Touch Down	GENW9-068	Mech Riser T12	1	1	EOL 02	ZF	WS8	Ward Support 8	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-08-SC-S660-002	2.2.63		
7		H	DB4_AB_8_1	GENW11-061	Touch Down	GENW11-068	Mech Riser T5	1	1	EOL 01	ZH	GENW11	General Ward 11	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-08-SC-S660-002	2.2.50		
8		J	DB4_AB_8_2	Adj CA8-009	Core Lobby	CA8-014	Mech Riser T2	1	0	EOL 02	ZJ	GENW10	General Ward 10	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-08-SC-S660-002	Merged Together 2.2.63		
9								1	0		ZH	GENW11	General Ward 11	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-08-SC-S660-002			
10			DB4_AB_8_2	GENW10-061	Touch Down	GENW10-068	Mech Riser T13	1	1	EOL 01	ZJ	GENW10	General Ward 10	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-08-SC-S660-002	2.2.62		
							Total HWC/BCWS Points	16												
1	9	E	DB3_AB_9_1	Adj GENW16-060	Single Bed	GENW16-068	Riser T4	1	1	EOL 01	ZE	GENW16	General Ward 16	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-09-SC-S660-002	4.2.74		
2			DB3_AB_9_1	Adj GENW16-062	Single Bed	GENW16-068	Riser T4	1	1	EOL 02	ZE	WS9	Ward Support 9	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-09-SC-S660-002	4.2.75		
3		F	DB3_AB_9_2	Adj GENW13-001	Single Bed	CA9-006	Mech Riser T1	1	0	EOL 03	ZE	GENW16	General Ward 16	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-09-SC-S660-002	Merged Together 4.2.64		
4								1	0		ZF	GENW13	General Ward 13	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-09-SC-S660-002			
5			DB3_AB_9_2	GENW13-061	Touch Down	GENW13-068	Mech Riser T12	1	1	EOL 01	ZF	GENW13	General Ward 13	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-09-SC-S660-002	4.2.62		
6			DB3_AB_9_2	GENW13-061	Touch Down	GENW13-068	Mech Riser T12	1	1	EOL 02	ZF	WS9	Ward Support 9	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-09-SC-S660-002	4.2.63		
7		H	DB4_AB_9_1	GENW15-061	Touch Down	GENW15-068	Mech Riser T5	1	1	EOL 01	ZH	GENW15	General Ward 15	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-09-SC-S660-002	4.2.50		
8		J	DB4_AB_9_2	Adj CA9-009	Core Lobby	CA9-014	Mech Riser T2	1	0	EOL 02	ZJ	GENW14	General Ward 14	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-09-SC-S660-002	Merged Together 4.2.63		
9								1	0		ZH	GENW15	General Ward 15	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-09-SC-S660-002			
10			DB4_AB_9_2	GENW14-061	Touch Down	GENW14-068	Mech Riser T13	1	1	EOL 01	ZJ	GENW14	General Ward 14	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-09-SC-S660-002	4.2.62		
							Total HWC/BCWS Points	16												
1	10	E	DB3_AB_10_1	Adj GENW20-060	Single Bed	GENW20-068	Riser T4	1	1	EOL 01	ZE	GENW20	General Ward 20	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-10-SC-S660-002	2.2.74		
2			DB3_AB_10_1	Adj GENW20-062	Single Bed	GENW20-068	Riser T4	1	1	EOL 02	ZE	WS10	Ward Support 10	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-10-SC-S660-002	2.2.75		
3		F	DB3_AB_10_2	Adj GENW17-001	Single Bed	CA10-006	Mech Riser T1	1	0	EOL 03	ZE	GENW20	General Ward 20	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-10-SC-S660-002	Merged Together 2.2.64		
4								1	0		ZF	GENW17	General Ward 17	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-10-SC-S660-002			
5			DB3_AB_10_2	GENW17-061	Touch Down	GENW17-068	Mech Riser T12	1	1	EOL 01	ZF	GENW17	General Ward 17	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-10-SC-S660-002	2.2.62		
6			DB3_AB_10_2	GENW17-061	Touch Down	GENW17-068	Mech Riser T12	1	1	EOL 02	ZF	WS10	Ward Support 10	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-10-SC-S660-002	2.2.63		
7		H	DB4_AB_10_1	GENW19-061	Touch Down	GENW19-068	Mech Riser T5	1	1	EOL 01	ZH	GENW19	General Ward 19	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-10-SC-S660-002	2.2.50		
8		J	DB4_AB_10_2	Adj CA10-009	Core Lobby	CA10-014	Mech Riser T2	1	0	EOL 02	ZJ	GENW18	General Ward 18	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-10-SC-S660-002	Merged Together 2.2.63		
9								1	0		ZH	GENW19	General Ward 19	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-10-SC-S660-002			
10			DB4_AB_10_2	GENW18-061	Touch Down	GENW18-068	Mech Riser T13	1	1	EOL 01	ZJ	GENW18	General Ward 18	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-10-SC-S660-002	2.2.62		
							Total HWC/BCWS Points	16												
1	11	E	DB3_AB_11_1	Adj GENW24-060	Single Bed	GENW24-068	Riser T4	1	1	EOL 01	ZE	GENW24	General Ward 24	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-11-SC-S660-002	4.2.74		
2			DB3_AB_11_1	Adj GENW24-062	Single Bed	GENW24-068	Riser T4	1	1	EOL 02	ZE	WS11	Ward Support 11	N	ZBP-ZE-XX-PL-500-055	Y	ME-ZE-11-SC-S660-002	4.2.75		
3		F	DB3_AB_11_2	Adj GENW21-001	Single Bed	CA11-006	Mech Riser T1	1	0	EOL 03	ZE	GENW24	General Ward 24	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-11-SC-S660-002	Merged Together 4.2.64		
4								1	0		ZF	GENW21	General Ward 21	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-11-SC-S660-002			
5			DB3_AB_11_2	GENW21-061	Touch Down	GENW21-068	Mech Riser T12	1	1	EOL 01	ZF	GENW21	General Ward 21	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-11-SC-S660-002	4.2.62		
6			DB3_AB_11_2	GENW21-061	Touch Down	GENW21-068	Mech Riser T12	1	1	EOL 02	ZF	WS11	Ward Support 11	N	ZBP-ZF-XX-PL-500-056	Y	ME-ZF-11-SC-S660-002	4.2.63		
7		H	DB4_AB_11_1	GENW23-061	Touch Down	GENW23-068	Mech Riser T5	1	1	EOL 01	ZH	GENW23	General Ward 23	N	ZBP-ZH-XX-PL-500-058	Y	ME-ZH-11-SC-S660-002	4.2.50		
8		J	DB4_AB_11_2	Adj CA11-009	Core Lobby	CA11-014	Mech Riser T2	1	0	EOL 02	ZJ	GENW22	General Ward 22	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-11-SC-S660-002	Merged Together 4.2.63		
9								1	0		ZH	GENW23	General Ward 23	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-11-SC-S660-002			
10			DB4_AB_11_2	GENW21-061	Touch Down	GENW21-068	Mech Riser T13	1	1	EOL 01	ZJ	GENW22	General Ward 22	N	ZBP-ZJ-XX-PL-500-059	Y	ME-ZJ-11-SC-S660-002	4.2.62		
							Total HWC/BCWS Points	16												
								105	73											
									178											

Consultation draft of

SHTM 04-01 Water Safety for Healthcare Premises Part G: Operational Procedures and exemplar Written Scheme

Consultation period expires 29th March 2013. Comments to be sent to ianstewart[redacted]

Name: Date:

[1]**T= Technical; G= General; E=Editorial**

Paragraph No.	Page	Type[1]	Comment

NHS National Services Scotland

Scottish Health Technical Memorandum 04-01: Water safety for healthcare premises

Part G: Operational procedures and exemplar Written Scheme

Health Facilities Scotland
Engineering and Environment

February 2013

A49585984

Contents

Acknowledgements

Health Facilities Scotland would like to thank Ken Walker of NHS Grampian for his considerable assistance and support in the preparation of this Scottish Health Technical Memorandum and for making available the results of his experience in the preparation of similar documentation.

The support of the National Water Services Advisory Group is also gratefully acknowledged.

Preface

About Scottish Health Technical Memoranda

Engineering Scottish Health Technical Memoranda (SHTMs) give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of healthcare.

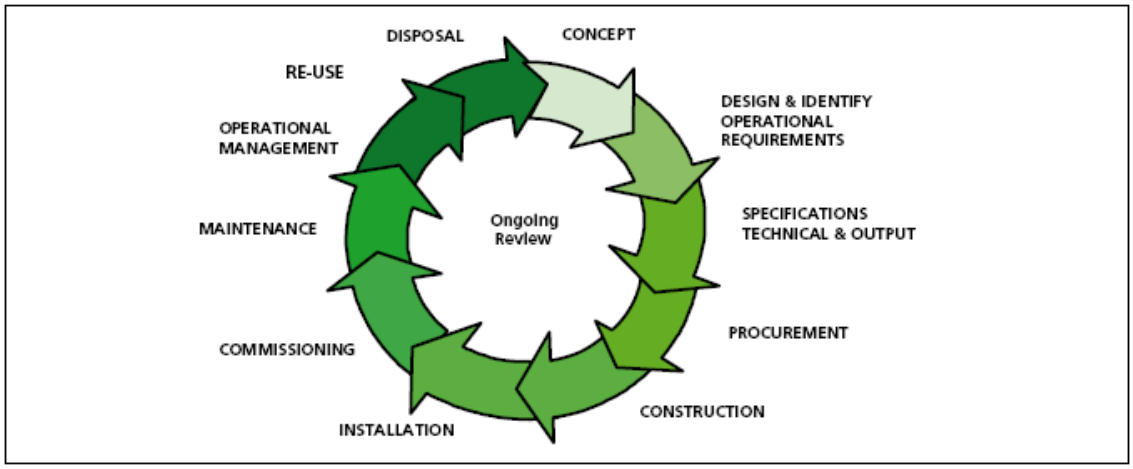
The focus of SHTM guidance remains on healthcare-specific elements of standards, policies and up-to-date established best practice. They are applicable to new and existing sites, and are for use at various stages during the whole building lifecycle. Healthcare providers have a duty of care to ensure that appropriate engineering governance arrangements are in place and are managed effectively. The Engineering Scottish Health Technical Memorandum series provides best practice engineering standards and policy to enable management of this duty of care.

It is not the intention within this suite of documents to repeat unnecessarily international or European standards, industry standards or UK Government legislation. Where appropriate, these will be referenced.

Healthcare-specific technical engineering guidance is a vital tool in the safe and efficient operation of healthcare facilities. Scottish Health Technical Memorandum guidance is the main source of specific healthcare-related guidance for estates and facilities professionals.

The core suite of eight subject areas provides access to guidance which:

- is more streamlined and accessible;
- encapsulates the latest standards and best practice in healthcare engineering;
- provides a structured reference for healthcare engineering.



Healthcare building life-cycle

Structure of the Scottish Health Technical Memorandum suite

The series of engineering-specific guidance contains a suite of eight core subjects:

Scottish Health Technical Memorandum 00: Policies and principles (applicable to all Scottish Health Technical Memoranda in this series)

Scottish Health Technical Memorandum 01: Decontamination

Scottish Health Technical Memorandum 02: Medical gases

Scottish Health Technical Memorandum 03: Heating and ventilation systems

Scottish Health Technical Memorandum 04: Water safety

Scottish Health Technical Memorandum 05: Reserved for future use

Scottish Health Technical Memorandum 06 Electrical services

Scottish Health Technical Memorandum 07: Environment and sustainability

Scottish Health Technical Memorandum 08: Specialist services

Some subject areas may be further developed into topics shown as -01, -02 etc and further referenced into Parts A, B etc.

Example: Scottish Health Technical Memorandum 06-02 Part A will represent: Electrical safety guidance for low voltage systems

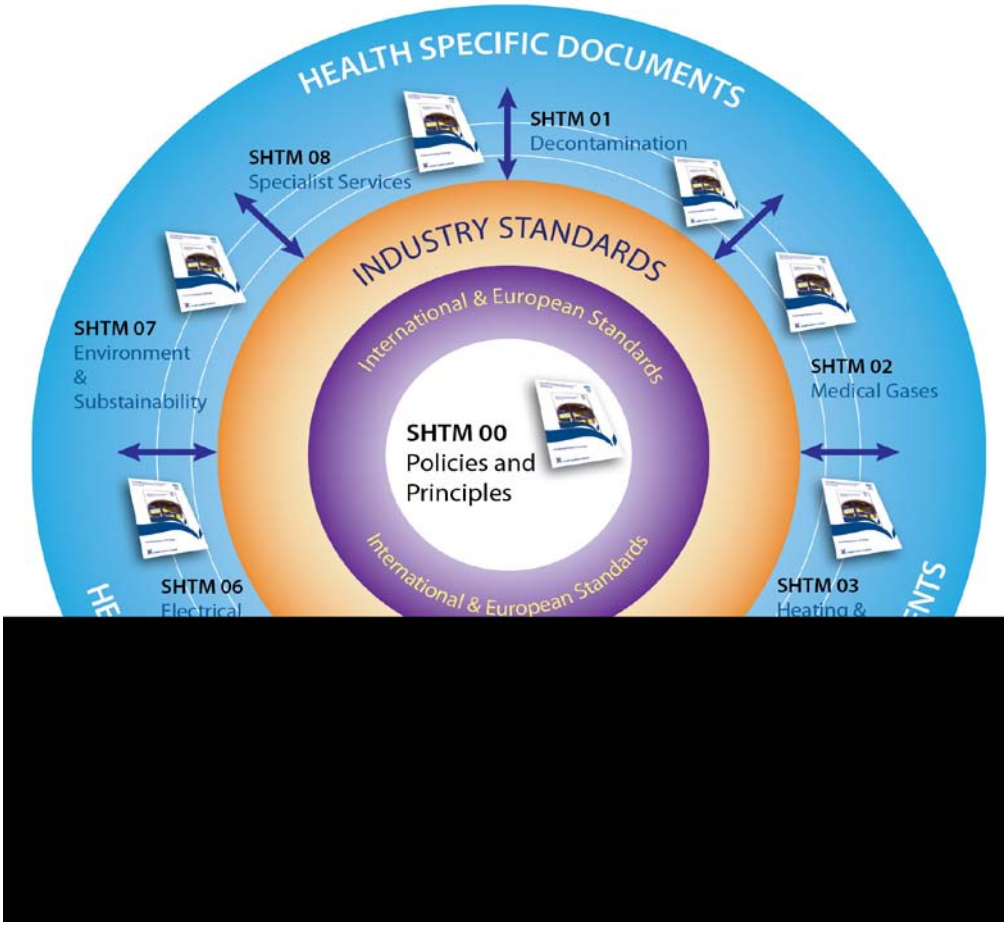
In a similar way Scottish Health Technical Memorandum 07-02 will simply represent: Environment and Sustainability – EnCO_2de.

All Scottish Health Technical Memoranda are supported by the initial document Scottish Health Technical Memorandum 00 which embraces the management

and operational policies from previous documents and explores risk management issues.

Some variation in style and structure is reflected by the topic and approach of the different review working groups.

Health Facilities Scotland wishes to acknowledge the contribution made by professional bodies, engineering consultants, healthcare specialists and NHS staff who have contributed to the review.



Engineering guidance structure

Executive summary

Background information

The Health & Safety Executive's Approved Code of Practice L8 "Preventing or controlling the risk from exposure to *Legionella* bacteria" refers to Written Schemes in paragraph 53 as follows:

> *"There should be a Written Scheme for controlling the risk from exposure which should be implemented and properly managed. This should specify measures to be taken to ensure that it remains effective. The Written Scheme should comprise:*
>
> - *up to date plans of installations (schematic drawings would be acceptable);*
> - *a description of correct and safe operation of systems;*
> - *precautions to be taken;*
> - *checks for efficacy and frequency of checks;*
> - *remedial action to be taken if the Written Scheme is ineffective".*

Aim of the guidance

Experience has shown that the quality and acceptability of Written Schemes has been variable. This guidance has drawn upon experience in producing the most comprehensive documentation to date in the form of operational procedures leading to the production of Witten Schemes, a relevant extract from the HSE Approved Code of Practice L8 and a template or exemplar for NHS Boards to follow in the preparation of a Written Scheme.

1. Operational procedures for the Written Scheme

General Overview

1.1 Premises used by the NHS for the delivery of healthcare are dependent upon water to maintain hygiene through a safe and comfortable risk assessed environment for all who may use, interface and support the delivery of functional healthcare.

1.2 *NHS Board* has a Management and Control of Water Safety Policy, which requires all management and staff across the organisation to be aware of statutory regulations, NHS Scotland mandatory guidance documents and responsibilities with specific arrangements.

1.3 In the healthcare delivery environment, there are a number of reasonably foreseeable risks leading from potential exposure in the use of water that have to be avoided, as far as is reasonably practicable.

1.4 With respect to the responsibilities and duties identified in the Management and Control of Water Safety Policy devolved to the General Manager, Facilities and Estates, this document sets out in writing the scheme to manage and control the risks from potential exposure.

Introduction and Legislative Context

1.5 Legionnaires' disease is a potentially fatal form of pneumonia which can affect anybody but which principally affects those who are susceptible because of age, life-style, illness, or immuno-suppression. It is caused by the bacterium *Legionella pneumophila* and related bacteria. *Legionella* bacteria are common and can be found naturally in environmental ground and water sources such as rivers, lakes and reservoirs, usually in low numbers.

1.6 *Legionella* can survive under a wide variety of environmental conditions and have been found in water at temperatures between 6°C and 60°C. Water temperatures in the range 20°C to 45°C seem to favour growth. The organisms do not appear to multiply below 20°C and will not survive above 60°C. The organisms may, however, remain dormant in cool water and multiply only when water temperatures reach a suitable level. Temperatures may also influence virulence. *Legionella* bacteria held at 37°C have greater virulence than the same *Legionella* bacteria kept at a temperature below 25°C.

1.7 *Legionella* bacteria also require a supply of nutrients to multiply. Sources include commonly encountered organisms within water systems, such as algae, amoebae and other bacteria. The presence of sediment, sludge, scale and other materials within the system together with biofilms play an important role in harbouring and providing favourable conditions in which the *Legionella* bacteria may grow. A biofilm is a thin layer of micro-organism which forms a slime on

surfaces which are in contact with water. Sludge, scale and biofilms can protect *Legionella* bacteria from temperatures and concentrations of biocide that would otherwise kill or inhibit these organisms if they were freely suspended in water.

1.8 *Pseudomonas aeruginosa* is a Gram negative organism most commonly found in soil and water. It can be isolated from any moist environment. It is often termed an 'opportunistic pathogen'. Water within systems can periodically be contaminated with these organisms. Although mains supplied water is treated and disinfected, it contains at the point of use, only residual (relatively low) levels of disinfectant chemicals (e.g. chlorine). Water is therefore not sterile and has a (highly variable) background level of micro-organisms, measured in terms of the Total Viable Count (TVC). Levels of TVC organisms in water samples give an indication of the effectiveness of residual disinfection and consequently the likelihood of finding potentially pathogenic micro-organisms.

Note: An opportunistic pathogen is one which normally only causes an infection in a person with a weakened immune system.

1.9 Where TVCs are higher, there may be an increased risk that water systems are colonised by opportunistic pathogens (e.g. *Pseudomonas* Spp). However, clinical problems are only likely to arise if *Pseudomonas* Spp or other water borne organisms are present in significant numbers in association with biofilms. There is a combination of factors that may have facilitated *Pseudomonas* Spp becoming a clinical problem. These factors include any or all of the following:

- water system materials which may have facilitated biofilm formation (e.g. plastic pipework, plastic and rubber components in TMVs and flexible hose liners etc);
- water outlets with thermostatic mixer valves (TMVs) designed to regulate water temperature and minimise the risk of scalding, which may also have increased the risk of other waterborne pathogens;
- the increased number of wash hand basins / sinks in clinical areas, combined with the increased use of alcohol based hand rubs (ABHRs) which may have resulted in a decreased use of water at individual wash hand basins / sinks;
- the use of non touch (sensor) water fittings, resulting in low water volumes flowing through outlets. This combined with a column of standing water left in the pipework provides an ideal condition for bacterial growth.

1.10 There are a number of Regulations involved in the management and control of *Legionella*, *Pseudomonas* Spp and other similar harmful bacteria. The main requirements are covered in:

- The Health and Safety at Work etc Act 1974;
- The Control of Substances Hazardous to Health 2002;
- The Management of Health and Safety at Work Regulations 1999;
- The Water (Scotland) Act 1980.

1.11 The following documents are cited under these regulations (*statutory guidance*) and require to be read and used in conjunction with the policy:

- L5 ACOP The Control of Substances Hazardous to Health Regulations 2002;
- L8 ACOP The Control of *Legionella* Bacteria in Water Systems 2000;
- Water Byelaws (Scotland) 2004.

Also relevant are:

- HSE – OC 255/12 Control of *Legionella*: Investigation of Outbreaks (and Single Cases) of *Legionellosis* from Water Systems;
- BS7592: 2008 Sampling for bacteria in water systems;
- BS8580: 2010 Water Quality – Risk Assessments for *Legionella* Control – Code of Practice.

Reference should be made also to the healthcare specific guiding principles contained in the following NHS Scotland mandatory guidance documents:

- SHTM 03-01 'Ventilation for healthcare premises';
- SHTM 04-01 'The control of *Legionella*, hygiene, 'safe' hot water, cold water and drinking water systems' Parts A – F;
- HPN2 'Guidance on Management of *Legionella* Incidents, Outbreaks and Clusters in the Community';

Note: SHTN 2 'Domestic hot and cold water systems for Scottish Healthcare Premises' to which reference is widely made, has been withdrawn and the relevant sections are included in Part E of SHTM 04-01.

1.12 *NHS Board* is committed to meeting the requirements of the relevant current statute and associated guidance. The purpose of this document is to detail the Scheme, set out in writing the principles and procedures by Facilities and Estates in compliance with the above, to manage and control the *Legionellosis* and water safety risks and in 'so far as is reasonably practicable' with respect to other requirements.

Responsibilities of the General Manager, Facilities and Estates (The Designated Person [Water]) appointed by the Duty Holder

1.13 These comprise:

- ensuring the Chief Executive (**The Duty Holder**) and Management Teams (**Duty Holders**) and their devolved staff are aware of and co-ordinate with the policy and are familiar with their devolved responsibilities, duties and relevant procedures;
- identifying water safety risks and non-compliance;

- providing adequate facilities, resources and competency training to support, implement and maintain all aspects of the policy;
- providing management and annual performance reports to Chief Executive, Management Teams, Infection Prevention & Control, Occupational Health & Safety, and Risk Management;
- reviewing the effectiveness of the policy across *NHS Board*;
- establishing a Water Safety Group to provide appropriate expertise, to support, co-ordinate and review operational management and controls in accordance with statutory and mandatory requirements;
- seeking support from a consultant medical microbiologist in the event of suspected exposure to *Legionella*, *Pseudomonas* Spp and other similar harmful bacteria;
- appointing in writing an independent professional advisor to act as "**Authorising Engineer**" with a brief to provide services in accordance with SHTM and HSE guidance under the policy;
- appointing in writing an independent professional assessor to act as "***Legionella* Risk Assessor**" with a terms of reference to provide services in accordance BS8580, SHTM and HSE guidance under this policy;
- appointing in writing appropriate Managers to act as "**Responsible Person (Water)**" as defined in appointment letters, to adopt day to day responsibility for controlling and managing any identified risk from potential exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria under the policy.

Note: The Head of Maintenance (or appointed deputy) is the "**Responsible Person (Water)**" managing day–to–day risks and will be the estates lead in the event of an operational incident;

- appointing in writing appropriate deputies and "**Authorised Persons (Water)**" who have sufficient authority, competence and knowledge of the water systems and installations to ensure that all operational procedures and SHTM 04-01 requirements are carried out in a timely and effective manner. The Scheme will involve "**Competent Persons**", "**Maintenance Technicians**", "**Tradespersons**", "**Installers**", "**Contractors**" and "**Contract Supervising Officers**" co-ordinated with **Duty Holders** in accordance with SHTM and HSE guidance under the policy;
- The organisational structure for *NHS Board* inclusive of the above-mentioned local arrangements for the management and control of risk from potential exposure to *Legionella*, *Pseudomonas* Spp and other similar harmful bacteria under the Policy are now expanded as shown below and in **Table 1,** overleaf:

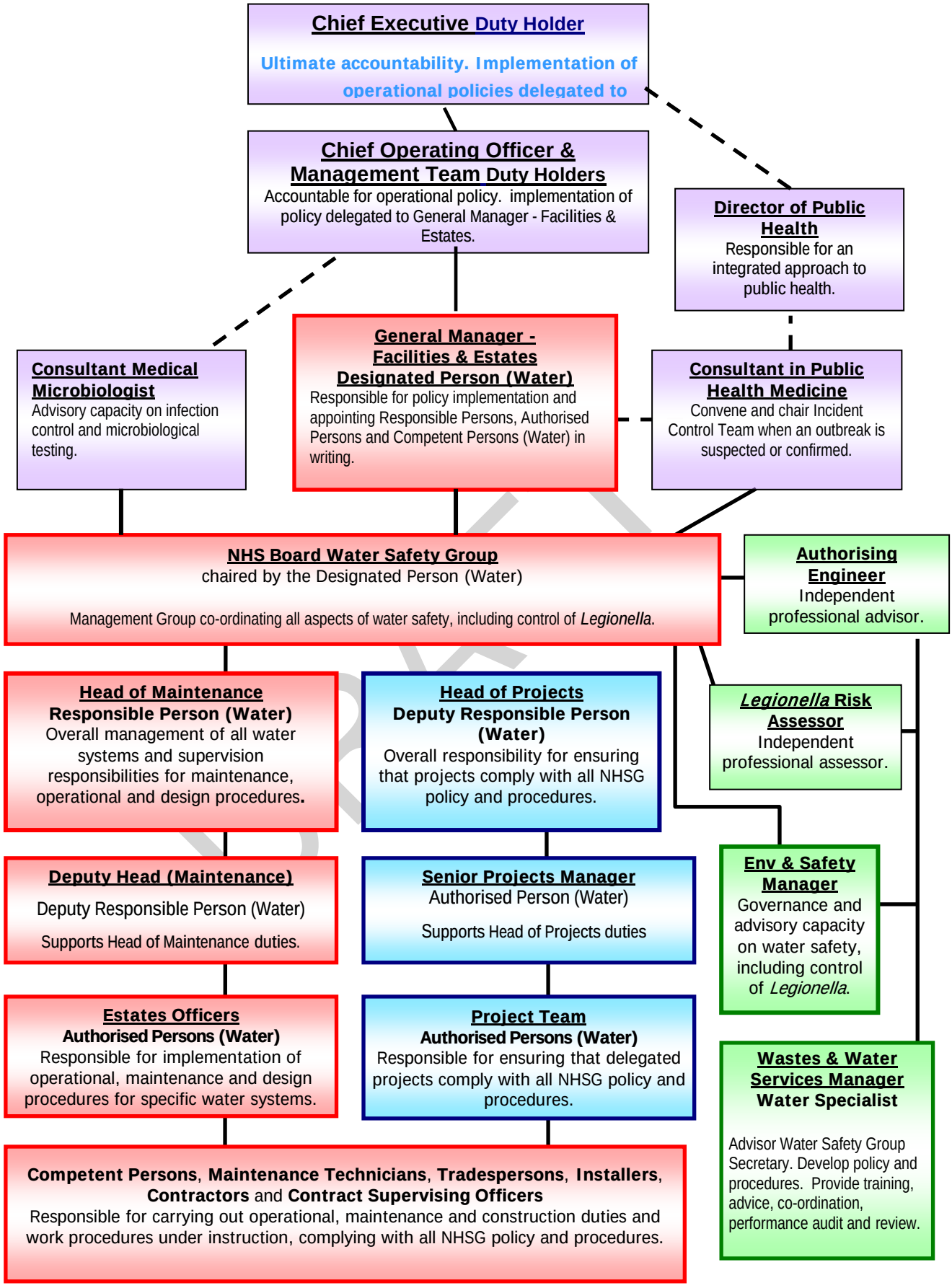


Table 1: Role Holders

Authorised Persons (Water) will be selected from Table 1 and appointed to specific Written Schemes (as shown on Table 2).

Legionella Role	Name	Appointment	Generic Title	Phone
The Duty Holder			Chief Executive	
Duty Holders			Chief Operating Officer	
.. ..			General Manager *Enter General Managers for each site or division as appropriate*	
Designated Person (Water)		In writing by Chief Operating Officer for Chief Executive on xx	General Manager, Facilities and Estates	
Deputy Designated Person (Water)		In writing by Chief Operating Officer for Chief Executive on xx	Head of Soft FM	
Authorising Engineer (Water)		In writing by General Manager Facilities & Estates on xxx	Technical Director of independent appointed organisation	
Legionella Risk Assessor		In writing by General Manager Facilities & Estates on xxx	To be Appointed	
Responsible Person (Water) AP *Add date of training*		In writing by General Manager Facilities & Estates on xxx	Head of Maintenance	
Deputy Responsible Person (Water) AP *Add date of training*		In writing by General Manager Facilities & Estates on xxx	Head of Projects	
Deputy Responsible Person (Water) AP trained Sept 2010		In writing by General Manager Facilities & Estates on xxx	Deputy Head of Maintenance	
Authorised Person (Water) AP *Add date of training*		In writing by General Manager Facilities & Estates on xxx	Estates Officer, Supervisor or Projects Manager *Enter names of all Authorised Persons as appropriate for sites or divisions*	
Competent Person (Water) New staff for AP training		In writing by General Manager Facilities & Estates on xxx	CAD Operator	
Competent Person (Water) AP *Add date of training*		In writing by General Manager Facilities & Estates on xxx	Plumber / TSS Plumber *Enter names of all Competent Persons as appropriate for sites or divisions*	

Others Involved				
Infection Prevention & Control			Consultant Medical Microbiologist	
Legionella Role	Name	Appointment	Generic Title	Phone
Laboratory Services			Biomedical Scientist	
Governance and Advisor			Environment and Safety Support Team Manager	
Water Specialist Advisor			Wastes & Water Services Manager	
Public Health			Consultant in Public Health Medicine	
O H & S Auditor			Health & Safety Auditor	
HSE	Health and Safety Executive			

Note: The names of any member of staff yet to receive relevant training should be entered separately.

1.14 All training and competency assessments provided to and received by all NHS Board personnel involved in water systems will be recorded in the individual's personal training file and the national NHS eKSF system.

1.15 The **Authorising Engineer** shall conduct a regular annual assessment review of competency and training requirements and shall make Training Programme recommendations to the **Responsible Person (Water)** for approved courses run by approved training organisations and where appropriate by the manufacturers of equipment.

1.16 **Authorised Persons (Water)** shall be selected from Table 1 and appointed in writing. They will be given the role of the named person with sole responsibility for the water system(s) identified in specific Written Schemes. (Table 2 refers).

1.17 The Authorised Person shall conduct and record induction and familiarisation with Estates staff and any new Competent Persons, Maintenance Technicians, Tradespersons, Installers, Contractors and Contract Supervising Officers being introduced to water systems. The Authorised Person shall conduct a regular annual review of system familiarisation, operational maintenance, monitoring issues and report recommendations to the Responsible Person (Water).

NHS Board Sites and Blocks with Water Systems

1.18 Table 2 extracted from the Property & Asset Portfolio, details where there are known applicable piped water distribution systems in owned and leased premises. It is anticipated that additional systems will become evident within the various premises, as the risk assessments and Written Schemes (WS) are compiled. Non-applicable Sites, Blocks and Systems are shaded in red.

WS Ref No.	NHS Site Code	Site Name	Block No.	Block Name	GIA m^2	Potential Water Distribution Systems (normally each with 1 CW system & 1 DHW system)	WS Contact
WS1-6						6 systems	
WS7						1 system	
WS8-9						2 systems	
WS243						1 system	
WS244						1 system	

2. Managing the risks

Water systems

2.1 *NHS Board* has a property and asset base of circa xx sites (owned and leased) with circa xxx building blocks (including hospitals, health centres, clinics and support premises) ranging from large multi-hospital campus to small areas within shared buildings, covering circa xxx,000m^2 with a wide range of construction, age and condition criteria (e.g. which can include asbestos, contamination, PPE requirements, confined spaces, access restrictions, permit to access/work).

2.2 Most building blocks will have their own individual water system, although some systems may cover more than one building block and some building blocks may have multiple water systems.

2.3 Water used in the each building block will be controlled to that of the Temperature Control Regime (as outlined in HSE ACOP L8) with full temperature control as advocated in SHTM 04-01 to temperatures in the various parts of the water system.

2.4 Each Building Block has a Water Safety Log Book (located in the Estates Department Offices at xxxxxxxxx Campus and xxxx Hospital and Site Estates Offices) containing details of the specific local water system(s). This includes:

- confirmation of the location with site name, building block name, system name and the **Authorised Person (Water)** who has been appointed in writing as the sole person with knowledge and full control of the identified water system;
- the applicable Written Scheme;
- the current applicable *Legionella* Risk Assessment with summary details of system, equipment, safe operation criteria, precautions to be taken and an Action Plan for any remedial works or routine control measures that may be required to control *Legionellosis* and water safety risks;
- an up to date plan of the system identifying all system plant, to include:
  - water softeners, filters, strainers, pumps, non-return valves and all outlets including showers, wash hand basins, sinks, baths and equipment – such as ice-making machines, drinking fountains etc and any external connections to hoses, mobile units or equipment;
  - all standby equipment such as spare pumps, with details for incorporating into use;
  - all associated pipework and piping routes (including flexible hoses, residual dead legs, blind stub-ends and plugged tee-pieces);
  - all associated storage and header tanks;

  - details of the origin of the water supply;
  - any parts that may be out of use temporarily;
  - thermostatic mixing valves;
  - sentinel hot and cold water outlets;
  - schematic and detailed drawings of the system are also available at the Estates Department, xxxxxxx, and viewable electronically > Shared on Yaren > *Legionella* > Site Drawings;
  - Plans must be kept up to date to include any alterations made to the water system. Notify xxxxxxx on tel 0xxxxxxx0 to make any changes to schematics or detailed drawings;

- insurance examination reports (where applicable) by the Competent Person (Pressure Systems);
- any hazard and Safety Action Notices and/or operational restrictions;
- any depreciation and condition reports highlighting actions for planned (in whole or component parts) system replacement;
- a clear detailed description of the correct and safe operation of the system;
- the precautions to be taken in respect of any identified risks;
- the checks to be carried out to ensure efficacy of the scheme and the frequency of the checks;
- the remedial action to be taken in the event that the scheme is shown not to be effective.

Note: The Written Scheme Template to be used for specific locations is detailed in Appendix B.

3. Planned Maintenance Procedures

Operational Criteria

3.1 Water used in the water systems will be controlled to that of the Temperature Control Regime (as outlined in HSE ACOP L8) with full temperature control as advocated in SHTM 04-01 to temperatures in the various parts of the water system as follows:

Note: Water must not be stored or circulated at temperatures within the range: above 20°C or below 50°C

3.2 Cold Water (CW) must be stored or distributed to outlets at or below 20°C.

3.3 Domestic Hot Water (DHW) must be at or above 60°C (at the flow point from heat exchangers/vessels) as it enters the supply system and circulated at no less than 50°C (at the return point to heat exchangers).

3.4 Domestic Hot Water supplied to Thermostatic Mixing Valves (TMV) or other outlets must be at no less than 55°C.

3.5 Cold Water supplied to Thermostatic Mixing Valves (TMV) or other outlets must be at or below 20°C.

3.6 Special attention and escalation in writing to the relevant **Authorised Person (Water)** and **Responsible Person (Water)** is required where and when any of the above criteria cannot be met.

Note: Hot water (and hot surfaces) above 45°C present risks of scalding and burning.

3.7 Point-of-Use Filters (P.O.U) Filters will only be installed and used where this is practical and there has been a written policy decision by the Water Safety Group, along with a complimentary managed maintenance change-filter process. This will be have to be put in place for life – or until a further policy decision by the Water Safety Group confirming that they are satisfied that the affected outlet and pipework can be removed or disinfected without compromising the rest of the water system.

3.8 Taps or other water outlets should **not** be installed if they will not be used regularly, that is, less than twice in a week.

3.9 Where taps or water outlets are, or are unlikely to be, in regular daily use, Management Team **Duty Holders** and their staff have been alerted and reminded to flush these through and purge to drain, or purge to drain immediately before use, without release of aerosols. In Neonatal Units (NNUs),

Adult and Paediatric Intensive Care Units (ICUs) infrequently used taps should be flushed daily at the start of each day. The Maintenance Department and Designers have responsibilities to be alert to the **Duty Holder** requirements contained in Risk Control Notice 11/04 – and the record keeping on Sample Record Sheet - or take steps to have the outlet removed and the resultant dead-legs eliminated by taking out redundant branch pipework back to the circulating mains, removing the tee-piece and replacing with a straight coupling.

3.10 Management Team **Duty Holders** and their staff have also been alerted on awareness and actions to minimise the risk of *Pseudomonas* Spp and other similar harmful bacteria in the use of equipment, transmission routes and requirements (such as in the use of hand wash stations and wash basins) in Risk Control Notice 12/04.

Maintenance Schedules Summary

Frequency	Item	Procedure	Description
Daily	Temperature Monitoring	P1C1 (*with ALL incidents logged on Form GUHLRC04 and BEMS alarms incidents on GUHLRC21*)	Incidents and Faults; BEMS monitoring & log of all alarms
Daily	DHW Temperature Monitoring	P1C1A (*logged on Form GUHLRC05A*)	Manual monitoring or where BEMS not installed or BEMS not operational
Weekly	Water Quality	P1C2 (*logged on Form GUHLRC27*)	Chloramine/chlorine checks (initially weekly)
	DHW Calorifiers	P1C3 (*logged on Form GUHLRC28*)	Manual change over and log of circulating pumps not on BEMS control
Monthly	Temperature Monitoring	P1C4 (*logged on Form GUHLRC05*)	a) Sentinel hot water taps b) Sentinel cold water taps c) Sentinel TMV taps d) DHW calorifier/heat exchanger flow & return temperatures e) Chilled Water heat exchanger flow & return temperatures
	Air Handling Plant	P1C5 (*logged on Form GUHLRC22*)	Inspect, clean & log glass traps
3 Monthly	DHW Calorifiers, DHW & CW Storage/ Buffer Vessels	P1C6 (*logged on Form GUHLRC06*)	Flushing of DHW calorifier(s) and Storage/Buffer Vessel(s) associated with Hot /Cold/Chilled Water Heat Exchanger(s)

Frequency	Item	Procedure	Description
3 Monthly for high risk areas and as required elsewhere, but at least once Annually	Shower Heads and Hoses	P1C12 (*logged on Form GUHLRC05B*)	Dismantle, clean and de-scale / or replace with new disinfected Shower Head and Hose
6 Monthly	Summer and Winter Temperature Monitoring	P1C7 (*logged on Form GUHLRC03*)	a) Cold Water at inlet to building block. Also to be continuously monitored by BEMS & log of all alarms
	Water Tanks	P1C7 (*logged on Form GUHLRC03*)	a) Tank and temperature checks & log b) Tank inspection
	Air Handling Plant	P1C8 (*logged on Form GUHLRC07*)	a) Humidity section inspection b) Cooling section inspection c) Disinfection
Annually	DHW Calorifiers, DHW & CW Storage/ Buffer Vessels	P1C9 (*logged on Form GUHLRC06*)	Drain & cleaning of DHW Calorifier(s) and Storage/Buffer Vessel(s) associated with Hot /Cold/Chilled Water Heat Exchanger(s)
	Temperature Monitoring	P1C10 (*logged on Form GUHLRC05*)	a) Representative hot water taps b) Representative cold water taps c) Representative TMV taps d) DHW calorifier flow & return temps e) BEMS graphs printout
Other Procedures		Record	Description
Short / Limited Closure Record Form		Logged on Form GUHLRC01	For a period not exceeding 30 days
Indefinite Closure / Re – Occupation Record Form		Logged on Form GUHLRC02	For periods exceeding 30 days
Incident Report Record Form		Logged on Form GUHLRC04	For all incidents and resulting actions
Water Maintenance Frequencies Risk Based Assessment Form		Logged on Form GUHLRC23	For review and change of any maintenance frequency
Water Disinfection Risk Based Assessment Form		Logged on Form GUHLRC24	For assessment for disinfection of systems after work or alterations
Checklist for New Water System Designs		Logged on Form **GUHLRC25**	Checklist for designers

Other Procedures	Record	Description
Flushing Water Outlets Record Form	Logged on Form **GUHLRC26**	Record sheet for Estates Department use
Estates Chloramine Record Form (**GUHLRC27**)	Logged on Form **GUHLRC27**	Record sheet for Estates Department use
Water Safety Control Log – Record Form	Logged on Form **GUHLRC28**	For plant status, maintenance tasks and resulting actions
Acceptance of Work to be Conducted and Completed Record Form	Logged on Form **GUHLRC29**	Record sheet for designers and Estates Department for alterations to existing and provision of new Water Systems
Risk Control Notice 11/04	Logged on Sample Record Sheet	For Duty Holders
Risk Control Notice 12/04	Actions to Estates Helpdesk	For Duty Holders

Temperature Monitoring by BEMS – P1C1

(Where Building Energy Management Systems (BEMS) installed)

3.11 All hot and cold water systems fitted with BEMS monitoring and control devices should be set to give high priority alarms in the event of system failure and/or temperature variances outwith alarm set points. Temperature monitoring devices shall be physically tested annually and recalibrated in accordance with manufacturers' instructions.

3.12 All system failures and/or temperature alarms should be continually monitored 24 hours a day, with alarms being generated at Estate locations and by remote paging of Estates staff (i.e. controls engineer or duty engineer etc).

3.13 The Estates person carrying out the monitoring or being notified of an alarm condition should log all incidents in the Estates Incident Report Record Form (**GUHLRC04**) and also where appropriate in the Estates BEMS Record Form (**GUHLRC21**).

3.14 The incident should be investigated by the Estates staff and appropriate action taken (see *Legionella* Operational Procedures, SHTM 04-01 & *Legionella* ACOP L8) and recorded in the Estates Incident Report Record Form (**GUHLRC04**)

Temperature Monitoring where a BEMS is *not* installed or where the BEMS is not operational – P1CC1A

3.15 Check the flow and return temperatures on the domestic hot water calorifier system as defined in the local plan of the system being checked, using the temperature gauges fitted or a suitable surface temperature probe.

3.16 The flow temperature to be at least 60ºC and the return temperature to be no less than 50ºC.

3.17 Record all temperatures daily on the Record Form (**GUHLRC05A**).

3.18 Inspect cold water tank and conduct temperature checks – P1C7 as per 3.7 below and record all inspection and temperatures on the Record Form (**GUHLRC03**).

3.19 The frequency of manual temperature checks and recording shall be:

Policy Generic Areas	Frequency for Domestic Hot Water systems	Frequency for Cold Water Systems
High Risk – Acute and Primary Care Premises - Hospitals and any premises concerned with the treatment of care of the elderly and susceptible immuno-compromised patients.	Daily	6 Monthly
Moderate Risk – ALL other Hospital clinical premises	Daily	6 Monthly
Moderate Risk – ALL other Non Hospital (health centres, clinics and specialist clinical premises	Weekly	6 Monthly
Low Risk – ALL Non Clinical premises	Monthly	6 Monthly

Water Dosing Systems – P1C2

3.20 *(Where applicable)*

Under the Water Supply (Water Quality) (Scotland) Regulations as amended, the water across the *NHS Board* area as supplied by the water authority is subject to a chloramination disinfection regime. Sampling results of *NHS Board* water systems shall be recorded in the Estates Chloramine Record Form (**GUHLRC27**). Sampling will be taken from a hot or cold water outlet point, representative of each secondary distribution pipework system. These will initially be conducted weekly and then subject to ongoing trend based frequency risk assessment, limited to no less than at once per month sampling test frequency. Frequency risk assessments shall be held in the Water Safety Log Book.

Should the water authority's disinfection regime across the *NHS Board* area change, then all cold water tanks and any systems with water treatment dosing systems should be checked weekly in accordance with the manufacturers recommended instructions as follows:

3.21 The relevant **Authorised Person (Water)** should produce and implement local planned maintenance tasks in accordance with the manufacturers recommended instructions for the approval of the **Responsible Person (Water)**.

3.22 This and all maintenance tasks should be recorded in the Water Safety Log Book on Form (**GUHLRC28**).

3.23 All water test readings should also be recorded on an appropriate record sheet.

Manual Changeover of Circulating Pumps – P1C3

(Where Building Energy Management Systems (BEMS) NOT installed)

3.24 Any plumbed-in duplicate circulating pump should be removed from the system. Where this is not practicable, the duty pump should be manually changed over a least once per week to reduce any danger of water stagnation. A spare pump should be kept for immediate replacement in the event of pump failure.

3.25 The relevant **Authorised Person (Water)** should produce and implement local maintenance tasks.

3.26 This and all maintenance tasks should be recorded in the Water Safety Log Book in Form (**GUHLRC28**).

Monthly Temperature Checks – P1C4

Sentinel Hot and Cold Taps

3.27 Sentinel taps for hot water services (and any recirculating cold water systems) are the first and last taps on a recirculating system. For non-recirculating cold water systems (or non-circulating hot water systems), they will comprise the nearest and furthest taps from the storage tank. The choice of further sentinel taps may also include other taps that are considered to represent a particular risk.

3.28 Check the temperatures at the sentinel taps as defined in the local plan of the system being checked.

- Using a calibrated temperature probe, check the temperature of water from the cold water tap does not rise above 20ºC after running the tap for 2 minutes.

- Using a calibrated temperature probe, check the temperature of water from the hot water tap does not drop below 50ºC whilst running the tap for 1 minute.
- Record all temperatures on Record Form (**GUHLRC05**).

3.29 Sentinel Thermostatic Mixing Valves (TMV)

- check the temperatures at the TMVs on a sentinel basis as defined in the local plan of the system being checked. The system should achieve 55°C under normal use at the supply to the furthermost draw-off point in the circulating system;
- using a calibrated temperature surface probe check that the temperature of water in the hot water pipework to the TMV does not fall below 50ºC whilst running the tap for 1 minute;
- record all temperatures on Record Form (**GUHLRC05**).

3.30 Domestic Hot Water Calorifier(s) and Plate Heat Exchanger(s)

- check the flow and return temperatures on the domestic hot water system as defined in the local plan of the system being checked, using the temperature gauges fitted or a suitable surface temperature probe;
- the flow temperature to be at least 60ºC and the return temperature shall be no less than 50ºC;
- record all temperatures on the Record Form (**GUHLRC05**).

3.31 Domestic Cold / Chilled Water Heat Exchanger(s)

- check the flow and return temperatures on the domestic cold / chilled water system as defined in the local plan of the system being checked, using the temperature gauges fitted or a suitable surface temperature probe;
- the flow and return temperatures shall be no more than 20ºC;
- record all temperatures on the Record Form (**GUHLRC05**).

3.32 Frequency Risk Based Assessment

Systems that continually conform to and have a database history of temperature readings within the control parameters should have a risk- based assessment carried out annually to determine if the maintenance frequency can be changed. This assessment should be recorded on Form **GUHLRC23** by the **Authorised Person (Water)** and ensure the **Responsible Person (Water)** is notified immediately in writing. Frequency risk assessments shall be held in the Water Safety Log Book.

Water Glass Trap Drains on Ventilation Units – P1C5

3.33 Visually inspect condition of glass drain trap assembly;

- top up glass trap assembly with clean water to the desired level if required;

- remove any glass trap assemblies that are dirty, clean and top up with clean cold water;
- record checks on Estates monthly checks of water drain traps on ventilation plant Record Form (**GUHLRC22**).

Domestic Hot Water Calorifier(s) and Storage/Buffer Vessel(s) associated with Hot /Cold/Chilled Water Heat Exchanger(s), Flushing – P1C6

3.34 Flush each domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. The hose from the drain valve should be discharged to the nearest drain.

3.35 Record all actions on the top section of Record Form (**GUHLRC06**).

3.36 Where the domestic hot water system has a stratification pump(s) fitted to circulate the hot water from the top to the base of the calorifier or the storage/buffer vessel, and the history data shows no sludge deposits during flushing, then this procedure should be risk assessed to determine if the maintenance frequency can be changed. This assessment should be recorded on Form **GUHLR23**.

Water Tank Inspection and Temperature Checks – P1C7

3.37 Summer / Winter Inspection of water tank as per Record Form (**GUHLRC03**).

3.38 Where the system has no BEMS temperature sensors connected the readings should be taken using a temperature sensor. The tank temperature should be below 20ºC.

3.39 Record all inspection and temperatures including the mains water supply at the building/block inlet on the Record Form (**GUHLRC03**).

Ventilation Plant Inspection and Disinfection – P1C8

Disinfection Procedure

3.40 Record all actions on “Air Handling Unit Disinfection Record Form” (**GUHLRC07**) for each system.

3.41 Prior to taking a plant into use or at intervals not exceeding six months, all parts of the plant that become damp in normal use shall be disinfected following the procedure given below. This will include humidifiers (where installed), cooler batteries/cooling coils, drainage systems and energy recovery devices.

3.42 All procedures must comply with the Health and Safety at Work etc Act, COSHH Regulations and other subordinate legislation.

3.43 Sodium Hypochlorite solution of strength 5ppm will normally be used. This can no longer be ordered from Pharmacy (Central Pharmacy at xxxxxx Health

Campus). The solution may be made up using Actichlor (or equivalent) tablets and mains tap water. This should only be done by personnel who have relevant training and the authority from the **Authorised Person (Water)**. Follow the instructions provided with the Actichlor, taking care to use appropriate PPE.

- the Sodium Hypochlorite solution 5ppm should be used without delay, normally within 2 hours of issue;
- notify all persons working in those areas served by the plant to be disinfected;
- switch off all ventilation systems containing devices to be disinfected;
- close the plant isolating dampers;
- open and remove the inspection covers/access doors on both sides of the devices;
- spray all internal surfaces of the humidifier section or cooler battery/cooling coil with a 5 ppm chlorine solution until all surfaces are thoroughly wetted, also flood drip trays and drainage system with the same solution and allow to stand for a minimum of 2 hours;
- spray all internal surfaces of the humidifier and cooler battery/cooling coil with sufficient clean water to remove all traces of the chlorine solution from the device, its drip trays and drainage system.
- restore the plant to normal operation.

Note: If any suspicion arises as to the possible contamination of the system then the microbiologist should be requested to take swab tests from all drain trays and cooler battery/cooling coil tubes and fins.

Domestic Hot Water Calorifier(s) and Storage/Buffer Vessel(s) associated with Hot /Cold/Chilled Water Heat Exchanger(s), Drain and Clean – P1C9

3.44 Follow the manufacturers maintenance instructions (in Water Safety Log Book). Record all actions where applicable on the lower section of “Calorifier and Storage/Buffer Vessel Maintenance Record Form” (**GUHLRC06**) for each system.

- isolate domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel service valves;
- heat any domestic hot water calorifier or hot water storage/buffer vessel up until the contents has reached 60ºC and hold at this temperature for a period of at least 1 hour;
- drain domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel and remove inspection hatch;
- hose out the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel to remove any debris, scale or other deposit. Care should be taken to keep aerosols to a minimum;

- if the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel does not have an inspection hatch, the pipework at the top of the vessel should be disconnected to allow the insertion of a water hose to allow debris to be washed down off internal surfaces;
- examine the internal and external condition of the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel and pipework, any defects should be reported in writing to the relevant **Authorised Person (Water)**. The safety valve should be checked, overhauled and reset as necessary. The temperature, altitude and pressure gauges to be checked for operation.

3.45 On completion of examination and any repairs, the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel should be re-constructed.

3.46 On completion of the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel assembly, the following sequence must be undertaken:

- refill with cold water;
- drain the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel;
- refill with cold water, leave cold feed valve open;
- run domestic hot water calorifier or hot water storage/buffer vessel at a temperature of 60ºC for at least 1 hour. Test the operation of high limit cut-out system if fitted. Check the temperature of the calorifier/vessel top and bottom with a surface thermometer;
- adjust any controls as necessary.

3.47 Take bacteriological samples from the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel drainage trap (where possible) and nearest and furthest outlet.

3.48 Record all actions on the Record Form (**GUHLRC06**).

Annual temperature monitoring – P1C10

Representative Hot and Cold Taps

3.49 Check the temperatures at the hot and cold taps on a representative number of taps on a rotational basis as defined in the local plan of the system being checked.

- using a temperature probe check the temperature in the cold water tap does not go above 20ºC after running the tap for 2 minutes;
- using a temperature probe check the temperature in the hot water tap does not go below 50ºC within running the tap for 1 minute;
- record all inspection and temperatures on the Record Form (**GUHLRC05**). Add “Annual Monitoring Procedure” to the Comments / Action box to clarify.

BEMS Data

3.50 DHW and CW system performance data is valuable for assurance and continuous improvement of *Legionellosis* risk control. Data should be reviewed and exploited as follows:

- produce a BMS plot covering a typical week, for each DHW and CW system;
- identify non-compliant systems and prioritise them for remedial actions by risk category;
- repeat the plots on an annual basis and when there is a change e.g. change of use, engineering modifications, etc;
- maintain hard copy records in the Water Safety Log Book.

Shower Head and Hoses Replacement – P1C12

3.51 Planned Shower Head and Hose Replacement Programme conducted 3-monthly in High Risk Areas and as required elsewhere, but undertaken at least once per annum, as follows:

- remove the shower head and hose assembly. Place shower head and hose assembly into a plastic bag and seal;
- check that the new clean disinfected head and hose package is intact;
- open replacement new clean disinfected shower head and hose assembly sealed packaging, remove and fit following the manufacturers instructions;
- run water and flush for 3 minutes in accordance with *Legionella* Risk Assessment in such a way as to avoid the creation of aerosols;
- check final temperature for compliance and working order and return shower appliance to use;
- return redundant sealed bag with shower head and hose assembly to workshop for disposal in accordance with Waste Procedures;
- record all actions on the Record Form (**GUHLRC05B**).

4. Procedure for Domestic Hot Water Systems following plant failure, allowing system water temperature to drop below critical control levels

4.1 This escalation procedure should be employed if the Calorifier or Plate Heat Exchanger outflow temperature falls below 45°C.

4.2 Decision Table for Hot Water System Breakdown

The table below should be used to decide on the actions necessary in the event of a plant breakdown such as power failure or steam supply failure.

Breakdown leading to temperature <45°C, lasting for:	Risk Category	Action
<12 hrs	High	Verify
	Significant	Verify
	Moderate	Verify
>12 hrs	High	Thermally pasteurise
	Significant	Verify
	Moderate	Verify
>24 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Verify
>72 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Thermally pasteurise

"Verify" : Ensure that normal temperature performance has been resumed, i.e. 60°C

"Thermally pasteurise" : Calorifier or Plate Heat Exchanger and complete distribution system

4.3 In the event of a reduction in domestic hot water temperature the **Authorised Person (Water)** should be notified in writing as soon as possible. The reason for failure must be identified and rectified as soon as possible.

4.4 The **Authorised Person (Water)** shall notify the **Duty Holder** and users on the failed system that they must not draw off any hot water from the affected services until further notice.

4.5 The relevant **Duty Holder** shall ensure that their staff are aware of the situation, and that they in turn shall prevent patients from using affected services.

4.6 Where thermal pasteurisation is to be carried out, the temperature of the calorifier or plate heat exchanger shall be raised to 70°C, and the water shall be circulated throughout the affected distribution system for at least one 1 hour. Each tap or appliance should be run in sequence until full temperature is achieved (this should be measured). To be effective the temperature in the calorifier or plate heat exchanger should be high enough to ensure that all distribution outlets receive water at a temperature of greater than 60°C. Ensure the return flow to the calorifier or plate heat exchanger is no less than 50°C.

4.7 The **Authorised Person (Water)** shall inform users that the system is back in operation.

4.8 Bacteriological samples should be taken in consultation with the Infection Prevention and Control team.

4.9 The **Authorised Person (Water)** shall complete an Incident Report Record (**GUHLRC04**) and ensure the **Responsible Person (Water)** is notified in writing as soon as possible. Maintain hard copy records in the Water Safety Log Book.

5. Procedure for Cold Water Tanks following the identification of water temperature greater than 20°C

5.1 Drinking water, to a relevant water quality under Regulations, is provided to *NHS Board* by Business Stream, a Licensed Provider (LP), who work with Scottish Water to make sure that the water supply is connected properly, and that the water is clean and ready to use.

5.2 These obligations cover the supply network up to the boundary point (normally the meter point). Thereafter obligations rest with *NHS Board*. Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be within the 5–10 °C range and in summer up to 20°C.

5.3 The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is greater than 20°C. (i.e. the water storage tanks for Domestic Cold Water Systems and for Domestic Hot Water Systems).

5.4 **Stage 1 - Verification**

- Where tepid cold water occurrence (i.e. more than 20 °C) is reported from any number of cold water outlets, from maintenance procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant **Authorised Person (Water)** as soon as the problem is identified and confirm this in writing within 24 hours.
- The **Authorised Person (Water)** should liaise with the person identifying the problem and verify the problem by independently rechecking by taking the water temperature of the appropriate cold water storage tank, the temperature of the incoming mains cold water at the site boundary point (and building entry point if there are multiple buildings served by the mains cold water system) and the outflow distribution temperature.
- If the cold water storage temperature is confirmed greater than 20°C, then the **Authorised Person (Water)** should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk.
- The **Authorised Person (Water)** should also review the Water Safety Log Book and take into account the recent water system history specifically to include the primary water treatment levels (for mains cold water supplied with Chloramination treatment); any water sampling carried out following

SHTM 04-01; system monitoring data, including temperature monitoring and water quality chloramine checks; recent maintenance history; recent alterations, changes or additions to the water system; and any other changes made by **Duty Holders** or users of the water system.

- On reviewing continuous monitoring temperature profiles, in conjunction with Water Safety Log Book and recent history, action as Stage 2 or Stage 3 or Stage 4 as appropriate. The **Authorised Person (Water)** will ensure the **Responsible Person (Water)** is notified immediately in writing at each Stage and also recorded in the Water Safety Log Book.

5.5 Stage 2 - Initial Action – high incoming mains cold water temperature

- Where the incoming mains cold water is 18°C or greater for more than a 48 hour period the **Responsible Person (Water)** should contact Business Stream the Licensed Provider, who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment.

5.6 Stage 3 - water temperatures fluctuating above and below 20°C (but no greater than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclic manner over 72 hour periods in response to regular user water demand (but no greater than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the **Authorised Person (Water)**, the reason(s) for failure(s) identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure).
- Considerations for failures include:
  - accuracy of temperature sensors (requires recalibration);
  - temperature sensors being located in water (requires reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (changes in user water demand);

- Ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or Steam systems);

5.7 **Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)**

- In this situation continuous monitoring should be continued by the **Authorised Person (Water)**, the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure).
- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) must be implemented.
- The **Authorised Person (Water)** should, unless instructed in writing to the contrary by **Responsible Person (Water)**:
  - arrange to drain the tank contents and clean if necessary;
  - inform the users of the failed system that they must not draw off any cold water (and hot water if a single domestic hot water header) from the affected system until further notice;
  - chlorine (or other suitable) disinfection of the tank and distribution system shall be carried out;
  - thereafter the tank shall be brought back into service;
  - then the users shall be informed that the system is back in operation.

5.8 The **Authorised Person (Water)** shall complete an Incident Report Record Form (**GUHLRC04**). An entry should also be made in the Water Safety Log Book and ensure the **Responsible Person (Water)** is notified in writing as soon as possible.

5.9 Water systems should be cleaned and disinfected under the circumstances in the table overleaf:-

System/ Service	Circumstance Requiring Cleaning and Disinfection* (* for disinfection check current Risk Assessment)	Frequency
Domestic Cold Water and Domestic Hot Water Tanks	New installations. Re-commissioning empty/unused tanks. Tank temperature exceeds 25°C. (check with Risk Assessment). Tank contains moderate sediment, i.e. a complete covering of tank base. Evidence of tank corrosion (check with Risk Assessment). Any contamination of tank (by organic, by vermin or vermin faeces or similar). Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc. Regular programme for high-risk healthcare category, with disinfection* where identified in the local Written Scheme (check with Risk Assessment). Regular programme for medium risk healthcare category, with disinfection* where identified in the local Written Scheme (check with Risk Assessment). Regular programme for non-healthcare premises, with disinfection* where identified in the local Written Scheme (check with Risk Assessment).	As required As required As required As required As required As required As required Annually 2 Yearly 5 Yearly
Domestic Cold Water Distribution System	New installations and modifications or additions. Temperature exceeds 25°C. (check with Risk Assessment). Any contamination of tank (by organic, by vermin or vermin faeces or similar). Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required As required As required As required
Domestic Hot Water Calorifier and Storage/ Buffer Vessels	New installations and modifications or additions. Temperature has fallen below 45°C. Re-commissioning of empty/unused plant. Any contamination of header tank (by organic, by vermin or vermin faeces or similar). Regular programme.	As required As required As required As required Annually
Domestic Hot Water Distribution System	New installations and modifications or additions. Temperature has fallen below 45°C. . Any contamination of header tank (by organic, by vermin or vermin faeces or similar).	As required As required As required
Air Handling Units	Any contamination (by organic, by vermin or vermin faeces or similar). Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc. Chiller battery, drip trays and drainage pipework.	As required As required 6 monthly

6. Protection of Maintenance Personnel

6.1 The disinfection procedures presented for cold water storage tanks, domestic hot water vessels and water systems are designed to minimise the risk to staff and others that may come into contact with water which may have been contaminated with *Legionella* sp or other harmful bacteria. In all instances of draining, water should be drained in such a way as to avoid the creation of an aerosol.

6.2 The appropriate protective clothing should be worn during such procedures. This can be a powered filter and hood, European Class TH3 (assigned protection factor of 40) or a power assisted filter and close fitting full face mask TM3 (assigned protection factor 40). It should be borne in mind that the filter on these systems is liable to get wet and subsequent resistance to air can increase with consequent discomfort to the operator.

6.3 Where possible, cleaning methods which create an aerosol (e.g. high-pressure water jets) should be avoided. If this is not possible, the operation should be executed when the building is unoccupied or, in the case of permanently occupied building, windows in the vicinity should be closed and air inlets temporarily blanked off. As systems requiring cleaning will have high organic load the operator and others closely involved should wear suitable respiratory protective equipment.

6.4 If plant is located in confined spaces, reference on entry into confined spaces can be sought from Safe Work in Confined Spaces Approved Code of Practice, Regulations and Guidance (L101), and NHS Board's Confined Space Entry procedure. Personnel shall not be permitted to enter any water storage system (i.e. tank, calorifier, AHU) without working to the *NHS Board* safe system (GEMsoft7 or equivalent) for access or work. Health Facilities Scotland publication "Confined Spaces policies, procedures and guidance" (2012) also refers.

6.5 Because water treatment chemicals, including chlorine-containing chemicals and solutions, are often toxic or corrosive they should be used cautiously to ensure that they do not endanger the users or other occupants of the building. Caustic resistant gauntlet type gloves will be required. Water treatment should be carried out by, or under the direction of, people who are suitably qualified and experienced.

6.6 The use of water treatment chemicals should be subject to a COSHH assessment in advance and permission would be required from the Water Authority prior to any discharge to sewers, storm water drains and watercourses.

Note: Scottish Water and SEPA should be contacted prior to direct discharge to watercourses.

Safe Purging of Stagnant Water

6.7 Stagnant water may potentially contain large numbers of *Legionella*. In order to avoid *Legionellosis* and water safety risks, precautions must be taken to avoid the creation of aerosols and to avoid the exposure of people to any unavoidable aerosols.

6.8 The specific precautions may vary according to the particular circumstances, but typically include:-

- work on or removal of dead leg pipework;
- running a hose from the outlet into a container of clean water;
- running hoses directly into a drain cover;
- running fire hoses at a distance from occupied buildings;
- testing fire mains or fire suppression systems;
- closing windows and air conditioning / ventilation intakes where aerosols are created outdoors;
- closing windows and air conditioning / ventilation intakes where excavations and soils removal is conducted outdoors;
- wearing respiratory protective equipment (remember this does not protect nearby members of the public and others who are not wearing masks).

Note: Care should be taken at all times to avoid the risk of contamination by the possibility of back siphonage into mains water supplies.

7. Procedure in the event of Ward or Department closure

Background

7.1 Where a ward or department is planned to close for a period of greater than 7 days, the **Duty Holder** must ensure that the manager of that department/ward has notified the relevant **Authorised Person (Water)** of the details so that the impact on the safety of the water system can be evaluated.

7.2 Following a decision to close a ward/department, full negotiations between the ward or department manager and the **Authorised Person (Water)** must take place to assess the risks and ensure that relevant safety procedures are established to mitigate the risks of exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria. The documented procedures shall clearly define responsibilities and the actions named individuals shall perform, including record keeping.

7.3 The period of closure should be established at the earliest point in negotiations. The period for which a department or ward is closed can play an important part on assessing the likelihood of exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria, the cost implications and the arrangements involved in closure.

Short / Limited Closure

7.4 Where a short term or limited closure of a ward/department is required (typically not exceeding 30 days) a nominated individual shall be identified to run every tap for three (3) minutes and to flush every toilet on a twice weekly cycle basis. The nominated individual should then complete the Record Form (**GUHLRC01**), signed by themselves and their relevant manager, the completed form being forwarded to the Estates Department for the attention of the **Authorised Person (Water).**

7.5 Before the department/ward is re-occupied the Estates Department shall organise an inspection and test of the water systems and report its condition to the **Authorised Person (Water)** for any remedial works that may be required.

Indefinite Closure

7.6 When a ward/department is to close with no planned re-opening date, or where the closure period typically exceeds 30 days, the Estates Department must be consulted and provided with funding in order to alter or disconnect and drain the relevant water services ‘so far as is reasonably practicable’. The department or ward manager should be aware that considerable cost for modifications could be needed to achieve this requirement in some large properties with multiple wards/departments being served by the water system. The top section of

Record Form (**GUHLRC02**) shall be completed "Indefinite Closure – System removed from operation from (*the date closed*)" by the **Authorised Person (Water).**

Detail of Works for an Indefinite Closure (Where Relevant)

7.7 All water tanks associated with the affected area shall be drained, cleaned and dried out.

7.8 All pipework and devices shall be drained and domestic hot water calorifiers (or other storage vessels) shall be opened up, cleaned and left open to the atmosphere.

7.9 To avoid dead-legs, pipework shall be disconnected from the mains services and tees replaced with straight couplings. Mains cold water services shall be isolated at the Mains and capped off from the system and all relevant pipework drained.

7.9 Notices shall be posted throughout the affected department or ward area stating that all water services are disconnected.

7.10 The Estates Department shall be responsible to ensure that an adequate water seal exists in unused toilets etc to prevent odours from the foul drain system entering the premises.

Re-occupation of an Indefinitely Closed Area

7.11 In the event of re-occupation of an indefinitely closed department or ward, full negotiations must take place between the ward/department manager and the Estates Department prior to the re-occupation exercise.

7.12 The Estates Department will require the following information:-

- the planned re-opening date;
- any proposed changes of use of the department or ward;
- any areas which will not be used;
- the approval of the **Authorised Person (Water)** in advance.

7.13 The Estates Department will provide the department/ward manager with a cost to put the water systems back in service.

7.14 Before the water system is put back into service, any necessary modifications and maintenance shall be carried out prior to cleaning and disinfecting the system.

7.15 The bottom section of Record Form (**GUHLRC02**) shall be completed at re-occupation and operation from (*the date re-occupied*)" by the **Authorised Person (Water).**

8. Occupation after alterations to water systems including refurbished and new premises – safe operation of water systems

Procedure until Occupation

8.1 This procedure is designed to prevent *Legionellosis* and other water safety risks developing during and after alterations to water systems, including the occupation of refurbished and new buildings through the interim period following alteration, construction, commissioning and hand over with interface with the **Authorised Person (Water)** for occupancy.

8.2 In design and build type contracts **-** outbreaks of Legionnaires' disease have been associated, whereby the client retains no clerk of works on site and/or where there is no 'commissioning' period on completion of the work. It is vital that immediately before occupation the measures outlined in SHTM 04-01 have been implemented.

8.3 Disinfection and cleaning shall be in accordance with:-

- SHTM 04-01 Part A: Testing and Commissioning (Section 16);
- SHTM 04-01 Part A: Disinfection (Section 17);
- SHTM 04-01 Part E: Flushing and Disinfection (Section 2) *which was formerly in SHTN 2 (section 2)*

8.4 Once the system is in use and has been cleaned and disinfected prior to hand over, an **Authorised Person (Water)** shall be nominated to monitor and observe the system. The **Authorised Person (Water)** shall ensure that the system is operated in accordance with *NHS Board's* 'procedure for ward/department closure - short/limited closure' and the relevant Record Forms (**GUHLRC01**) completed.

8.5 At the point of hand over **ALL** relevant information written on operating the system, system performance, together with accurate ‘as-fitted’ drawings and design criteria of the domestic hot water systems and cold water services shall be submitted to *NHS Board* (i.e. an appropriate current Written Scheme, accepted in writing by the relevant **Authorised Person [Water]**).

8.6 Full operation of the system and occupancy of the building/property should be as soon after hand over as possible to reduce the potential of *Legionellosis* and other water safety risks and avoid further costs being incurred due to of any further re-disinfection of the water systems.

Residential Accommodation Owned or Leased by NHS Board

8.7 This sub-section applies to domestic residential properties served by individual water systems. Where domestic residential properties share a common water system, the procedures for the larger premises apply.

8.8 *NHS Board* recognises its obligations as a provider of residential accommodation. In practical terms it fulfils these by routine maintenance actions/checks immediately prior to the occupation of a domestic residential dwelling by a new tenant and by the provision of information to the new tenant.

Maintenance Actions/Checks Prior to Occupation by Tenant

8.9 Whenever the expected time delay between vacation of accommodation by one tenant and occupation by the next is greater than one week, the following actions should be taken where appropriate.

8.10 A member of the Estates staff visits the accommodation unit within one week prior to occupation. The following actions are taken, in the order stated:-

- the hot water is switched on;
- all WCs are flushed twice (one full flush where dual flush type WCs);
- the cold water storage tank, where present, is checked for contamination e.g. microbiological growth, the presence of organic debris or live organisms such as insects. In the event of discovering such contamination the Estates Officer shall arrange tank cleaning and disinfection. The remaining actions below are not undertaken until the cleaning and disinfection of the tank is complete;
- each hot and cold water outlet is run for three minutes, creating as little aerosol as possible;
- the shower head is removed and the shower hose run under water for three minutes;
- the hot water system is left switched on;
- any defects are reported to the Estates Officer and wherever possible, rectified prior to tenant occupation.

Note: These actions apply to accommodation served by either a conventional hot water system or a combination boiler.

Provision to Inform New Tenants

8.11 *NHS Board* can influence but not control the actions of its domestic tenants. It exerts its influence by the provision of the following guidance as part of the general information pack as provided to new tenants.

"The water systems in this accommodation have been prepared by the Estates Department in such a way as to protect water hygiene. Personal health and safety can be protected by:-

- *Ensuring that all outlets are used regularly (preferably once per week) or run for a couple of minutes per week to keep water fresh.*
- *Reporting any water system defects, such as hot water temperatures failure or dirty drinking water, to the Estates Department as soon as possible".*

9. Domestic Hot Water Systems

9.1 The default hot water treatment method used by *NHS Board* is that of the Temperature Control Regime (as outlined in HSE ACOP L8) with full temperature control as advocated in SHTM 04-01.

9.2 Should an alternative water treatment regime be sought, the onus shall be on *NHS Board* to establish the efficacy of the system in its control of *Legionella* and water safety for each site, this shall be in the form of a trial to establish:-

- a control level;
- the ability to achieve that control level;
- the assurance that the control levels will be maintained;
- develop a Written Scheme for operation and control.

9.3 With regard to scalding risk *NHS Board* will ensure that all that is reasonably practicable will be done to follow the requirements of the Safe Hot Water and Surface Temperature guidance in SHTM 04-01.

Hot Water Storage and Distribution Temperatures

9.4 The storage of domestic hot water should be arranged to ensure that a water outflow temperature of at least 60°C is achieved. No two water systems are the same and through periodic monitoring operational system performance, the system outflow temperature should be set to over 60°C to ensure an outflow of 60°C is achieved under normal draw-off demand and achieve 55°C at the supply to the furthermost draw-off point in the circulating system. It is important to maintain temperatures at above this figure (*Legionellae* organisms will survive for only a short period of time above this temperature - approximately two minutes).

9.5 Periodic performance monitoring and a system of continuous monitoring and recording of water temperatures via a building management system (BEMS) or data logger is essential to ensure compliant system performance.

9.6 The outflow water temperature, under prolonged maximum continuous demand (at least 20 minutes) from calorifiers should not be less than 60°C.

9.7 While it is accepted that occasionally under peak instantaneous or prolonged demand the water outflow temperature will fall, it is not acceptable if this occurs frequently (more than twice in any 24 hour period) and/or for long periods (exceeding 20 minutes).

9.8 Under no circumstances should the domestic hot water flow temperature fall below 50°C.

9.9 It is recommended that disinfection by pasteurisation is undertaken if the water temperature of the calorifier falls below 45°C.

9.10 A minimum domestic hot water circulation (return) temperature of 50°C shall be maintained during the hours of occupancy.

Water Temperature Checks (Including Cold Water Outlets)

9.11 Temperature checks on calorifiers and distribution systems should be carried out on a monthly, six-monthly and annual basis. In the event of non-compliance, both the **Authorised Person (Water)** and the **Responsible Person (Water)** should be informed as soon as possible. Use of a digital thermometer with a touch and immersion probe is recommended.

9.12 Although the HSE recommends spot temperature checks, SHTM 04-01 requires a temperature excursion limit of less than 20 minutes, therefore continuous monitoring and recording will be necessary in certain circumstances.

Calorifier Operation

9.13 Calorifiers are to **be run 24 hours per day, 7 days per week, with the domestic hot water circulation pump kept running**. Should it be necessary for interrupted operation or shutdown overnight, then the calorifier should be allowed to maintain its water storage temperature and the domestic hot water pump should be started up to ensure full temperature throughout the distribution system for at least one hour prior to occupation of the premises.

Plate Heat Exchangers

9.14 Plate heat exchangers and any associated storage/buffer vessels are to be run to the same temperature regime as calorifiers. The large contact area and lack of dead spots should ensure good kill of *Legionella* bacteria.

9.15 In the event of a plant failure the water outflow temperature will quickly fall below 60°C and it may be necessary to apply Section 4 - “Procedure for domestic hot water systems following plant failure, allowing system water temperature to drop below control levels”.

DHW Circulation Pumps

9.16 Domestic hot water circulation pumps should perform in such a way to ensure a minimum water circulation (return) temperature of 50°C.

9.17 Where possible, any plumbed-in duplicate circulating pump should be removed. Where this is not practicable, the duty pump should be manually changed over a least once per week to reduce any danger of water stagnation. It may be more efficient to utilise an auto-changeover system. A spare pump should be kept for immediate replacement in the event of pump failure.

Stratification Checks

9.18 Domestic hot water storage vessels and any associated storage/buffer vessels should be subject to water temperature stratification checks every two years for

each calorifier/vessel. These checks should extend over a period of seven (7) days using a logging device. Logging should also be used where de-stratification pumps have been fitted to establish that such a pump will ensure that the water temperature at the base of the vessel achieves 50°C.

Quarterly Flushing

9.19 Each calorifier and any associated storage/buffer vessels should be flushed quarterly through its drain valve by opening the drain valve 3 times, each time for a 3 minute period.

9.20 Calorifier and any associated storage/buffer vessels flushing should be carried out after temperature checks on the calorifier and system have been completed. Record Form (**GUHLRC06**) should be completed.

9.21 Hot Water Services Routine Inspection and Frequency Table:

Service	Task	Frequency
Hot Water Services	Arrange for samples to be taken from hot water calorifiers, in order to note condition of drain water. (on Procedure **P1C9** – recorded on **GUHLRC06**)	Annually
	Visual check on internal surfaces of calorifiers for scale and sludge. Clean and disinfect. Check representative taps for temperature as above on a rotational basis. (on Procedure **P1C9** – recorded on **GUHLRC06**)	Annually
	Check temperatures in flow and return at calorifiers. (on Procedure **P1C4** – recorded on **GUHLRC05**)	Monthly
	Check water temperature up to one minute to see if it has reached 50ºC in the sentinel taps. (on Procedure **P1C4** – recorded on **GUHLRC05**)	Monthly

10. Domestic Cold Water Systems

Cold Water Cisterns and Cold Feed Tanks

10.1 All new domestic cold water storage cisterns and tanks shall comply with the requirements of the Scottish Water Byelaws.

10.2 Duplicate tanks often create a risk of water becoming stagnant in one of them, leading to risk of *Legionella, Pseudomonas* Spp or similar contamination. Consideration should be given to taking one of the tanks out of service. See guidance in "Guidance for Alterations to Water Systems".

10.3 All cold water storage tanks are to be examined and the temperature tested on a regular summer / winter six monthly cycles and cleaned on an annual basis as required. (on Procedure **P1C7** – recorded on Form (**GUHLRC03**).

10.4 Temperatures in cold water storage tanks and the mains inlet to them should be checked during periods of high ambient temperatures (e.g. summer afternoons between June and August). Water temperatures should be less than 20°C. At the same time, the furthest and nearest draw off points in the system should be checked to ensure that the water distribution temperatures are less than 20°C within 1 minute of running the water (at full flow). A similar temperature check regime should be undertaken during the winter months to identify the performance of cold water distribution systems and the impact of heat gain from heating systems.

Cold Water Services - Pressurisation/Supply Pumps

10.5 Where two or more pumps have been fitted for pressurisation systems, the lead pump shall be changed over at least once a week in order to avoid water stagnation.

10.6 Dates and times of the pump changeover should be recorded in the Water Safety Log Book (on Safety Control Log – Record Form **GUHLRC28**). Printouts of regimes for automatic systems will be adequate.

10.7 Where pumps have not been in service for a period of four weeks or greater, or have been removed for any reason, the pump and associated pipework shall be thoroughly washed out and disinfected before being brought back into service. Disinfection of pumps shall be to 50ppm free residual chlorine for one hour and pumps shall be totally submerged during this period. Incident report Record Form (**GUHLRC04**) shall be completed giving details of why the pump was out of use.

Tank Cleaning Procedure

10.8 *NHS Board* staff or contract staff shall not be permitted to enter any water storage system (i.e. tank, calorifier, AHU) without working to the *NHS Board*

safe system (GEMsoft7 or equivalent) for access, or work or if they are suffering or have recently suffered from any gastric or other communicable illness, or a condition which may result in their increased susceptibility to *Legionellosis, Pseudomonas* Spp and other similar harmful bacteria. It is the responsibility of the individual to inform the supervisor immediately if applicable.

10.9 The relevant **Authorised Person (Water)** shall notify all users of the proposed line of action, and of any disruption or modification to service.

10.10 All equipment and tools to be employed during the cleaning and disinfection process must be dedicated only to this task - this will include hire equipment. All equipment should be disinfected in a high concentration of chlorine solution prior to commencement of the process.

10.11 The Process Steps

- Isolate and shut down the cold water storage tank and remove the cover or inspection hatch. The operator shall display warning labels in and around the plant room stating disinfection in progress.
- Permission must be obtained from Scottish Water before dumping the tank contents. The Water Authority will need to be informed of the volume to be discharged. Any further quantities of disinfected/chlorinated water that are to be dumped as a result of tank cleaning should be included.
- The tank shall be examined visually for signs of damage, corrosion, debris and biological growth. The water storage temperature and any such defects identified are recorded for report to the Estates Department.
- Tank cleaning shall be performed using non-abrasive cleaning materials.
- Protective clothing, footwear, face goggles and masks are to be employed. These items must be specific to the task of cleaning and chlorination, and must not have been used for other activities.
- Where tanks are to be painted, only paints or coatings and materials that are recognised and approved by the WRc and detailed in "The Water Fittings and Materials Directory" shall be employed. The specification for any such product must be submitted to the **Authorised Person (Water)** or their nominated deputies for their approval prior to use.
- Details of all cleaning and painting materials shall be listed on Record Form (**GUHLRC03**).
- On completion of the cleaning/painting exercise, and after the necessary paint maturing period (if required), the tank shall be thoroughly flushed and washed out with water, refilled to the tanks normal working level and dosed to a level of 50 ppm free residual chlorine. The tank shall be left to stand for a minimum period of one hour. During this period the level of free chlorine shall be monitored and maintained at 50 ppm.
- On completion of the tank chlorination period, the tank contents shall be discharged as previously detailed in (b) above. The tank is then refilled to its normal operating level with fresh water. The free chlorine level in the tank water shall be monitored until it matches that of the incoming water supply.

- On completion of this exercise the tank shall be put back into service immediately, and water samples taken for analysis - A sample of water should be taken using sterile bacteriological techniques for deposit and examination at a UKAS accredited laboratory.
- The TVC and *Legionella* Sampling and Test Protocol are detailed in SHTM 04-01 Part C. As described, sampling must follow that set out in BS7592: 2008 Code of Practice and BS EN ISO 5667-1: 2008 on Water Quality Sampling. Those organising sampling must make clear in advance which water quality technique is to be undertaken in order that systematic conclusion on risk can be drawn.
- For initial water system sampling take a Post-Flush sample (as defined in BS7592: 2008) at sentinel points without disinfection. Where there is an initial concern with a particular outlet location – say, a combined system and outlet problem – a BS Pre-Flush sample should be taken. If concerns persist with an outlet location (typically, a known dead-leg issue or lack of, or low, water use, a further BS Pre-Flush sample should be taken followed by disinfection before a BS Post-Flush with disinfection sample. Water should be allowed to run hot for 1 minute and cold for 2 minutes by which sampling would be temperature calibrated.

Note: Samples following SHTM 04-01 Part C, taken for *Legionella* must be in a 1 litre container, available from the Microbiology Laboratory.

SAMPLES FROM SOURCE SAMPLING MUST REACH THE UKAS LABORATORY WITHIN 2 HOURS – IF THERE IS A DELAY THE SAMPLES SHOULD BE STORED BETWEEN 6°C and 18°C FOR EXAMINATION WITHIN 24 HOURS.

- On receipt of analysis results, these shall be submitted to the **Authorised Person (Water).** The assistance of Infection Prevention and Control team may be required to aid with the interpretation of the results, and the identification of remedial actions if necessary.
- On completion of the tank cleaning or inspection exercise, it is recommended that details should be entered onto a tank cleaning record label to be posted on or adjacent to the tank. Such a label must be robust, and able to withstand contact with water.
- Details of findings, actions taken and test results are to be entered onto the Water Storage Tank Maintenance Record Form (**GUHLRC03**). Chlorination certificates are to be obtained and be retained in the Water Safety Log Book.

ANY DEFECTS SHALL BE REPORTED IMMEDIATELY TO THE AUTHORISED PERSON (WATER) OR NOMINATED DEPUTIES.

- Once a system has been filled *NHS Board* and/or their Contractors WILL NOT drain that system unless full disinfection is to be undertaken before the system is brought into use again. The only exception is in the case of an emergency and with the consent of the Infection Prevention and Control Team.

10.12 Cold Water Services Routine Inspection and Frequency Table:

Service	Task	Frequency
Cold Water Services	Check tank water temperature remote from ball valve and mains temperature at ball valve. Note maximum temperatures recorded by fixed maximum thermometers where fitted. (on Procedure **P1C7** – recorded on **GUHLRC03**)	Six monthly
	Check that temperature is below 20ºC after running the water for up to two minutes in the sentinel taps. (on Procedure **P1C4** – recorded on **GUHLRC05**)	Monthly
	Visually inspect cold water storage tanks and carry out remedial work where necessary. Check representative taps for temperature as above on a rotational basis. (on Procedure **P1C7** – recorded on **GUHLRC03**)	Annually
Shower Heads	Dismantle, clean and de-scale shower heads and hoses / or replace with new disinfected Shower Head and Hose. (on Procedure **P1C12** – recorded on **GUHLRC05B**)	3 Monthly for high risk areas and as required elsewhere, but at least Once Annually
Little Used Outlets	Flush through and purge to drain, or purge to drain immediately before use, without release of aerosols. (on Risk Control Notice 11/04 – recorded on Sample Record Sheet by **DUTY HOLDER**) NB Little-used outlets in ICUs should be flushed daily at the start of each day.	Twice weekly

11. Air Conditioning Plant

General

11.1 Air conditioning plant and ductwork should be inspected at the access point(s) on an annual basis in order to check cleanliness, general condition and assess risk. After several years of service, even a correctly filtered system may contain dirt accumulation. It may be necessary to consider cleaning of the system taking account of HAI-Scribe procedures and the risk assessment.

11.2 In particularly recurring polluted areas, it may be necessary to consider the installation of high grade final and pre-filters. The quality of filter housing design and in particular the seals are critical factors in maintaining the efficiency of the filtration system by ensuring that air does not bypass the filter panels.

11.3 All information on condition, cleanliness etc., to be recorded in the plant room log book, with any non-compliance or incidents being identified to the **Authorised Person (Water)** immediately on identification. An Incident Report Record Form (**GUHLRC04**) should be completed and the **Responsible Person (Water)** must be notified as soon as possible.

Draining Traps and Pipework

11.4 A drainage drip tray should be provided to collect condensation build-up on cooling coils (including the return bends and headers), for humidifiers, eliminators and, if necessary, heat recovery devices. The drainage drip tray should be constructed from a corrosion resistant material and be so arranged that it will completely drain - i.e. the drain connection should have no upstand in order to prevent 'pooling'. The drainage tray should be large enough to collect all the water produced by the device it serves. Provision should be made to allow for inspection of the drainage tray (i.e. viewing window/access panel). A slope of 1:20 in all directions towards the drain outlet position should be incorporated.

11.5 Drainage drip trays should be connected to a drainage trap assembly which should discharge via a Type ‘A’ air gap as laid down in BS6281: Part1: 1992.

11.6 The depth of any trap should be at least twice the static pressure head generated by the fan so that the water seal is not 'blown out' during plant start up.

11.7 A trap need not be directly under the drainage drip tray which it serves, provided that the connecting pipework has a continuous fall. Each trap shall be made of the clear (borosilicate) glass or transparent plastic type in order to show clearly the integral water seal level, and should be fitted with a screw-top cap to permit re-filling. The water seal level shall be permanently marked on the trap, to indicate the water seal levels when the fan is operational at its design duty.

11.8 Traps fitted to plant located outside or in unheated plant rooms may require trace heating to prevent freezing damage during the winter period. The trace heating system employed should not raise the temperature of the water in the trap to greater than 5°C. Similarly, it may be necessary to shield the trap from direct sunlight in mid-summer in order to prevent heat gain and algae growth.

11.9 The pipework from each trap should be constructed of thermoplastic, copper or stainless steel tube. Stainless steel may be particularly useful in instances where greater mechanical strength is required. The pipework shall have a minimum fall of 1 in 60 in the direction of water flow.

11.10 Water from each trap should discharge over an open tundish connected to a drainage stack via a second trap or a floor gully.

11.11 Where the drainage pipework from the tundish outlet, which should be ventilated, discharges to a surface water drainage stack or a dedicated plant drainage stack, then the connection shall be in the form of an easy-sweep tee.

11.12 It may be necessary to employ chlorine or other chemicals in order to clean humidifiers and cooling coils etc. Under such circumstances it is necessary to discharge the plant effluent produced to the foul drainage system.

11.13 Individual drain trap systems should be separate wherever possible. All drain trap systems are to be examined, cleaned and topped up on a monthly basis as required. (on Procedure **P1C5** – recorded on Form **GUHLRC22**.

Humidifiers (where installed)

11.14 Humidification was originally required for some healthcare ventilation applications in order to control the risk associated with the use of flammable anaesthetic gases. The use of such gases has now ceased.

11.15 Where humidification is still required this must follow the requirements of SHTM 03-01 and this should be included in the *Legionella* risk assessment.

11.16 The steam supply connections to the humidifier should be provided with a dirt pocket and trap set installed as close as practicable to the humidifier. The water supply to the steam generating unit shall be designed as if potable supply right up to the device.

11.17 The humidifier chamber should be inspected on a six-monthly basis and specified in the plant PPM schedule. Particular attention should be given to any pooling of water. The chamber interior should be clean, and free from any scale or other build-up on the walls.

Heater Batteries

11.18 Inspection of the heater batteries is necessary in order to ensure free airflow and no build up of dirt, scale or other debris. Cooling coils should be examined regularly in order to ensure that correct drainage is being achieved, and that there is no pooling of water or development of slime, algae or other deposit.

Drainage drip trays should be removed (if possible) and cleaned on a regular basis.

.

12. Hydrotherapy Pools, Whirlpool Baths, Whirlpool Spas and Birthing Pools

General

12.1 Hydrotherapy pools, whirlpool baths, whirlpool spas, birthing pools and water features provide conditions which may favour the growth of *Legionella, Pseudomonas* Spp and other similar harmful bacteria. Whirlpool spas are particularly vulnerable because of the recirculation of a relatively small volume of water, and careful maintenance and chemical water treatment is needed in order to maintain water quality. A detailed log must be kept detailing the treatment method, filter cleaning, temperature, PH, chlorine residual, quantity and strength of chemicals applied and other key parameters.

12.2 Whirlpool baths and birthing pools normally employ a single fill for each user, and do not present the same level of risk as spas, provided that the guidance recommended for hot and cold water systems is followed.

Guidance

12.3 Hydrotherapy pools and spa pools should be operated to the guidance given in the following publications published by the Public Health Laboratory Service (PHLS):-

- 'Hygiene for Hydrotherapy Pools'
- 'Hygiene for Spa Pools'

12.4 Copies of these publications should be held in the Estates Department, and used as the primary source of guidance for the management of such pools.

12.5 All information on condition, cleanliness, servicing and monitoring to be recorded in a pool log book. Non-compliance or incidents to be identified to the **Authorised Person (Water)** immediately, and the Incident Report Record Form (**GUHLRC04**) completed and ensure the **Responsible Person (Water)** is notified as soon as possible.

13. Showers / Unused Outlets

13.1 Showers and other water outlets which are rarely used should preferably be removed or, if retained, flushed to waste at intervals for a 3 minute period. The interval should be at least twice-weekly. Where the outlet may be used by high risk patients, more frequent flushing will be needed and the increased frequency should be determined following risk assessment. In ICUs little-used outlets should be flushed daily at the start of each day.

13.2 The flushing must be carried out in such a way as to avoid the creation of aerosols. Full flow is not necessary.

13.3 A record must be kept of the flushing operation and should be retained for at least 5 years. The sample Record Form for Estates Department use is (**GUHLRC26**).

13.4 Risk Control Notice NHSG 07/01 was first issued on 11 April 2007 to instruct all **Duty Holders** and Department Heads of this requirement. This has been updated to reflect SHTM 04-01 changes and NHSG 11/04 has subsequently re-issued on 20 June 2011 to **Duty Holders** to instruct ALL devolved management and local ward or departmental staff of the requirements. A sample record sheet for devolved mangers was included. The record sheet is audited as an integral part of Infection Control Audit (3 monthly using the HEI Inspection Audit Tool).

14. Monitoring Requirements for Other Risk Systems

Service	Task detailed Under Risk Assessment	Frequency
Ultrasonic humidifiers/ foggers and water misters	NOT TO BE USED IN *NHS Board*	
Spray humidifiers, air washers and wet scrubbers	NOT TO BE USED IN *NHS Board*	
Water Softeners and R.O. Systems	Clean and disinfect resin and brine tank - check with manufacturer what chemicals can be used to disinfect resin bed **DUTY HOLDERS** and their Local Managers TO NOTE THEIR SPECIFIC RESPONSIBILITIES FOR SYSTEMS INSTALLED AND USED BY FUNCTIONAL DEPARTMENTS (Renal etc)	As recommended by specific manufacturer
CBRN, Deluge & Emergency Showers and Eye Wash Sprays	Flush through and purge to drain. **DUTY HOLDERS** and their local Managers TO NOTE THEIR SPECIFIC RESPONSIBILITIES FOR SYSTEMS INSTALLED AND USED BY FUNCTIONAL DEPARTMENTS	2 times per week following Risk Control Notice 11/04
Fire Sprinkler / Suppression and Hose Reel Systems	When witnessing tests of sprinkler / suppression system blow down and hose reels ensure that there is minimum risk of exposure to aerosols. *Any Hose Reels identified must be reported on Incident Report Record Form (GUHLRC04) for immediate removal INCLUDING all dead leg pipework*	As directed by specific manufacturers
Lathe and Machine Tool coolant systems	COOLANT NOT TO BE USED IN *NHS Board* SYSTEMS	
Horticultural misting systems	NOT TO BE USED IN *NHS Board*	
Dental Equipment	Drain down and clean	At the end of each working day
Trolley Wash & Vehicle and Power Washing Plant	To be operated in line with manufacturers instructions	See manufacturers instructions
External Fountains and Water Features	Clean and disinfect ponds, spray heads and make-up tanks including all wetted surfaces, de-scaling as necessary. Risk Assessment to take account of proximity and likelihood of risk to healthcare buildings	Interval depending on condition
Internal Fountains and Water Features	NOT TO BE USED IN *NHS Board*	
Vending, Chilled Water and Ice-Making Machines	Follow the infection control precautions detailed in Scottish Health Facilities Note 30 **DUTY HOLDERS** and their Local Managers to note Freestanding water dispensing machines using proprietary water containers *should not to be used in healthcare applications* (remove and return to supplier if found)	

15. Alterations to (including refurbishment or new) Water Systems Guidance

15.1 Where alterations are planned to water systems and the Written Scheme, the **Guidance for Alterations to Water Systems** document must be followed. The document provides separate specific guidance and the details to be followed for controlling and avoiding the potential of *Legionellosis, Pseudomonas* Spp, other similar harmful bacteria and water safety risks. (specifically using Record Form **GUHLRC29** to record the acceptance of work to be conducted and conformation of work completed on a water system and all conditions involving **Duty Holders** and their staff, the **Authorised Person (Water)** of the written scheme of the system and the **Authorised Person (Water)** from the Project Team accepting responsibility for the work).

Note: Record Form **GUHLRC29** shall e used to record the acceptance of ALL work to be conducted, confirmation of ALL work completed on a water system, ALL conditions involving **DUTY HOLDERS** and their staff, the Authorised Person (Water) of the Written Scheme of the system and the Authorised Person (Water) from the Project Team accepting responsibility for the work.

15.2 At the point of hand over **ALL** relevant information written on operating the system, system performance, together with accurate as-fitted drawings and design criteria of the domestic hot water systems and cold water services shall be submitted to *NHS Board* (i.e. an appropriate current Written Scheme, accepted in writing by the relevant **Authorised Person [Water]**).

15.3 Full operation of the system and occupancy of the building/property should be as soon after hand over as possible to reduce the potential of *Legionellosis, Pseudomonas* Spp, other similar harmful bacteria and avoid further costs being incurred due to any further necessary re-disinfection of the water systems.

16. Control of Contractors

16.1 Contractors shall only be engaged in work on water systems or air conditioning plant under the control of the **Authorised Person (Water)** co-ordinated with any Estates persons.

16.2 The *NHS Board* Management and Control of Contractors – Health, Safety and Environment Policy & Procedural Arrangements along with the associated Guide for Contractors (and Consultants etc) will apply.

16.3 The **Authorised Person (Water)** shall ensure that the contractor is competent for the task(s) to be undertaken and shall ensure that the contractor is aware of and has made provision for all responsibilities under the various Environmental, Health and Safety Regulations, including CDM, COSHH, *Legionella*, water safety etc.

16.4 The **Authorised Person (Water)** shall ensure that the contractor:-

- is suitably briefed in writing on the task(s) to be undertaken and is fully aware of the water safety implications and prescribed *Legionella* Procedures to be followed;
- demonstrates that all workforce to be engaged on the task(s) are suitably trained and experienced for the task and are properly managed and supervised;
- has provided appropriate equipment for the task including PPE;
- carries out the task(s) to the correct standards and in the correct manner all in accordance with ALL *NHS Board* and Estates policies and procedures.

16.5 The **Authorised Person (Water)** shall record the evidence provided by the contractor and store it for future reference and maintain hard copy records in the Water Safety Log Book.

16.6 The **Authorised Person (Water)** shall complete a review questionnaire upon completion of the work and shall forward it to the Environment & Safety Support team for recording.

17. Designer's responsibilities

Safety Criteria

17.1 In order to avoid potentially costly remedial works, the design of new buildings or the installation or alterations to existing buildings and their water systems should be controlled in order to "get it right first time". The checklist provided in the "Control of Water Record Forms" document **GUHLRC25** (included in Appendix C for ease of reference), should be used by relevant Estates staff and/or supplied to design consultants in order that they may check their own design. The Designer *(i.e. the person identified to perform the design duties through clarifying assumptions, eliminating hazards and risks and providing the information about remaining risks – in compliance with the Construction (Design and Management) Regulations: 2007 which are part of the Health & Safety at Work regulatory framework)* shall ensure the Client and CDM Co-ordinator are aware.

17.2 This checklist is not a design brief and is not intended to deal with the potential design issues, but is a management checklist. If these issues are incorrect it is likely that other aspects of the design are also not compliant with regulatory and mandatory standards, or best practice. Also see Record Form **GUHLRC29**.

The checklist should be used to record, take account and weigh up all relevant matters regarding the safety of the water system, the operating parameters, the assumptions and what is known (or importantly the level not known) or reasonably be expected to be known to eliminate or mitigate risk. ('*reasonably practicable*').

17.3 Water systems operate in premises across a wide range of settings - through a scale from suites of rooms within larger premises, to premises with single building blocks, to premises with multiple building blocks with multiple functions, up to large health campus containing multiple hospitals and complex specialist care services.

Additionally due to the age, construction type and nature of *NHS Board* premises there are a wide number of potential health hazards arising from care and support functions (such as infectiousness, hazardous, dangerous substances and radiation etc) and the nature of the physical environment (such as exposure to asbestos, confined spaces and access restriction etc). Where buildings owned or leased by *NHS Board* were built or refurbished prior to 2004 the use of asbestos containing materials in their construction was common practice and it is possible that personnel could encounter asbestos material in difficult physical environments whilst undertaking work activities. It may also be very difficult to safely investigate intrusively, so considerations and assumptions on what is actually known must be recorded.

NHS Board takes a positive approach to controlling and reducing any potential risk exposure to those conducting work or exposing others to risk through the

work activities. This will be achieved by staff and contractors co-operating, working together to the control measures and work methods outlined in Board Policies and associated Procedural Arrangements.

17.4 Domestic Hot and Cold Water Systems should be designed to ensure safe operation at all time by avoiding, preventing or controlling conditions which permit the growth of *Legionella, Pseudomonas* Spp or any other similar harmful bacteria and which allow easy maintenance, cleaning and disinfection. In particular, the following must be considered:

- materials such as natural rubber, hemp, linseed oil based jointing compounds and fibre washers must **not** be used in domestic water systems. Materials and fittings for use in water systems, such as plastic pipework, plastic and rubber components in TMVs and flexible hose liners etc must **not** support microbial growth. The WRc Water Fitting and Materials Directory should be consulted to identify approved products in keeping with regulatory requirements. Flexible hoses, WRc approved or not, shall not be used in water systems except in exceptional (approved) circumstances;
- water storage tanks should be fitted with covers which comply with water regulations, also insect screens fitted to any pipework open to atmosphere, e.g. the overflow pipe and vent;
- tanks should be provided with a bottom drain outlet that allows the full contents to be safely drained to a suitable drainage point;
- multiple linked storage tanks or tanks with multiple ball valves should be avoided because of operational difficulties due to possible unequal flow rates and possible stagnation;
- accumulator vessels on pressure boosted hot and cold services should be fitted with diaphragms which are accessible for cleaning and that do **not** support microbial growth;
- point of use hot water generators, with minimal or no storage, taken with safe temperature guidance should be considered for remote low use outlets;
- thermostatic mixing valves (TMVs) where fitted, should be sited as close as possible to the point of use. A single TMV should serve a single shower outlet or a single tap outlet. A single TMV **must not** serve multiple tap or shower outlets. Where pipework contains blended water the maximum length of pipe is given in SHTM 04-01 Part A with the downstream leg not exceeding 2 metres and the complete length of the spur without circulation not exceeding 3 metres;
- duplicate or multiple circulation pumps should **not** be installed, as the pump on standby may harbour stagnant water. Instead, a single pump should be installed and a spare provided.
- for applications involving Neonatal Units and Adult & Paediatric Intensive Care Units there is particular guidance (which should be good practice elsewhere) to ensure:

- engineering and cleaning protocols are achieved and manufacturers' instructions are followed;
- taps and thermostatic mixing valves (manual and automated) are commissioned (including programming auto flush cycles) and can be routinely validated, as per the manufacturer's instructions;
- for automated taps, ensure records of remote flushing can be achieved;
- flushing of all hand wash stations and sinks can be performed for 1 **minute** daily, at the maximum flow rate that this does not give rise to any splashing beyond the sink, e.g. on the floors;
- that water flowing from the taps cannot flow directly into the drain holes (to prevent splash back). Water flow must impact on the basin offset from the drain hole. Flushing (automated or manual) should not result in splashes beyond the wash hand station area;
- where outlets are planned to be flushed daily, there is no additional requirement for weekly (or automated) flushing;
- liaison with the user (Senior Charge Nurse) regarding the potential of infrequently used wash hand stations or sinks (used and / or flushed once a day) which will have to be subjected to a documented flushing regime, risk assessed and regularly reviewed for the need for the wash hand station or sink to be still there. (See: Guidance on the number of hand wash stations required);
- removal of any redundant branches from circulating mains and provide straight couplings on distribution pipework to eliminate residual dead-legs or blind stub-ends created by plugged tee-pieces (anywhere in the water system under alteration);
- the length of any dead-legs is checked and minimise where possible by taking the return leg pipework up to wash hand stations and sinks. (this should be included in the *Legionella* Risk Assessment for the water system);
- before undertaking any modifications to pipework, perform an impact risk assessment. Keep records of risk assessments and modifications made;
- considering whether thermostatic mixer valves can be located closer to the outlet;
- new taps, wherever considered necessary, have integral thermostatic control;
- the careful selection of taps to minimise the formation of aerosols. The water flow profile should be compatible with the shape of the wash hand station. Flow straighteners can capture biofilm, but their removal can create turbulent flow and increased pressure resulting in splashing of surrounding surfaces and flooring. Any policy for removal should result from risk assessments and / or restricting flow to the same as applied prior to the removal of the straighterners;

- to avoid positioning soap dispensers / alcohol based hand rubs such that any drips could fall on to the taps or into the basin of the hand wash station;
- as it is not possible to have taps, shower heads and hoses etc 'pre-disinfected' in the supply from manufacturers - disinfection will have to rely on normal flushing and disinfection protocols that would apply to any new installation before commissioning and putting into use. In large projects this process should be undertaken as close as possible to the system being handed over to avoid pipework being left unused filled with stagnant water. A daily flushing regime should be put in place until the system is handed over to the *NHS Board.*

Domestic Hot Water Systems

17.5 The storage capacity and recovery rate of the water heater should be selected to meet the normal daily functions in hot water use without any drop in the supply temperature.

17.6 Temperature is used as a means of control and each water heating device shall deliver water at a minimum of 60^0C at the flow point from the water heating device under normal water system demand draw-off. All storage water heating devices should have a suitably located drain valve.

The flow of water throughout the domestic hot water circuit shall be balanced by adjusting regulating valves to ensure that the target temperature is achieved throughout the system under all levels of water consumption.

Temperature is used as the means of controlling *Legionella* and other harmful bacteria. The domestic hot water circulating loop shall be designed to give a return temperature to the storage water heater of 55°C, but certainly no less than 50°C. The pipe branches to the individual hot taps shall be of sufficient size to enable the water in each of the hot taps ideally to reach 55°C, but certainly no less than 50°C, within one minute of turning on the tap.

In normal use, the system should be designed to achieve 55°C at the supply to the furthermost draw-off (sentinel) point in the circulating system. The set points for the water heating device should be adjusted to be at or above 60°C to ensure the water system achieves these criteria. Thermometer/immersion pockets shall be fitted on the flow and return to the storage water heating device and in the base of the storage water heater in addition to those required for control.

17.7 In larger domestic storage water heating devices, the fitting of time control shunt pumps (de-stratification pumps) shall be included to overcome temperature stratification of stored water.

Domestic hot water distribution pipes should be insulated with sufficient thermal performance to avoid affecting cold water pipes.

Whether a BEMS is fitted or not – a visible manual means of monitoring domestic hot water system storage, flow and return temperatures must be available at all time.

Cold Water Systems

17.8 The cold water storage tank should be sited in a cool place and protected from extremes of temperature by thermal insulation. Tanks and piping should be insulated with sufficient thermal performance and kept away from heat sources, hot ducting and other hot pipes to prevent excessive temperature rises in the cold water supply and distribution system.

Access hatches should be provided on cold water tanks for inlet valve maintenance, inspection and cleaning (more than one hatch may be needed on larger tanks).

The volume of cold water stored should be minimised. It should not normally be greater than one day's water use. Multiple cold water storage tanks require care in the connecting piping to ensure water flows through each of the tanks, to avoid stagnation in any one tank.

17.9 The pipework should be easy to inspect so that the thermal insulation can be checked to see that it is in position and has remained undisturbed.

17.10 Low-use outlets should be installed upstream of higher use outlets to maintain frequent flow; e.g. a safety shower can be installed upstream of a WC.

Whether a BEMS is fitted or not – a visible manual means of monitoring cold water system supply (at building block inlet or meter point), tank storage, flow (and return where appropriate) temperatures at **no more than 20^{0}C** must be available at all time

Temperature Settings and Building Energy Management Systems (BEMS)

17.11 Domestic hot and cold water systems should be temperature monitored by the BEMS performing to SHTM 08-05 to ensure compliance with the temperature standards specified in the relevant regulations and guidance. System parameters must be detailed in the Written Scheme for the water system.

17.12 The minimum BEMS performance monitoring of the water system must be to ensure:

- Domestic Hot Water is continuously monitored and records the parameters highlighted in paragraph 17.6 above and described in detail in SHTM 04-01. i.e. 60^{o}C flow (minimum) from the water heating device to ensure 55°C at

the supply to the furthermost draw-off (sentinel) point in the circulating system under normal use and no less than 50°C return (lowest limit) to the water heating device;

- Cold Water is continuously monitored and records from the point it enters a building to the parameters highlighted in section17.8 above and described in detail in SHTM 04-01. i.e. no more than 20°C (highest limit);
- failures outwith the parameters are subject to alarms and service response messages;
- performance data requires to be secured and retained for at least 5 years, but must be easily available to the **Authorised Person (Water),** the other independent professional advisors, assessors and others with an interest in system performance.

Note: The definition of sentinel taps and information on TMV settings can be found in SHTM 04-01 Part A, Appendix 6

Other Water Systems Connected or Operating in Close Proximity

17.13 Designers must ensure there are no other water systems (such as for Fire Suppression, Fire Precautions or Fire Protection) connected or in close proximity to the water system. Reference should be made to the Water Safety Log Book and Written Scheme for the Building Block for information, changes or alterations.

18. Scottish Water Byelaws 2004

18.1 On 30 August 2004, the Scottish Water Byelaws 2004 replaced the previous Byelaws in governing the prevention of waste, misuse, undue consumption and contamination of public water supplies in domestic and commercial plumbing installations and represent important protection for public health and the environment. The Byelaws are based on performance standards, e.g. British Standards or those European Standards being mandated under the Construction Products Directive.

18.2 The Byelaws are enforced by Scottish Water, and further advice should be sought from them or from their website: www.scottishwater.co.uk

18.3 The Byelaws introduce a new specification to prevent the backflow of water. This brings the UK approach into line with the emerging harmonised European Standard. The system consists of five fluid categories, which reflect the potential toxicity of the downstream fluids. These categories relate to the risk posed to public health should fluids contaminate drinking water. The specification then equates each fluid category to the range of suitable backflow prevention devices. Particular reference should be made to the determination of fluid categories when considering alternative water treatment systems. The addition of a treatment chemical to potable water may result in it changing fluid categories to Category 3, with the resultant backflow prevention being required.

18.4 General issues of design, sizing, layout, construction and commissioning are discussed in BS6700: 2006. This is being superseded by BS EN 806-1-5: 2000-2012 and BS8558: 2011 following a transitional period. Material and fittings acceptable for use in the water system are listed in the directory published by the Water Research Centre. Low corrosion materials (copper, plastic, stainless steel etc) should be used where practicable. Non-metallic materials are deemed to be compliant provided they meet with the appropriate British Standard, BS6920: 'Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water'.

18.5 Certain aspects of the system will have to comply with the Building Regulations.

18.6 Water storage tanks should be fitted with covers which comply with Byelaws and insect screens fitted to any pipework open to the atmosphere, e.g. the overflow pipe.

18.7 The Water Byelaws 2004 introduced a scheme for 'Approved Contractors' (approved plumbers) who are approved to carry out work in compliance with the Water Byelaws. All approved plumbers undertake to work to the terms of the Plumbing Industry Licensing Scheme (PILS). Scottish Water has encouraged all professional plumbers to become members of a Licensing Scheme, showing a commitment to their industry, a willingness to raise quality standards and promote to customers a professional image of the industry. Scottish Water continues to support the "Plumbing Industry Licensing Scheme" (PILS)

operated by the Scottish and Northern Ireland Plumbing Employers Federation (SNIPEF) and recognises members of the Water Industry Approved Plumbers Scheme (WIAPS) operated by the Water Regulations Advisory Service (WRAS).

19. Risk Assessments

Identification and Assessment of Risk

19.1 A suitable and sufficient assessment following the requirements of BS8580: 2010 Water Quality – Risk assessments for *Legionella* Control – Code of Practice is required to identify and assess the risk of exposure to *Legionella* bacteria from work activities and water systems on NHS Boards premises and any necessary precautionary measures.

19.2 The ***Legionella* Risk Assessor** shall be appointed as the Risk Assessor, shall be UKAS accredited and complete *Legionella* risk assessments to BS8580 criteria and the written terms of reference. The Risk Assessor will have access to competent assistance to assess the risks of exposure to *Legionella* bacteria in the water systems present in the premises and the required control measures.

19.3 The assessment will include:

- identification and evaluation of potential sources of risk and the particular means by which exposure to *Legionella* bacteria is to be prevented, or
- if prevention is not “reasonably practicable”, the particular means by which the risk from exposure to *Legionella* bacteria is to be controlled;
- identification of the use of flexible hoses in water supply and distribution systems following Safety Action Notice 886, for elimination of risk. Where flexible hoses are essential components to connect the water system to necessary equipment (or are part of equipment such as in hi-low baths) identification of action measures to test and prevent risk;
- identification of primary heat sources (such as steam systems and fixed temperature heating systems etc) that impact (directly, or indirectly, or seasonally) on the control and management of water systems and the operational criteria;
- a drinking water quality assessment.

19.4 Where the assessment demonstrates that there are no reasonably foreseeable or insignificant risks that are likely to increase, no further assessment or measures are necessary. The assessment needs to be reviewed and any necessary changes implemented should the situation change or whenever there is a reason to believe that the original assessment may no longer be valid.

Record Retention Period

19.5 The following types of records are kept.

Record	Retention Period
Policy & Procedure Documents.	Throughout the period for which they remain current and for at least two further years.
Risk Assessments.	
Risk minimisation scheme & details of its improvement.	
Monitoring, inspection, test & check results, including details of the state of operation of systems.	At least five years.

20. Training

20.1 *NHS Board* staff appointed to carry out the control measures and strategies shall be suitably informed, instructed & trained and their suitability assessed. Staff shall be trained to a standard, which ensures that tasks are carried out in a safe, technically competent manner.

20.2 The **Authorising Engineer** shall conduct a regular annual assessment review of competency and training requirements and shall make Training Programme recommendations to the **Responsible Person (Water)** for approved courses run by approved training organisations and where appropriate by the manufacturers of equipment.

20.3 The **Authorised Person (Water)** shall conduct and record induction and familiarisation with any new Competent Persons, Maintenance Technicians, Tradespersons, Installers, Contractors and Contract Supervising Officers being introduced to water systems. The **Authorised Person** shall also conduct a regular annual review of system familiarisation, operational maintenance, monitoring issues.

20.4 Recommendations shall be reported to the **Responsible Person (Water).**

20.5 Training will be appropriate to the post holders duties, covering the following:-

- Water Safety Policy, Procedures and the Written Scheme;
- SHTM 03-01 'Ventilation for healthcare premises';
- SHTM 04-01 'Water safety for healthcare premises';
- HSE Approved Code of Practice L8 – legislation;
- *Legionellosis* and other water safety risks – responsibilities;
- prevention or controlling the risk from exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria;
- hot & cold water systems;
- ventilation systems;
- water treatment;
- maintenance procedures;
- action in the event of a case of outbreak of Legionnaires' disease.

20.6 The training will be presented in the following formats:-

- annual 'In-house' awareness training;
- induction training;
- toolbox talks;

- training (update and refresher on changes).

20.7 Regular refresher training shall be given and records of all initial and refresher training all training and competency assessments provided to and received by all *NHS Board* personnel involved in water systems will be recorded in the individual's personal training file and the national NHS eKSF system.

20.8 *NHS Board* staff engaged in work which may have a direct or indirect effect on the control of *Legionella*, shall have adequate information, instruction & training to ensure that the Code of Practice and Written Scheme is applied at all times, and so ensure that *NHS Board* systems are not compromised.

21. Performance Monitoring

21.1 The relevant **Authorised Person (Water)** will gather and maintain all the relevant information and records, including relevant *Legionella* Risk Assessments and Written Schemes.

21.2 Working with the **Authorising Engineer** and **Responsible Person (Water)**, the relevant **Authorised Person (Water)** will review and analyse all records for compliance with *Legionella* and other water safety parameters.

21.3 The relevant **Authorised Person (Water)** will detail on these records any deviations from the *Legionella* and other water safety parameters giving a brief description as to the reason for this deviation.

21.4 The relevant **Authorised Person (Water)** will file locally all relevant information and maintain hard copy records in the Water Safety Log Book.

22. Audit / Management Review

Internal Audit Procedure:

22.1 This procedure will be audited at agreed intervals.

22.2 Prepare an Audit Programme and ensure the entire procedure is audited.

22.3 The Audit Programme will consist of planned audits on the following elements of the procedure:-

- this Procedure document;
- documentation associated with this Procedure;
- training review and records;
- risk Assessments;
- Written Schemes;
- schematic drawings
- Water Safety Log Book(s).

22.4 A report will be produced on the audit.

External Audit Procedure:

22.5 A duly appointed **Authorising Engineer** will audit the entire *Legionella* and Water Safety Systems within *NHS Board* annually.

22.6 A duly appointed **Authorising Engineer** for *Legionella* and Water Safety Systems will produce an annual report for management review.

22.7 A duly appointed ***Legionella* Risk Assessor** for *Legionella* and Water Safety Systems will update the *Legionella* risk assessment database annually, as appropriate.

Management Review:

22.8 The **Responsible Person (Water)** will hold regular review meetings to confirm:-

- current compliance with *Legionella* and Water Safety System requirements;
- identification of any deficiencies and actions required to resolve;
- staff training needs.

22.9 The management review will be based on following:-

- results of internal audits;
- results of external audits;

- staff suggestions;
- training records;
- operation of the system and procedures over the last six months.

23. The Course of Action for Suspected Nosocomial Legionnaires' Disease

Suspected or confirmed incident or outbreak

23.1 *NHS Board* will follow the guidance presented in the following regulatory and mandatory guidance documents:

- HSE ACOP L8 "The control of *Legionella* bacteria in water systems", see Appendix 2;
- SHTM 04-01 "Water safety for healthcare premises", Part B, Appendix 1;
- HPN2, "Guideline on management of *Legionella* incidents, outbreaks and clusters in the community";
- The *NHS Board* "Outbreak Plan".

Legionellosis is an atypical and potentially life-threatening form of pneumonia (Legionnaires' Disease). The majority of cases are isolated although outbreaks can occur (including large community outbreaks and hospital outbreaks).

In the event of a nosocomial case(s) of Legionnaires' disease *NHS Board* will follow the Health Protection Network's (HPN) – *'Guideline on Management of Legionella, Incidents, Outbreaks and Clusters in the Community'* (2009), SHTM 04-01 and *NHS Board's* Outbreak Plan.

23.2 An outbreak is defined in HSE ACOP L8 by the Public Health Laboratory Service (PHLS) as two or more confirmed cases of *Legionellosis* occurring in the same locality within a six month period. However:

- HPN2 sets out and defines:

Incident	A (first) single case – presumptive or confirmed- where based on the evidence there are concerns about actual or suspected threats to the safety or quality of water systems that could require intervention to protect the public's interest.
Sporadic case	A single case not associated with any other case. No other case may be linked to probable source of exposure in last 2 years.
Outbreak	Two or more cases in the same locality for which there is strong epidemiological evidence of a common source of infection, with or without microbiological evidence, occurring within a 6 month period of the onset of illness from the first case confirmed.

Linked case	Two or more cases associated with a single source with dates of onset more than 6 months apart but less than 2 years apart.
Probable Nosocomial	Legionnaires' disease in a person who was in hospital for between one and nine of the ten days before the onset of symptoms and either became ill in a hospital associated with one or more previous cases of Legionnaires' disease or yielded an isolate that was indistinguishable (by monoclonal antibody subgrouping [mAB] or by molecular typing methods) from isolates obtained from the hospital water system at about the same time.
Possible Nosocomial	Legionnaires' disease in a person who was in hospital for between one and nine of the ten days before the onset of illness in a hospital not previously known to be associated with any case of Legionnaires' disease and where no microbiological link has been established between the infection and the hospital.

- The *NHS Board* "Outbreak Plan" defines an outbreak and incident as:
  - "An outbreak is defined either as two or more linked cases of the same illness or when the observed number of cases exceeds the number expected;
  - An incident is defined as a case of communicable disease that has actual or potential serious implications for the public's health e.g. VHF or measles in a health care setting. An Incident Management Team (IMT) should be established using the approach described in this plan."

Actions

23.3 A nosocomial case(s) of Legionnaires' disease (definite/probable/possible) should be investigated immediately.

23.4 An Incident Management Team (IMT) or an Outbreak Control Team (OCT) will be convened for a single case or an outbreak of nosocomial Legionnaires' disease respectively;

The IMT/OCT will be convened by the Consultant in Public Health Medicine (CPHM) with responsibility for Health Protection (or the duty CPHM). The CPHM will lead and co-ordinate the investigation and control of the incident/outbreak in close collaboration with the Infection Prevention and Control Doctor. Further information on the roles and responsibilities of the different members of the IMT/OCT can be found in NHS Board's Outbreak Plan;

In the event of a case(s) of nosocomial Legionnaires' disease the following people/groups will be members of IMT/OCT and will be briefed by the CPHM:

- Consultant in Public Health Medicine (IMT/OCT Chair);
- Consultant Physician (involved with care of case);
- Consultant Medical Microbiologist/Infection Prevention and Control Doctor;
- Infection Prevention and Control Nurse;

- Health Protection Nurse Specialist;
- Facilities & Estates Department ;
- Environmental Health Officer;
- Health & Safety Executive;
- Health Protection Scotland;
- Reference Laboratory;
- Corporate Communications (*NHS Board*);
- Other members from partner agencies as decided by IMT/OCT Chair.

Guidance on the general response to a case(s) of nosocomial Legionnaires' disease can be found in the HPN Guidance, Section 3.1.1.2 and NHS Board's Outbreak Plan.

23.5 See Table 1 for the contacts to be used in the event of a confirmed or suspected incident:

Legionella Role	Name	Title	Phone
Designated Person (Water)	SEE TABLE 1		
Responsible Person (Water)	SEE TABLE 1		
Responsible Person, Defined	SEE TABLE 1		
Advisor Responsible Person, Defined	SEE TABLE 1		
Infection Control	SEE TABLE 1		
Legionella Role	Name	Title	Phone
Laboratory Services	SEE TABLE 1		
Authorising Engineer	SEE TABLE 1		
Wastes & Water Services Manager – Water Specialist Advisor	SEE TABLE 1		
Public Health	SEE TABLE 1		
HSE	SEE TABLE 1		
Health Protection Scotland	Duty Epidemiologist advised by Public Health		
Reference Laboratory Microbiologist	Duty Microbiologist advised by Public Health		

23.6 When it is unclear whether there is a threat to public health the CPHM may choose to convene a Problem Assessment Group (PAG) in order to undertake an initial assessment of the problem and determine if an IMT is required. Further information on the role of the PAG can be found in the Scottish Government guidance on the *Management of Public Health Incidents: Guidance on the Roles and Responsibilities of NHS led Incident Management Team: October 2011*.

23.7 The general response to an incident or outbreak may include:

- investigation of all potential sources of *Legionella* infection. This shall include checking recent maintenance work and project work that may have been carried out on water or air handling systems;

- identifying the location of any medical equipment used for dental care, respiratory therapy and within Haemodialysis units;
- identifying off-site information such as excavation or earth moving works, alterations to water supply and drainage;
- shutting down any processes which are capable of generating and disseminating airborne water droplets and keeping them shut down until sampling procedures and any remedial cleaning or other work has been done. Final clearance to restart the system may be required;
- taking water samples from the system before any emergency disinfection being undertaken. This will help the investigation of the cause of the illness. The investigating officers from the local authority may take samples or require them to be taken;
- co-operating fully in an investigation of any plant that may be suspected of being involved in the cause of the outbreak. This may involve, for example:-
  - tracing of all pipework runs;
  - detailed scrutiny of all operational records;
  - statements from plant operatives and managers;
  - statements from water treatment contractors or consultants;
- any emergency cleaning and disinfection will be undertaken in accordance with *NHS Board* procedures;
- the **Designated Person (Water)** shall brief relevant Estates staff so that they are aware of the event and can respond to phone calls etc as instructed. The briefing shall include instructions that any comments to outside parties are agreed by Infection Prevention and Control;
- records shall be kept of all relevant information, including that provided by other departments.

General Microbiological and *Legionella* Sampling in Hot & Cold Water Systems

23.8 Circumstances under which samples are taken:-

- prior alterations to an existing water system;
- as part of commissioning process, prior to handover of a new building or introduction of a (altered, refurbished or new) water system into use;
- one week following handover of a new building or new water system;
- as part of the tank cleaning and disinfection process;
- as part of an assessment programme;
- in response to taste, odour or sustained discoloured water complaints.

SHTM 04-01 Section C details Total Viable Counts (TVC) and *Legionella* water quality testing requirements (to BS EN ISO 5667-1, BS6068 and ISO 11731) to identify sampling for the following harmful bacteria:

Coliforms	*Legionella*
Escherichia coli	*Salmonella*
Pseudomonas aeruginosa	*Campylobacter*
Aerobic Colony Counts	*E.coli O157*
Environmental Mycobacteria	*Staphylococcus aureus*
The following may also be identified:	
Cryptosporidium	*Klebsiella*
Clostridia	*Enterococci*

There are also a variety of other organisms that can behave in a similar way to that of *Pseudomonas aeruginosa* that may also be identified. These organisms are less pathogenic and less frequently isolated than *Pseudomonas aeruginosa:*

Burkholderia cepacia	*Ralsotonia picketti*
Chrysebacterium spp	*Serratia marsecens*
Stenotrophomonas maltophilia	*Acinetobacter* spp
Sphingomonas spp	*Enterobacter* spp

The Consultant Microbiologist will provide interpretation on the isolation of particular bacteria, the results and confirm any necessary actions.

23.9 When such samples are taken, a mains supply sample should be taken as a control to verify whether the supply could be the source of the identified problems. Scottish Water should also be contacted for distribution zone water quality data.

23.10 Samples for *Legionella* testing may be taken:-

- monthly from hot water systems treated with biocides where storage and distribution temperatures are reduced from those recommended in the HSE ACOP L8. At the time of preparation of this procedure, there are no such testing regimes within *NHS Board*;
- weekly from hot and cold water systems where control levels of the treatment regime, i.e. temperatures, are not consistently achieved – these samples should be taken until the system is brought back under control;
- when an outbreak is suspected or has been identified;
- regularly where a department specializes in services for “high risk” patients.

Note: Samples taken for *Legionella* must follow SHTM 04-01 in a 1 litre container as described, available from the Microbiology Laboratory.

23.11 Laboratory Compliance: Samples of *Legionella* should be tested by a UKAS accredited laboratory for the isolation of *Legionella* from water.

23.12 The Sampling and Leachate Testing to be undertaken is detailed in SHTM 04-01 Part E.

23.13 The TVC and *Legionella* Sampling and Test Protocol are detailed in SHTM 04-01 Part C. As described, sampling must follow that set out in BS7592: 2008 Code of Practice and BS EN ISO 5667-1: 2008 on Water Quality Sampling. Those organising sampling must make clear in advance which water quality technique is to be undertaken in order that systematic conclusion on risk can be drawn.

For initial water system sampling take a Post-Flush sample (as defined in BS 7592: 2008) at sentinel points without disinfection. Where there is an initial concern with a particular outlet location – say, a combined system and outlet problem – a BS Pre-Flush sample should be taken. If concerns persist with an outlet location (typically, a known dead-leg issue or lack of, or low, water use, a further BS Pre-Flush sample should be taken followed by disinfection before a BS Post-Flush with disinfection sample. Water should be allowed to run hot for 1 minute and cold for 2 minutes by which sampling would be temperature calibrated.

Where water quality sampling in a water system confirms (acceptable) *Legionella* results less than 100 CFUs/Litre – the **Authorised Person (Water)** would be informed and provided with copies of the samples in writing and record keeping. The **Authorised Person (Water)** would provide interpretation (with the Consultant Microbiologist when and where required) on the results and confirm if any actions are required.

Where water quality sampling in a water system confirmed *Legionella* results in excess of 100, but less than 1,000 CFUs/Litre – the **Authorised Person (Water)** and Consultant Microbiologist must be informed and provided with copies of the samples in writing. The Consultant Microbiologist would provide interpretation on the results and confirm the necessary actions prior to bringing the water system into use.

Where water quality sampling in a water system confirmed *Legionella* results in excess of 1,000 CFUs/Litre **immediate action must be taken** and the Consultant Microbiologist and **Authorised Person (Water)** must be informed and provided with copies of the samples in writing. They will immediately confirm the necessary actions prior to re-sampling and bringing the water system into use when (acceptable) *Legionella* results are reliably less than 100 CFUs/Litre.

Where continued water system sampling is required, this would be undertaken on a weekly frequency.

Where the results of 3 consecutive weekly water system samples remained below 100 CFUs/Litre, the **Authorised Person (Water)** and Consultant Microbiologist would be informed and sampling would revert to a monthly sampling frequency.

Where the results of 3 consecutive monthly Water System samples remained below 100 CFUs/Litre, the **Authorised Person (Water)** and Consultant

Microbiologist would be informed and sampling would revert to a 3 monthly sampling frequency.

Appendix A – Understanding "*the Written Scheme**"

Extract replicated courtesy HSE - ACOP & GUIDANCE L8

"Preventing or controlling the risk from exposure to Legionella bacteria (Regulations Control of Substances Hazardous to Health Regulations 2002, Regulation 7 and 9 Health and Safety at Work etc. Act 1974, Sections 2, 3 and 4**)**

52 "Where the assessment shows that there is a reasonably foreseeable risk, the use of water systems, parts of water systems or systems of work that lead to exposure has to be avoided so far as is reasonably practicable.

53 "Where this is not reasonably practicable, there should be a written scheme for controlling the risk from exposure which should be implemented and properly managed. The scheme should specify measures to be taken to ensure that it remains effective. The scheme should include:

- an up-to-date plan showing layout of the plant or system, including parts temporarily out of use (a schematic plan would suffice);
- a description of the correct and safe operation of the system;
- the precautions to be taken;
- checks to be carried out to ensure efficacy of scheme and the frequency of such checks; and
- remedial action to be taken in the event that the scheme is shown not to be effective.

54 "The risk from exposure will normally be controlled by measures which do not allow the proliferation of *Legionella* bacteria in the system and reduce exposure to water droplets and aerosol. Precautions should, where appropriate, include the following:

- controlling the release of water spray;
- avoidance of water temperatures and conditions that favour the proliferation of *Legionella* bacteria and other micro-organisms;
- avoidance of water stagnation;
- avoidance of the use of materials that harbour bacteria and other micro-organisms, or provide nutrients for microbial growth;
- maintenance of the cleanliness of the system and the water in it;
- use of water treatment techniques; and
- action to ensure the correct and safe operation and maintenance of the water system.

55 “Once the risk has been identified and assessed, a Written Scheme should be prepared for preventing or controlling it. In particular, it should contain such information about the system as is necessary to control the risk from exposure.

56 “The primary objective should be to avoid conditions which permit *Legionella* bacteria to proliferate and to avoid creating a spray or aerosol. It may be possible to prevent the risk of exposure by, for example, using dry cooling plant, adiabatic cooling systems or point-of-use heaters (with minimal or no storage). Where this is impractical, the risk may be controlled by minimising the release of droplets and by ensuring water conditions which prevent the proliferation of *Legionella* bacteria. This might include engineering controls, cleaning protocols and other control strategies. Decisions should be made about the maintenance procedures and intervals, where relevant, on equipment used for carrying out the control measures. *Legionella* bacteria may be present in very low numbers in many water systems but careful control will prevent them from multiplying.

57 “In general, proliferation of *Legionella* bacteria may be prevented by:

- avoiding water temperatures between 20ºC and 45ºC – water temperature is a particularly important factor in controlling the risks;
- avoiding water stagnation, which may encourage the growth of biofilm;
- avoiding the use of materials in the system that can harbour or provide nutrients for bacteria and other organisms;
- keeping the system clean to avoid the build-up of sediments which may harbour bacteria (and also provide a nutrient source for them);
- the use of a suitable water treatment programme where it is appropriate and safe to do so; and
- ensuring that the system operates safely and correctly and is well maintained.

58 “The scheme should give details on how to use and carry out the various control measures and water treatment regimes including:

- the physical treatment programme - for example, the use of temperature control for hot and cold water systems;
- the chemical treatment programme, including a description of the manufacturer's data on effectiveness, the concentrations and contact time required;
- health and safety information for storage, handling, use and disposal of chemicals;
- system control parameters (together with allowable tolerances); physical, chemical and biological parameters, together with measurement methods and sampling locations, test frequencies and procedures for maintaining consistency;
- remedial measures to be taken in case the control limits are exceeded, including lines of communication; and
- cleaning and disinfection procedures.

59 "The scheme should also describe the correct operation of the water system plant including:

- commissioning and re-commissioning procedures;
- shutdown procedures;
- checks of warning systems and diagnostic systems in case of the system malfunctions;
- maintenance requirements and frequencies; and
- operating cycles - including when the system plant is in use or idle.

60 "Detailed guidance on how to effectively prevent or control exposure can be found in ACOP Part 2.

Review of control measures - monitoring and routine inspection

61 "If precautions are to remain effective, the condition and performance of the system will need to be monitored. This should be the responsibility of the responsible person or, where appropriate, an external contractor or an independent third party and should involve:

- *checking* the performance of the system and its component parts;
- *inspecting* the accessible parts of the system for damage and signs of contamination; and
- *monitoring* to ensure that the treatment regime continues to control to the required standard.

62 "The frequency and extent of routine monitoring will depend on the operating characteristics of the system, but should be at least weekly.

63 "Testing of water quality is an essential part of the treatment regime, particularly in cooling towers. It may be carried out by a service provider, such as a water treatment company or consultant, or by the operator, provided they have been trained to do so and are properly supervised. The type of tests required will depend on the nature of the system and further details are given in Part 2 for both cooling towers and hot and cold water systems."

Note: Although there are no cooling towers in use in the NHS Scotland, *NHS Boards* require to be alert to where there may be cooling towers operating in the local proximity.

64 "The routine monitoring of general bacterial numbers (total viable count) is also appropriate as an indication of whether microbiological control is being achieved. This is generally only carried out for cooling towers, rather than hot and cold water systems. Periodic sampling and testing for the presence of *Legionella* bacteria may also be relevant to show that adequate control is being achieved. However, reliably detecting the presence of *Legionella* bacteria is technically difficult and requires specialist laboratory facilities. The interpretation

of results is also difficult; a negative result is no guarantee that *Legionella* bacteria are not present. Conversely, a positive result may not indicate a failure of controls as *Legionella* are present in almost all natural water sources. Further guidance on bacteriological monitoring and interpretation of test results can be found in ACOP Part 2.

65 "The results of monitoring and testing should be interpreted by a suitably experienced and competent person and any remedial measures, where necessary, should be carried out promptly."

Appendix B "*the Written Scheme**" template document

Water Safety – Facilities & Estates Sector

Note: Although the following pages set out a typical Written Scheme, it is stressed that account will require to be taken of issues that will not necessarily apply to all NHS facilities that could be influenced by configuration of accommodation (particularly plant spaces), varying NHS Board policies, type, age and complexity of accommodation.

The following pages detail *the Written Scheme for controlling the risks of exposure to *Legionella* and other harmful bacteria at:**

Location: xxx

Building Block: Block zz, (xx Block)

System(s): Water System

Authorised Person (Water): xxx

Valid from:

No work will be carried out on the water system without the knowledge and written consent of the Authorised Person (Water)

NHS Board

Facilities & Estates Sector

The Written Scheme*

for controlling the risk of exposure to *Legionella* and other harmful bacteria.

	CONTENTS:
1	Strategy for the correct and safe operation of the Water System……..……....
2	System Description……
3	Drawings and Schedules of Plant / Equipment…..……
4	Risk Assessment and Annual Review .
5	System Monitoring / Information
6	Contractors
7	Temporary Closures
8	Risk Control Notices
9	Documentation and Records……..
10	Outbreaks – Actions……..……..
11	Operational Restrictions……
12	Alterations to Water Systems……

This WRITTEN SCHEME Document is to be read in conjunction with the OPERATIONAL PROCEDURES for the WRITTEN SCHEME Document
This WRITTEN SCHEME Document is to be read in conjunction with the CONTROL OF WATER RECORD FORMS document
For any ALTERATIONS TO THE WATER SYSTEM this WRITTEN SCHEME Document is to be read in conjunction with the GUIDANCE FOR ALTERATIONS TO WATER SYSTEMS document

Strategy for the correct and safe operation of the water system

1. Safe Management Criteria

1.1 The Head of Maintenance (or appointed deputy) is the "Responsible Person (Water)" who is appointed in writing to manage the day–to–day risks of exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria and will be the estates lead in the event of an operational incident.

1.2 This water system is within the knowledge and control of an "Authorised Person (Water)" who is appointed in writing and has authority, competence, knowledge and control of the identified water system to ensure that all operational procedures and SHTM 04-01 requirements are carried out in a timely and effective manner to documented timescales. This strategy will involve "Competent Persons", "Maintenance Technicians", "Tradespersons", "Installers", "Contractors" and "Contract Supervising Officers" co-ordinated with DUTY HOLDERS in accordance with SHTM and HSE guidance.

2. Safe Operational Criteria

2.1 Water used in the Block **will be controlled to that of the Temperature Control Regime** (as outlined in HSE ACOP L8) with full temperature control as advocated in SHTM 04-01 to temperatures in the various parts of the water system as follows:

Note: Water **WILL NOT** be stored or circulated at temperatures in the range – above 20°C or below 50°C

- Cold Water (CW) shall be stored or distributed to outlets at or below 20°C.
- Domestic Hot Water (DHW) shall be at or above 60°C (at the flow point from heat exchangers/vessels) as it enters the supply system and shall be circulated at no less than 50°C (at the return point to heat exchangers).
- Domestic Hot Water supplied to Thermostatic Mixing Valves (TMV) or other outlets shall be at no less than 55°C.
- Cold Water supplied to Thermostatic Mixing Valves (TMV) or other outlets shall be at or below 20°C.

Special attention and escalation in writing to the relevant **Authorised Person (Water)** and **Responsible Person (Water)** is required where and when any of these criteria cannot be met.

Remember that hot water (and hot surfaces) above 45°C presents a scalding risk.

2.2 Point-of-Use Filters (P.O.U Filters) will only be installed and used where this is practical and there has been a written policy decision by the Water Safety Group, along with a complimentary managed maintenance change filter process. This will be have to put in place for life – or until a further policy decision by the Water Safety Group are satisfied that the affected outlet and pipework has been removed or disinfected without compromising the rest of the water system.

2.3 Taps or other water outlets should **not** be installed if they will not be used regularly, that is, less than twice in a week.

2.4 Where taps or water outlets are, or are unlikely to be, in regular daily use, **Duty Holders** have been alerted and reminded to flush these through and purge to drain, or purge to drain immediately before use, without release of aerosols. In Neonatal Units (NNUs), Adult and Paediatric Intensive Care Units (ICUs) infrequently used taps should be flushed daily at the start of each day. The Maintenance Department and Designers have responsibilities to be alert on **Duty Holder** requirements in Risk Control Notice 11/04 – and the record keeping on Sample Record Sheet) *or take steps to have the outlet removed* and the resultant dead-legs eliminated by taking out redundant branch pipework back to the circulating mains, removing the tee-piece and replacing with a straight coupling. The Instruction and Actions to **Duty Holder**'s is detailed in Section 8 below.

2.5 Management Team **Duty Holders** have also been alerted on awareness and actions to minimise the risk of *Pseudomonas* Spp and other similar harmful bacteria in the use of equipment, transmission routes and requirements (such as in the use of hand wash stations and wash basins) in Risk Control Notice 12/04.

3. System Description

XXXX, Block xx

3.1 The mains cold water supply which serves Block xx is fed directly from xxx and is located at the xxx end of the site at the corner of xxxx.

3.2 The point of entry is fed directly from the Scottish Water "xxx Pressure Line".

3.3 Scottish Water have introduced Chloramine as the water treatment/disinfecting agent to the incoming water supply. As advised in writing by Scottish Water at introduction in 2004, *NHS Board* are not required to carry out any secondary water treatment of the reservoir supply feeding the site.

3.4 A xxmm water supply makes its way underground into the basement area within the xxxx Blocks.

Domestic Cold Water System

3.5 A xxmm Mains Cold Water (MCW) supply rises from basement level through a pipe duct and feeds the LPHW Heating System and Block xx Cold Water Storage Tank. A xxmm MCW supply branches off before the tank and feeds down through the Block serving the following areas

- Ward xx.
- Ward xx.
- Ward xx.

3.6 The Cold Water Storage Tank has a capacity of approximately xx litres and serves the following:

- xxmm Cold Feed supply to the Domestic Hot Water Plate Heat Exchangers located in Plant Room xx (xx Block).
- xxmm Cold Downwater Service to Wards xx.
- A Cold Water Down Service serving the Block xx area is fed via a xxmm supply, water is drawn from the tank via the automated water booster pump set which is located within the roof plant room. This supplies cold water to all showers, washbasins, baths and WCs as per the reference drawings.
- Cold Feed to the Domestic Hot Water storage calorifiers is fed via a xxmm supply. Water is drawn from the tank via the automated water booster pump set located within the roof plant room. The xxmm cold feed runs within the DHW calorifier plant room at high level, the cold feed serving DHW calorifier No 1 (xx) drops and enters the lower section of the DHW calorifier. Prior to entering the DHW calorifier a xxmm branch goes to the system pressurisation vessel which serves DHWC No 1. The xxmm cold feed continues on to serve DHW calorifier No.2 (xx) in a similar manner.

Domestic Hot Water System

3.7 A xxmm Hot Water supply from each of the domestic hot water calorifiers, branches into a xxxmm Hot Water supply pipe at high level within the plant room. This pipe is routed around the xx Block dropping within the pipe duct, branching off at ceiling void level, feeding fitments *en route* and returning within the pipe duct to the DHW Calorifiers. Circulation is achieved by means of a single circulating pump located within the roof plant room.

Other Water Systems Connected or Operating in Close Proximity

3.8 There are no other water systems (such as for Fire Suppression, Fire Precautions or Fire Protection) connected or in close proximity. Regular reference should be made to the Water Safety Log Book for the Building Block for any changes or alterations.

Other Water Safety Features

3.9 There are no Point-of-Use (P.O.U.) Filters fitted in the water system.

Details of any future policy decisions to fit, operate and maintain or remove Point of Use Filters to/from specific points in the system in specific locations to be held in the Water Safety Log Book.

4. Drawings, Water Safety Log Book and Schedules of Plant/Equipment

- **Schematic and detailed drawings** of the main systems are kept within the Maintenance Section, Estates Department Offices, xxx.
- **CAD Drawings, Schematic and detailed drawings** of the system are also available at the Estates Department, xxxx, and viewable electronically > Shared on Yaren > *Legionella* > Site Drawings.
- **Plans are to be kept up to date** to include any alterations made to the water system. Notify xxx on tel 01xxx of any changes to be made to schematics or detailed drawings.
- **All drawings of water distribution for xxx Block xx (xxx Block) are referenced** with the Drawing Reference Number - Nxxx – Ox
- **Each Building Block has a Water Safety Log Book** held by the **Competent Person (Water) Site Supervisor,** located in the Estates Department Offices at xxxx containing details of the specific local water system(s).
- The **PROPERTY ASSET REGISTER REFERENCE NUMBER** is as detailed per *NHS Board* Planet System. The Planet System produces Works Dockets for precautionary checks and maintenance routines for the water system.

5. Risk Assessment and Annual Review

5.1 A current *Legionella* Risk Assessment by Water Hygiene Centre for the site is in place. **Reference Number xxx.**

By complying with the provisions of HSE ACOP L8 and SHTM 04-01 the level of risk will be minimized. Any system modifications will be designed in accordance with the above standards and recorded.

The *Legionella* Risk Assessments are reviewed every two years or earlier when any changes are made to the operation or configuration of the system.

6. System Monitoring / Information

Water Treatment

6.1 Primary water treatment is by Scottish Water (Chloramination/chlorination*).

* Delete as required

Sampling

6.2 Sampling will be carried out following SHTM 04-01. Protocols for general microbiological and *Legionella* sampling in hot and cold water systems are detailed in the Operational Procedures for the Written Scheme Document Section 22 (22.7 – 22.12).

Temperature Controls and Checks

6.3 Water used in the Block will be controlled to the Temperature Control Regime (as outlined in HSE ACOP L8) with full temperature control with a minimum flow temperature of 60°C from heat exchangers/vessels as advocated in SHTM 04-01. Water **WILL NOT** be stored or circulated at temperatures in the range above 20°C or below 50°C.

Regular temperature and maintenance checks on cold water tanks and hot and cold water distribution systems are carried out in accordance with operational procedures and with the detailed instructions on Planet Works Dockets, current guidance and the values logged in the Water Safety Log Book.

Daily - Temperature Monitoring

6.4 This shall be carried out in accordance with the following:

Procedure	Description
P1C1 (with ALL incidents logged on Form GUHLRC04 and BEMS alarms incidents on GUHLRC21)	Incidents and Faults; BEMS monitoring & log of all alarms

Temperature is Monitored by BEMS – to procedure P1C1

6.5 This system continually monitors the temperature of the following points:

- BEMS Outstation No xxx
- Common Flow Temp Point No **xx**
- Common Return Temp Point No **xx**
- No 1 DHW Calorifier (xx) Flow Temp, Point No **xx**
- No 1 DHW Calorifier (xx) Return Temp, Point No **xx**
- No 2 DHW Calorifier (xx) Flow Temp, Point No **xx**
- No 2 DHW Calorifier (xx) Return Temp, Point No **xx**

6.6 The BEMS monitoring and control devices are set to give high priority alarms in the event of system failure and/or temperature variances outwith alarm set points. Temperature monitoring devices are physically tested annually and recalibrated in accordance with manufacturers' instructions.

System failures and/or temperature alarms are continually monitored 24 hours a day, with alarms being generated at Estate locations and by remote paging of Estates staff (i.e. controls engineer or duty engineer etc).

The Estates person carrying out the monitoring or being notified of an alarm condition is required to log all incidents in the Water Incident Report Record Form (**GUHLRC04**) and also where appropriate in the BEMS Water System Alarm/Fault Record Form (**GUHLRC21**).

All incidents require to be investigated by the Estates staff and appropriate actions implemented (see Water Safety Operational Procedures, SHTM 04-01 & *Legionella* ACOP L8) Incidents are to be recorded in the Incident Report Record Form (**GUHLRC04**).

Temperature Monitoring in the event where the BEMS is not operative

6.7 This shall be carried out in accordance with the following:

Procedure	Description
P1C1A (logged on Form GUHLRC05A)	Manual monitoring or where BEMS not installed or BEMS not operational

Check the flow and return temperatures on the domestic hot water calorifier system as defined in the local system plan, using the temperature gauges fitted or a suitable surface temperature probe.

The flow temperature to be at least 60°C and the return temperature has to be at least 50°C.

Record all temperatures on the Water Temperature Record Form (**GUHLRC05A**) DHW – daily; CW 6 monthly.

Inspect cold water tank and conduct temperature checks – P1C7 and record all inspection and temperatures on the Record Form (**GUHLRC03**).

Weekly – Water Quality

6.8 The following procedures shall be carried out where chloramination treatment is provided by the water authority:

Procedure	Description
P1C2 (logged on Form GUHLRC27)	Chloramine checks (initially weekly)

Sampling results of *NHS Board* water systems shall be recorded in the Estates Chloramine Record Form (**GUHLRC27**). Sampling will be taken from a hot or cold water outlet point, representative of each secondary distribution pipework system. These will initially be conducted weekly and then subject to ongoing trend based frequency risk assessment, limited to no less than at once per month sampling test frequency. Frequency risk assessments to be held in the Water Safety Log Book.

Weekly – Manual Change-over of DHW Circulating Pumps

6.9 Where applicable, the following procedures shall apply:

Procedure	Description
P1C3 (logged on Form GUHLRC28)	Manual change over and log of circulating pumps not on BEMS control

Not applicable on this system. The BEMS controls and logs the change-over of circulating pumps.

System failures and/or temperature alarms are continually monitored, with alarms being generated at Estate locations and by remote paging of Estates staff (i.e. controls engineer or duty engineer etc).

Monthly (and Annual) – Temperature Monitoring

6.10 The extent of temperature monitoring is set out below:

Procedure	Description
P1C4 (monthly logged on Form GUHLRC05) P1C10 (annual logged on Form GUHLRC05)	a) Sentinel hot water taps b) Sentinel cold water taps c) Sentinel TMV taps d) DHW calorifier/heat exchanger flow & return temperatures e) Chilled Water heat exchanger flow & return temperatures

6.11 Sentinel Hot and Cold Water Outlets in the water system are located:

- 4th Floor, Ward xx.
- 3rd Floor, Ward xx.
- 2nd Floor, Ward xx
- 1st Floor, Ward xx.

Sentinel Hot and Cold Taps

6.12 Sentinel taps for hot water services (and any recirculating cold water systems) – **are the first and last taps on a recirculating system**. For non-recirculating cold water systems (or non-circulating hot water systems) they would comprise the nearest and furthest taps from the storage tank.

Note: The choice of further sentinel taps may also include other taps that are considered to represent a particular risk. In normal use the system should achieve 55°C at the supply to the furthermost draw-off point in the circulating system.

6.13 Check the temperatures at the sentinel taps as defined:

- Using a calibrated temperature probe, check the temperature of water from the cold water tap does not rise above 20°C after running the tap for 2 minutes.

- Using a calibrated temperature probe, check the temperature of water from the hot water tap does not fall below 50°C whilst running the tap for 1 minute.
- Record all temperatures on Water Temperature Record Form (**GUHLRC05**).

Sentinel Thermostatic Mixing Valves (TMV)

6.14 Sentinel Thermostatic Mixing Valves (TMV) in the water system are located:

- 4th Floor, Ward xx.
- 3rd Floor, Ward xx.
- 2nd Floor, Ward xx
- 1st Floor, Ward xx.

Note: In normal use the system should achieve 55°C at the supply to the furthermost draw-off point in the circulating system.

6.15 Check the temperatures at the TMVs on a sentinel basis as defined:

- Using a calibrated temperature surface probe check that the temperature of water in the hot water pipework to the TMV does not fall below 50°C whilst running the tap for 1 minute.
- Record all temperatures on Water Temperature Record Form (**GUHLRC05**).

Domestic Hot Water Calorifier(s) and Plate Heat Exchanger(s)

6.16 Check the flow and return temperatures on the domestic hot water system, using the temperature gauges fitted or a suitable surface temperature probe.

The flow temperature to be at least 60°C and the return temperature to be no less than 50°C.

Record all temperatures on the Water Temperature Record Form (**GUHLRC05**).

Domestic Cold / Chilled Water Heat Exchanger(s)

6.17 Not normally applicable.

Monthly – Air Handling Plant

6.18 *Complete the following where applicable:*

Procedure	Description
P1C5 (logged on Form GUHLRC22)	Inspect, clean & log glass traps

Three-monthly – DHW Calorifier, DHW & CW storage/ buffer vessel flushing

6.20 The following procedures should be carried out:

Procedure	Description
P1C6 (logged on Form GUHLRC06)	Flushing of DHW calorifier(s) and Storage/Buffer Vessel(s) associated with Hot /Cold/Chilled Water Heat Exchanger(s)

- Flush each domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. The hose from the drain valve should be discharged to the nearest drain.
- Record all actions on the top section of Record Form (**GUHLRC06**).
- Where the domestic hot water system has a stratification pump(s) fitted to circulate the hot water from the top to the base of the calorifier or the storage/buffer vessel, and the history data shows no sludge deposits during flushing, then this procedure should be risk assessed to determine if the maintenance frequency can be changed. This assessment should be recorded on Form **GUHLR23** as below.

Frequency Risk Based Assessment

6.21 Systems that continually conform to and have a database history of temperature readings within the control parameters should have a risk-based assessment carried out annually to determine if the maintenance frequency can be changed. This assessment should be recorded on Form **GUHLRC23** by the **Authorised Person (Water)** ensuring that the **Responsible Person (Water)** is notified immediately in writing. Frequency risk assessments are to be held in the Water Safety Log Book.

Three-monthly for High Risk Areas and as required elsewhere, but at least once annually - Shower Heads and Hoses

6.22 The following procedures shall be carried out:

Procedure	Description
P1C12 (logged on Form GUHLRC05B)	Dismantle, clean and de-scale / or replace with new disinfected Shower Head and Hose

6.23 **Showers** in the water system are located:

- 4th Floor, Ward xx.
- 3rd Floor, Ward xx.
- 2nd Floor, Ward xx.
- 1st Floor, Ward xx.

6.24 Planned Shower Head and Hose Replacement Programme shall be conducted 3-Monthly in identified High-Risk Areas and as required elsewhere, but undertaken at least once per Annum.

- Remove the shower head and hose assembly. Place shower head and hose assembly into a plastic bag and seal.
- Check that the new clean disinfected head and hose package is intact.
- Open replacement new clean disinfected shower head and hose assembly sealed packaging, remove and fit following the manufacturers instructions.
- Run water and flush for 3 minutes in accordance with *Legionella* Risk Assessment in such a way as to avoid the creation of aerosols.
- Check and record final temperature for compliance and return shower appliance to use.
- Return redundant sealed bag with shower head and hose assembly to workshop for disposal in accordance with Waste Procedures.
- Record all actions on the Record Form (**GUHLRC05B**).

Six-monthly Cold Water Summer / Winter Temperature Monitoring

6.25 These procedures shall be carried out as follows:

Procedure	Description
P1C7 (logged on Form GUHLRC03)	a) Cold Water at inlet to building block. Also to be continuously monitored by BEMS & log of all alarms
P1C7 (logged on Form GUHLRC03)	a) Tank and temperature checks & log b) Tank inspection

- Complete the Summer / Winter Inspection of water tank as per Record Form (**GUHLRC03**).
- Where the system has no BEMS temperature sensors connected, the readings should be taken using a temperature sensor. The tank temperature should be below 20°C.
- Record all inspection and temperatures including the mains water supply at the building/block inlet on the Record Form (**GUHLRC03**).

Six-monthly Air Handling Plant

6.26 Where applicable these procedures shall be carried out as follows:

Procedure	Description
P1C8 (logged on Form GUHLRC07)	a) Humidity section inspection b) Cooling section inspection c) Disinfection

Annual - DHW Calorifiers, DHW & CW Storage/ Buffer Vessels

6.27 The following procedures shall be carried out:

Procedure	Description
P1C9 (logged on Form GUHLRC06)	Drain & cleaning of DHW Calorifier(s) and Storage/Buffer Vessel(s) associated with Hot /Cold/Chilled Water Heat Exchanger(s)

- follow the manufacturers maintenance instructions (in the Water Safety Log Book). Record all actions where applicable on the lower section of "Calorifier and Storage/Buffer Vessel Maintenance Record Form" (**GUHLRC06**) for each system;
- isolate domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel service valves;
- heat up any domestic hot water calorifier or hot water storage/buffer vessel until the contents have reached 60°C and hold at this temperature for a period of at least 1 hour;
- drain domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel and remove inspection hatch;
- hose out the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel to remove any debris, scale or other deposit. Care should be taken to keep aerosols to a minimum;
- if the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel does not have an inspection hatch, the pipework at the top of the vessel should be disconnected to allow the insertion of a water hose to allow debris to be washed down off internal surfaces;
- examine the internal and external condition of the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel and pipework. Any defects should be reported in writing to the relevant **Authorised Person (Water)**. The safety valve should be checked, overhauled and reset as necessary. The temperature, altitude and pressure gauges to be checked for operation;
- on completion of examination and any repairs, the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel should be re-constructed;
- on completion of the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel assembly, the following sequence must be undertaken;
- refill with cold water;
- drain the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel;
- refill with cold water, leave cold feed valve open;
- run domestic hot water calorifier or hot water storage/buffer vessel at a temperature of 60°C for at least 1 hour. Test the operation of high-limit cut

out system if fitted. Check the temperature of the calorifier/vessel top and bottom with a surface thermometer;

- adjust any controls as necessary;
- take bacteriological samples from the domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel drainage trap (where possible) and nearest and furthest outlet;
- record all actions on the Record Form (**GUHLRC06**).

Flexible Hoses

6.28 There are no flexible hoses in the water supply and distribution system.

There are no flexible hoses connecting to necessary equipment. *(amend if required)*

Risk Assessment – not applicable.

Risk assessments for any future flexible hoses added to the system to be held in the Water Safety Log Book.

General Comments – Hot Water System

6.29 If conditions, e.g. temporary ward closure, leave a system unused for a period greater than 7 days, for a short term or limited closure typically not exceeding 30 days, then the Authorised Person (Water) must be notified.

Arrangements for the system must be made to ensure thorough flushing of all outlets weekly by opening all taps and allowing water temperatures to stabilise (see Section 7). If shutdown is longer than 30 days the Authorised Person (Water) will make arrangements for the system to be drained and left dry and sealed (see Section 7).

If and when the system is reinstated the Authorised Person (Water) will make arrangements for the system to be subject to a disinfecting regime. This will also include any de-stratification pumps.

The minimum number of DHW Calorifiers will be operated on line 24 hours per day, 7 days per week, with the domestic hot water circulation pump kept running to provide maximum turnover of water storage. Off-duty DHW Calorifiers will always be held in a drained, empty and dry condition until required for use. On return to service, DHW Calorifiers must be run through the pasteurising procedure.

Valves should be opened slowly to avoid disturbance of any sediment in the system.

Over-capacity of hot water storage must be identified and surplus equipment disconnected from the system.

Materials that sustain microbiological growth will not be used in connection with the waterside of domestic hot water systems (i.e. Water Byelaws, WRAS and SHTM 04-01 compliant).

Every DHW Calorifier shall be clearly marked with the following information:

- Insurance Folio ‘xx’ Number
- Areas supplied
- DHW Calorifier capacity

Hot Water Circulating Pumps

6.30 The *Legionella* risk is where duty and standby pumps are provided and there is no automatic changeover sequencer fitted to prevent stagnant water forming in the standby pump unit.

The circulation for secondary domestic hot water circuits from each calorifier are run on a simplex basis **with one pump installed and operating 24 hours per day, 7 days per week**.

Thermostatic Mixing Valves (TMVs)

6.31 Thermostatic mixing valves are installed to condition water for whole or partial body submersion to eliminate the risk of scalding.

These devices are fixed to showers, bidets, baths and wash basins. They are included on the Domestic Services Water Layout drawings for the site.

A maintenance programme of testing is ongoing throughout the year to ensure compliance with Safe Hot Water and Surface Temperatures requirements as set out below.

All temperature and maintenance checks are recorded on the Planet F.M. Pre-Planned Maintenance docket P.P.M. Completed Control of Water Record Sheets are to be returned to the Supervisor / Estates Officer for filing in the Water Safety Log Book. In normal use the system should achieve 55°C at the supply to the furthermost draw-off point in the circulating system.

Only Type 3 TMVs are used in the water system.

The maximum set domestic hot water temperature must not exceed the following temperatures:

- 38°C Bidets
- 41°C Showers
- 41°C Wash basins
- 43°C Bath (43°C fill)
- 46°C Bath (46°C fill)

Note: Bath fill temperatures of more than 43°C should only be considered in exceptional circumstances where there are particular difficulties in achieving an adequate bathing temperature. If a temperature of greater than 43°C is to be used then a safe means of preventing access to the hot water should be devised to protect vulnerable patients. Any valve delivering hot water exceeding this temperature should be isolated and removed from service immediately.

Materials and Fittings

6.32 All materials for use on water systems shall comply with The Water Supply (Water Fittings) Regulations 1999 (WRc approved).

Tap washers, joint rings and compound shall be in accordance with the appropriate British Standard.

6.33 Materials in contact with water shall not:

- impart any objectionable taste or colour;
- release any toxic substance;
- support microbiological growth;
- include traditional white products such as “Boss White” used with hemp contain linseed oil and shall **not be** used as they support microbiological growth.

6.34 However,

- polytetrafluroethylene (PTFE) products can be used;
- lead-free solder fittings must be used on all potable water supplies.

6.35 All systems shall be designed and installed to ensure no back syphonage occurs and where applicable be passed to the Local Water Authority for comment and or information.

6.36 Also there is a combination of factors that may have facilitated *Pseudomonas* Spp becoming a clinical problem. These factors include any or all of the following:

- water system materials which may have facilitated biofilm formation (e.g. plastic pipework, plastic and rubber components in TMVs and flexible hose liners etc);
- water outlets with thermostatic mixer valves (TMVs) designed to regulate water temperature and minimise the risk of scalding, which may also have increased the risk of other waterborne pathogens;
- the increased number of wash hand basins / sinks in clinical areas, combined with the increased use of alcohol based hand rubs (ABHRs) which may have resulted in a decreased use of water at individual wash hand basins / sinks;

- the use of non touch (sensor) water fittings, resulting in low water volumes flowing through outlets. This combined with a column of standing water left in the pipework provides an ideal condition for bacterial growth.

Planned Maintenance Programme

Legionella and Water Safety Risk Reduction

6.37 *Legionellosis* and other water safety risks can be controlled by actively pursuing a policy of good housekeeping.

This requires the following maintenance actions:

- yearly tank inspection and monitoring/recording of tank temperatures;
- quarterly inspection and annual cleaning of DHW Calorifiers;
- daily monitoring and recording of DHW Calorifier temperatures;
- twice-weekly flushing, of all little used water outlets except in ICUs where daily flushing is required at the start of each day;
- monthly monitoring and recording of sentinel water outlet temperatures;
- annual monitoring and recording of representative water outlet temperatures;
- annual cleaning of humidity chambers on air movement systems;
- satisfactory operation of thermostatic mixer valves (3 monthly for high risk areas and as required elsewhere, but at least once annually);

Water Safety Log Books and maintenance records are kept in the Maintenance Managers office

Daily BMS Record Forms are printed out, for all critical system temperatures and plant status, and are held in the Maintenance Managers Office.

Cold Water Services Routine Inspection and Frequency Table:

6.38 The procedures set out below shall be followed:

Service	Task	Frequency
Cold Water Services	Check tank water temperature remote from ball valve and mains temperature at ball valve. Note maximum temperatures recorded by fixed maximum thermometers where fitted. (on Procedure P1C7 – recorded on GUHLRC03)	Six monthly
	Check that temperature is below 20°C after running the water for up to two minutes in the sentinel taps. (on Procedure P1C4 – recorded on GUHLRC05)	Monthly
	Visually inspect cold water storage tanks and carry out remedial work where necessary. Check representative taps for temperature as above on a rotational basis. (on Procedure P1C7 – recorded on GUHLRC03)	Annually

Service	Task	Frequency
Shower Heads	Dismantle, clean and de-scale shower heads and hoses / or replace with new disinfected Shower Head and Hose. (on Procedure P1C12 – recorded on GUHLRC05B)	3 Monthly for high risk areas and as required elsewhere, but at least once annually
Little Used Outlets	Flush through and purge to drain, or purge to drain immediately before use, without release of aerosols. (on Risk Control Notice 11/04 – recorded on Sample Record Sheet by Duty Holder)	Twice weekly

Hot Water Services Routine Inspection and Frequency Table:

6.40 The procedures set out below shall be followed:

Service	Task	Frequency
	Arrange for samples to be taken from hot water calorifiers, in order to note condition of drain water. (on Procedure P1C9 – recorded on GUHLRC06)	Annually
	Visual check on internal surfaces of calorifiers for scale and sludge. Clean and disinfect. Check representative taps for temperature as above on a rotational basis. (on Procedure P1C9 – recorded on GUHLRC06)	Annually
	Each calorifier and any associated storage/buffer vessels should be flushed quarterly through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. Calorifier and any associated storage/buffer vessels flushing should be carried out after temperature checks on the calorifier and system have been completed. Record form (GUHLRC06) should be completed.	Quarterly
	Check temperatures in flow and return at calorifiers. (on Procedure P1C4 – recorded on GUHLRC05)	Monthly
	Check water temperature up to one minute to see if it has reached 50°C in the sentinel taps. (on Procedure P1C4 – recorded on GUHLRC05)	Monthly

Maintenance Instructions

6.41 The Planet System produces Works Dockets for the precautionary checks and maintenance routines for the water system. Copies of the maintenance instructions for each of the above tasks are included in the Water Safety Log Book.

Disinfection

6.41 Where not an integral part of the Planet precautionary checks and maintenance routines, water systems should also be cleaned and disinfected under the circumstances in the following table:

System/ Service	Circumstance Requiring Cleaning and Disinfection* (*for disinfection check current Risk Assessment)	Frequency
Domestic Cold Water Tank	New installations.	As required
	Re-commissioning empty/unused tanks.	As required
	Tank temperature exceeds 25°C.	As required
	Tank contains moderate sediment, i.e. a complete covering of the tank base.	As required
	Evidence of tank corrosion (check with current Risk Assessment).	As required
	Any contamination of tank (by organic, by vermin or vermin faeces or similar).	As required
	Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
	Regular programme for high-risk healthcare category, with disinfection* (check with current Risk Assessment).	Annually
	Regular programme for medium risk healthcare category, with disinfection* (check with current Risk Assessment).	2 Yearly
	Regular programme for non-healthcare premises, with disinfection* (check with current Risk Assessment).	5 Yearly
Domestic Cold Water Distribution System	New installations and modifications or additions.	As required
	Temperature exceeds 25°C.	As required
	Any contamination of tank (by organic, by vermin or vermin faeces or similar).	As required
	Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
Domestic Hot Water Calorifier and Storage/ Buffer Vessels	New installations and modifications or additions.	As required
	Temperature has fallen below 45°C.	As required
	Re-commissioning of empty/unused plant.	As required
	Any contamination of header tank (by organic, by vermin or vermin faeces or similar).	As required
	Regular programme.	Annually
Domestic Hot Water Distribution System	New installations and modifications or additions.	As required
	Temperature has fallen below 45°C.	As required
	Any contamination of header tank (by organic, by vermin or vermin faeces or similar).	As required
Air Handling Units	Any contamination (by organic, by vermin or vermin faeces or similar).	As required
	Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
	Chiller battery, drip trays and drainage pipework.	6 monthly

Domestic Cold Water Tanks and Distribution Systems

6.43 The procedures set out below shall be followed:

Procedure	Description
(logged on Form GUHLRC04)	for Cold Water Tanks and Distribution Systems following the identification of water temperature greater than 20°C

Drinking water, to a relevant water quality under Regulations, is provided to *NHS Board* by Business Stream, a Licensed Provider (LP) who works with Scottish Water to make sure that the water supply is connected properly, and the water is clean and ready to use.

These obligations cover the supply network up to the boundary point (normally the meter point), thereafter obligations rest with *NHS Board*.

Note: Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5 – 10 °C range and in summer up to 20°C.

6.44 The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is greater than 20°C. (i.e. the water storage tanks for Domestic Cold Water Systems and for Domestic Hot Water Systems).

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. more than 20 °C) is reported from any number of cold water outlets, from maintenance procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant **Authorised Person (Water)** as soon as the problem is identified and confirm this in writing within 24 hours.
- The **Authorised Person (Water)** should liaise with the person identifying the problem and verify the problem by independently rechecking by taking the water temperature of the appropriate cold water storage tank, the temperature of the incoming mains cold water at the site boundary point (and building entry point if there are multiple buildings served by the mains cold water system) and the outflow distribution temperature.
- If the cold water storage temperature is confirmed greater than 20°C, then the **Authorised Person (Water)** should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk.
- The **Authorised Person (Water)** should also review the Water Safety Log Book and take into account the recent water system history to specifically include - the primary water treatment levels (for mains cold water supplied with Chloramination treatment); any water sampling carried out following SHTM 04-01; system monitoring data, including temperature monitoring and water quality chloramine checks; recent maintenance history; recent alterations, changes or additions to the water system; and any other changes made by **Duty Holders** or users of the water system.
- On reviewing continuous monitoring temperature profiles, in conjunction with Water Safety Log Book and recent history, action as Stage 2 or Stage 3 or Stage 4 as appropriate. The **Authorised Person (Water)** will ensure

the **Responsible Person (Water)** is notified immediately in writing at each Stage and also recorded in the Water Safety Log Book.

Stage 2 - Initial Action – high incoming mains cold water temperature

- Where the incoming mains cold water is 18°C or greater for more than a 48 hour period the **Responsible Person (Water)** should contact Business Stream, the Licensed Provider, who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment.

Stage 3 - Water temperatures fluctuating above and below 20°C (but no greater than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclic manner over 72 hour periods in response to regular user water demand (but no greater than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the **Authorised Person (Water)**, the reason(s) for failure(s) identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure).

Considerations for failures include:

- accuracy of temperature sensors (requiring recalibration);
- temperature sensors being located in water (requiring reposition where tank storage levels have been reduced and sensor no longer sensing stored water);
- inappropriate standby tank configuration;
- temperature sensor in standby system;
- temperature sensor measuring stagnation (requiring reposition);
- inappropriate siting (not in a cool location);
- heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
- storage capacity not minimised to match daily use (changes in user water demand);
- ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or Steam systems);

Stage 4 - Water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the **Authorised Person (Water)**, the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating –

where there will be an increased risk and appropriate actions will be required to mitigate exposure).

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) must be implemented.
- The **Authorised Person (Water)** should, unless instructed in writing to the contrary by **Responsible Person (Water)**:
  - arrange to drain the tank contents and clean if necessary;
  - inform the users of the failed system that they must not draw off any cold water (and hot water if a single domestic hot water header) from the affected system until further notice;
  - chlorine (or other suitable) disinfection of the tank and distribution system shall be carried out;
  - thereafter the tank shall be brought back into service;
  - then the users shall be informed that the system is back in operation.

The **Authorised Person (Water)** shall complete an Incident Report Record Form (**GUHLRC04**). An entry should also be made in the Water Safety Log Book and ensure the **Responsible Person (Water)** is notified in writing as soon as possible.

Domestic Hot Water Plant and Distribution Systems

6.45 The following procedure should be employed if the Calorifier or Plate Heat Exchanger outflow temperature falls below 45°C.

Procedure	Description
(logged on Form GUHLRC04)	Domestic Hot Water Systems following plant failure, allowing system water temperature to drop below critical control levels

Decision Table for Hot Water System Breakdown

6.46 The Table below should be used to decide on the actions necessary in the event of a plant breakdown such as power failure or steam supply failure.

Breakdown leading to temperature <45°C, lasting for:	Risk Category	Action
<12 hrs	High	Verify
	Significant	Verify
	Moderate	Verify
>12 hrs	High	Thermally pasteurise
	Significant	Verify
	Moderate	Verify
>24 hrs	High	Thermally pasteurise

	Significant	Thermally pasteurise
	Moderate	Verify
Breakdown leading to temperature <45°C, lasting for:	Risk Category	Action
>72 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Thermally pasteurise

"Verify" = Ensure that normal temperature performance has been resumed, i.e. 60°C

"Thermally pasteurise" = Calorifier or Plate Heat Exchanger and complete distribution system

6.47 In the event of a reduction in domestic hot water temperature the **Authorised Person (Water)** should be notified in writing as soon as possible. The reason for failure must be identified and rectified as soon as possible.

6.48 The **Authorised Person (Water)** shall notify the **Duty Holder** and users on the failed system that they must not draw off any hot water from the affected services until further notice.

6.49 The relevant Duty Holder shall ensure that their staff are aware of the situation, and that they in turn shall prevent patients from using affected services.

6.50 Where thermal pasteurisation is to be carried out, the temperature of the calorifier or plate heat exchanger shall be raised to 60°C, and the water shall be circulated throughout the affected distribution system for at least one 1 hour. Each tap or appliance should be run in sequence until full temperature is achieved (this should be measured). To be effective the temperature in the calorifier or plate heat exchanger should be high enough to ensure that all distribution outlets receive water at a temperature of greater than 60°C. Ensure the return flow to the calorifier or plate heat exchanger is no less than 50°C.

6.51 The **Authorised Person (Water)** shall inform users that the system is back in operation.

6.52 Bacteriological samples should be taken in consultation with the Infection Prevention and Control team.

6.53 The **Authorised Person (Water)** shall complete an Incident Report Record (**GUHLRC04**) and ensure the **Responsible Person (Water)** is notified in writing as soon as possible. Maintain hard copy records in the Water Safety Log Book.

Air Handling Plant

6.54 If applicable the following procedures shall be carried out:

Procedure	Description
P1C8 (logged on Form GUHLRC07)	a) Humidity section inspection b) Cooling section inspection c) Disinfection

Aerosol Generation

Note: The disease caused by the *Legionella* bacteria is a type of pneumonia, affecting the lungs and other organs of the body. The basic cause of infection is the inhalation of droplets of water infected with the *Legionella* bacteria, the highest risk being aerosols.

6.55 Aerosols may be generated from a number of sources, such as showers, aerated taps, air conditioning units, water disturbances in tanks and calorifiers and by the use of hoses for flushing and cleaning. All maintenance tasks are therefore conducted in a manner that minimises the production of potentially dangerous aerosols. Some examples are as follows: -

- calorifiers are pasteurised, fully drained, prior to opening for examination;
- sediment and sludge should be carefully cleared before hosing.

6.56 Risk Assessment has been used to identify the possible producers of aerosols, the hazards associated when they are produced, and the control measures in place to reduce the risks to a manageable level.

7. Contractors

7.1 Only Competent Contractors may be used to supplement the in-house labour force in carrying out the following operations:

- water storage tank cleaning and disinfection;
- thermostatic Mixer Valve (TMV) maintenance;
- system disinfection;
- BEMS Maintenance.

Note: Contractors are appointed in accordance with the *NHS Board* Control of Contractors Policy. Contractors shall only be engaged in work on water systems or air conditioning plant under the control of the **Authorised Person (Water)** co-ordinated with any Estates persons.

7.2 The *NHS Board* Management and Control of Contractors – Health, Safety and Environment Policy & Procedural Arrangements along with the associated Guide for Contractors will apply.

7.3 The **Authorised Person (Water)** shall ensure that the Contractor is competent for the task(s) to be undertaken and shall ensure that the Contractor is aware of and has made provision for all responsibilities under the various Environmental, Health and Safety Regulations, including CDM, COSHH, *Legionella*, water safety etc.

7.4 The **Authorised Person (Water)** shall ensure that the Contractor:-

- is suitably briefed in writing on the task(s) to be undertaken and is fully aware of the water safety implications and prescribed Water Safety Procedures to be followed;
- demonstrates that all workforce to be engaged on the task(s) are suitably trained and experienced for the task and are properly managed and supervised;
- has provided appropriate equipment for the task including PPE;
- carries out the task(s) to the correct standards and in the correct manner all in accordance with all *NHS Board* and Estates policies and procedures.

7.5 The **Authorised Person (Water)** shall record the evidence provided by the contractor and store it for future reference and maintain hard copy records in the Water Safety Log Book.

7.6 The **Authorised Person (Water)** shall complete a review questionnaire upon completion of the work and shall forward it to the Environment & Safety Support team for recording.

8. Temporary Closures

8.1 The **Duty Holder** requires to ensure that Ward/Departmental Managers notify the **Authorised Person (Water)** and Estates Maintenance Department in advance to assess the risks of exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria when closures are planned.

8.2 When wards or departments are closed temporarily (for short terms or limited periods not exceeding 30 days), a procedure for the regular flushing of all domestic water outlets will be implemented immediately. The flushing operation should be conducted on a twice weekly flushing cycle basis and details recorded and transferred to the Water Safety Log Book and the Planet system. The procedure will involve running every water outlet for 3 minutes and flush each toilet.

8.3 Domestic Services Supervisors and Managers will also notify the Maintenance Department if they identify any unused areas or outlets.

8.4 Where wards or departments are to be closed indefinitely or mothballed with no planned re-opening date, or where the closure period typically exceeds 30 days, the Estates Department must be consulted and provided with funding in order to assess the risks of exposure to *Legionella, Pseudomonas* Spp and other similar harmful bacteria with a view to alter or disconnect and drain the relevant water services.

9. Risk Control Notices

9.1 *NHS Board* Clinical Governance and Risk Management Unit have issued Risk Control Notice 11/04 dated 20th June 2011 to **Duty Holders** on the Management and Control of *Legionella*. This instructs actions by devolved

management and local ward or department staff to eliminate or manage the risk as follows:

Use of Water System Outlets

9.2 The manager responsible for the ward or department must put systems in place to undertake a weekly review of the use of water systems outlets.

Where water outlets are:

- Unused or Redundant – follow Action 8.3 below.
- Little Used – follow Action 8.4 below.

9.3 **Unused or Redundant System Outlets** – outlets deemed unused or redundant (and associated supply pipework at showers, taps in basins & baths, etc) must be reported by the manager responsible for the ward or department to the Estates Department on ext: xxxxx to be taken out of service and for removal, to eliminate the risk.

Alternatively, if the outlet has to be retained (such as for emergency or irregular use) the manager responsible for the ward or department must put systems in place for the outlet to be flushed to waste for 3 minutes, at least **twice weekly**, by ward or department staff, following Actions 8.5 – 8.8 below.

9.4 **Little Used System Outlets** - (i.e. outlets that are not used at least twice weekly). The manager responsible for the ward or department must put systems in place for the outlet to be flushed to waste for 3 minutes, at least twice weekly, by ward or department staff, following Actions 8.5 – 8.8 below. Where the outlet may be used by high-risk patients, more frequent flushing may be needed and the frequency should be determined following a risk assessment.

9.5 The flushing must be carried out in such a way as to avoid (or protect from) the creation of any aerosols. If the flushing has been *regular and in accordance with this notice,* the risk posed by aerosols is very low.

9.6 Shower heads which are dirty and are to be retained should be reported to domestic services so that these may be thoroughly cleaned or replaced.

9.7 A record must be kept of the weekly flushing operation. A template record sheet is attached. This must be retained in your ward or department for at least 5 years.

9.8 Local flushing regimes must be ongoing and continuous at all times, in order to prevent critical increases in *Legionella* growth and to demonstrate auditable management control of *Legionella* in local workplaces.

9.9 The Record Sheet is audited as an integral part of Infection Control Audit (3-monthly using the HEI Inspection Audit Tool).

9.10 Management Team **Duty Holders** have also been alerted on awareness and actions to minimise the risk of *Pseudomonas* Spp and other similar harmful bacteria in the use of equipment, transmission routes and requirements (such

as in the use of hand wash stations and wash basins) in Risk Control Notice 12/04.

10. Documentation and Records

10.1 The documentation and records of all work undertaken to prevent the growth and spread of *Legionella* require to be maintained and performance reviewed by the **Authorised Person.** These records include:

- Risk Assessments;
- the *Legionella* operational maintenance site plan;
- records of maintenance actually carried out, contained within Water Safety Log Books and Planet;
- records of procedural audit and review, contained within the Water Safety Log Book;
- other Procedures are set out below:

Other Procedures	Record	Description
Short / Limited Closure Record Form	Logged on Form GUHLRC01	For a period typically not exceeding 30 days
Indefinite Closure / Re – Occupation Record Form	Logged on Form GUHLRC02	For periods typically exceeding 30 days
Incident Report Record Form	Logged on Form GUHLRC04	For all incidents and resulting actions
Water Maintenance Frequencies Risk Based Assessment Form	Logged on Form GUHLRC23	For review and change of any maintenance frequency
Water Disinfection Risk Based Assessment Form	Logged on Form GUHLRC24	For assessment for disinfection of systems after work or alterations
Checklist for New Water System Designs	Logged on Form GUHLRC25	Checklist for designers
Other Procedures	Record	Description
Flushing Water Outlets Record Form	Logged on Form GUHLRC26	Record sheet for Estates Department use
Estates Chloramine Record Form	Logged on Form GUHLRC27	Record sheet for Estates Department use

Other Procedures	Record	Description
Water Safety Control Log – Record Form	Logged on Form GUHLRC28	For plant status, maintenance tasks and resulting actions
Risk Control Notice 11/04	Logged on Sample Record Sheet	For DUTY HOLDERS
Risk Control Notice 12/04	Actions to Estates Helpdesk	For Duty Holders

11. Outbreaks – Actions

Note: Any incidents or deviance from the controls for the Temperature Control Regime must be reported to the **Authorised Person (Water)** immediately, the Incident Report Record Form (**GUHLRC04**) is completed and ensure the **Responsible Person (Water)** is notified as soon as possible.

11.1 In the event of an Outbreak, an Incident Management Team (IMT) or an Outbreak Control Team (OCT) will be convened for a single case or an outbreak of nosocomial Legionnaires' disease respectively.

11.2 The IMT/OCT will be convened by the Consultant in Public Health Medicine (CPHM) with responsibility for Health Protection (or the duty CPHM). The CPHM will lead and co-ordinate the investigation and control of the incident/outbreak in close collaboration with the Infection Prevention and Control Doctor. Further information on the roles and responsibilities of the different members of the IMT/OCT can be found in *NHS Board's* Outbreak Plan. Refer to Section 22 and *NHS Board* Control of Infection Manual for full information.

11.3 The general response to an incident or outbreak may include:

- investigation of all potential sources of *Legionella* infection. This shall include checking recent maintenance work and project work that may have been carried out on water or air handling systems;
- identifying the location of any medical equipment used for dental care, respiratory therapy and within Haemodialysis units;
- identifying off-site information such as excavation or earth moving works, alterations to water supply and drainage;
- shutting down any processes which are capable of generating and disseminating airborne water droplets and keep them shut down until sampling procedures and any remedial cleaning or other work has been done. Final clearance to restart the system may be required;
- taking water samples from the system before any emergency disinfection being undertaken. This will help the investigation of the cause of the illness.

The investigating officers from the local authority may take samples or require them to be taken;

- co-operating fully in an investigation of any plant that may be suspected of being involved in the cause of the outbreak. This may involve, for example:-
  - tracing of all pipework runs;
  - detailed scrutiny of all operational records;
  - statements from plant operatives and managers;
  - statements from water treatment contractors or consultants;
- any emergency cleaning and disinfection will be undertaken in accordance with *NHS Board* procedures;
- the **Designated Person (Water)** shall brief relevant Estates staff so that they are aware of the event and can respond to phone calls etc as instructed. The briefing shall include instructions that any comments to outside parties are agreed by Infection Prevention and Control;
- records shall be kept of all relevant information, including that provided by other departments.

12. Operational Restrictions

12.1 These will be recorded within the Water Safety Log book, in consultation with the users (if any) of the facility.

13. Alterations to Water Systems

13.1 Where alterations are planned to water systems and the Written Scheme, the **Guidance for Alterations to Water Systems** document must be followed. The document provides separate specific guidance and the details to be followed for controlling and avoiding the risk of *Legionellosis* and other water safety risks. (specifically using Record Form **GUHLRC29** to record the acceptance of work to be conducted and conformation of work completed on a water system and all conditions involving **Duty Holders**, the **Authorised Person (Water)** of the written scheme of the system and the **Authorised Person (Water)** from the Project Team accepting responsibility for the work).

13.2 Record Form **GUHLRC29** shall be used to record the acceptance of ALL work to be conducted and confirmation of ALL work completed on a water system and ALL conditions involving **Duty Holders**, the **Authorised Person (Water)** of the Written Scheme of the systems and the **Authorised Person (Water)** from the Project Team accepting responsibility for the work.

13.3 At the point of hand over **ALL** relevant information written on operating the system, system performance, together with accurate ‘as-fitted’ drawings and design criteria of the domestic hot water systems and cold water services shall be submitted to *NHS Board* (i.e. an appropriate current Written Scheme, accepted in writing by the relevant **Authorised Person [Water]**).

13.4 Full operation of the system and occupancy of the building/property should be progressed as soon after hand over as possible to reduce the potential of *Legionellosis* and other water safety risks and avoid further costs being incurred due to of any further re-disinfection of the water systems.

Appendix C Typical Report Forms

CONTENTS:

This CONTROL OF WATER RECORD FORMS Document is to be read in conjunction with the WRITTEN SCHEME and the GUIDANCE FOR ALTERATIONS TO WATER SYSTEMS documents.

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

TEMPORARY WARD / DEPARTMENT
CLOSURE RECORD FORM (**GUHLRC01**)

Site/Premises		Closure Date	
Ward/Department		Closure Period (typically not exceeding 30 days)	

Equipment and Outlets affected by closure:

Compiled By: …….. Print Name: ……
(signature)

Supervisor: …….. Print Name: ……
(signature)

APPROVAL BY AUTHORISED PERSON (WATER) TO OPERATE ON A TWICE WEEKLY FLUSHING CYCLE BASIS (to run every water outlet for 3 minutes and to flush each toilet):

To operate the water system listed above in accordance with the procedure for short / limited closure.

Approved By: …… Print Name: ……
(signature)

Date: ……..

Remarks:

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

INDEFINITE WARD / DEPARTMENT / SITE
CLOSURE RECORD FORM (**GUHLRC02**)

Site/Premises		Closure Date	
Ward/Department		Closure Period	

Work carried out to disconnect and close down water services:

CLOSURE DECLARATION BY AUTHORISED PERSON (WATER)

Compiled By: …….. Print Name:

……
(signature)
Date: ……..

RE-OCCUPATION OF THE ABOVE AREA Date: ……

Work carried out and details of modifications:

Work Done By: …… Print Name:
……
(signature)

Clean and Disinfect:……..…… Print Name:
……
carried out by (signature)

RE-OCCUPTION DECLARATION APPROVED BY AUTHORISED PERSON (WATER)

Approved By: ……..…… Print Name:
……
(signature) Date: ……

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

6-MONTHLY (Summer/Winter) TEMPERATURE RECORDING & ANNUAL TANK INSPECTION RECORD FORM (GUHLRC03)

Site/Premises		Tank Location	
Date		Tank Reference	

Annual Tank Inspection:

Question	Compliance Yes / No	Comments / Action
Tank Clean – (does tank require draining and chlorinating?)		
Tank Access Locked? (if applicable)		
Adequate Covers?		
Water Regulations Compliant?		
Insect Screens Fitted?		
External Condition?		
Internal Condition?		
Water Level?		
Operation of Ball Valve?		
Cleaning Method Used? (if used)		
Paint/Coating? (if used)		
Bacteriological Results? (if applicable)		

6-Monthly Temperature Readings:

Reading at	Temp °C	Comments / Action
Ambient Outside Air		
Tank Room		
Water within Tank		
Mains Supply Water at inlet to Building/Block		

Work Done By: ……Print Name: ……..

Accepted By (Supervisor): …… Print Name: ……..
(signature)

Date: ……

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

INCIDENT REPORT
RECORD FORM (**GUHLRC04**)

Site/Premises		Date	
Ward/Department		Time	

Nature and details of incident / fault:

Identified By: …….. Print Name:

……
(signature)

Actions taken

Forward to **AUTHORISED PERSON (WATER)**

Work Done By: …… Print Name:
……

Date / Time Completed:
……..……..

Accepted By (Supervisor): …… Print Name:

……..…… (signature)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

WATER TEMPERATURE
RECORD FORM (**GUHLRC05**)

Site/Premises		Date	
System(s)		Time	

Storage Temperatures (°C):

Detail	**Cal/Heat Exchanger No 1 Plant Ref No:**	**Cal/Heat Exchanger No 2 Plant Ref No:**	**Cal/Heat Exchanger No 3 Plant Ref No:**
Storage Temp			
Outflow Temp			
Return Temp			
Cold Feed Temp			

Outlet Temperatures (°C):

Ward / Dept	**Room**	**Temperature**		**Okay Yes / No**	**Comments**
		Hot	**Cold**		

Additional Comments / Actions

Readings Taken By: ……. Print Name

Date / Time Completed: ……

Accepted By (Supervisor): …….. Print Name:

……
(signature)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

DAILY DHW CALORIFIER / WATER TEMPERATURE RECORD FORM
(**GUHLRC05A**) or where a BEMS is not installed or where BEMS is not Operational

Site/Premises		Month/Year	
Block/System		Calorifier No.	

Temperatures:

Day	Temperature (°C)			Comments	Time of Recording	Name & Signature
	Storage	Flow	Return			
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

Additional Comments / Actions

Accepted By (Supervisor): …….. Print Name:

……
(signature)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

DISINFECTED SHOWER HEAD and HOSE REPLACEMENT RECORD FORM (GUHLRC05B)

Site/Premises		Date	
Block/System(s)		Time	

Replacement details:

Ward / Dept	**Room**	**Shower Ref. or Item No.**	**Replaced by:**		**Attach Disinfection ID and LOT Number** (sticker from pack)
			(Print Name**)**	(Signed)	

Additional Comments / Actions

Accepted By (Supervisor): ……..… Print Name: ……
(signature)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

CALORIFIER and STORAGE/BUFFER VESSEL MAINTENANCE RECORD FORM (GUHLRC06)

Site/Premises		System Ref:	
System: (Domestic Hot Water Calorifier(s) and Storage /Buffer Vessel(s) associated with Hot/Cold/Chilled Water Heat Exchanger(s)		Plant Ref No:	

Quarterly Flushing:

Period	Date Undertaken	By (Name)	Signature	Comments
1st Quarter				
2nd Quarter				
3rd Quarter				
4th Quarter				

Annual Plant Cleaning (Plant Ref No as above):

Date and Time Plant taken out of service for Annual Cleaning:
……

Drain and Clean Done By:…… Print Name:
……
(signature)

Drain and Clean Done By:…… Print Name:
……
(signature second man)

Start Up Procedure Done By:…… Print Name:
……
(signature)

Where Domestic Hot Water Calorifier or Storage/Buffer Vessel - held at 60°C for (hours): ……

Plant back in service (date and time): ……..

Accepted By (Supervisor): ……..… Print Name:
……
(signature)

Additional Comments / Actions – forward to **AUTHORISED PERSON (WATER)**

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

AIR HANDLING UNIT DISINFECTION RECORD FORM (GUHLRC07)

PLEASE REFER TO WATER OPERATIONAL PROCEDURE AT ALL TIMES

Site/Premises		Plant Location	
Date		Plant Reference	
Sodium Hypochlorite Solution 5ppm Batch Number & Expiry Date			

NB: Use Sodium Hypochlorite Solution 5ppm within 2 hours of issue.

Safety Checks

Ref	Details	Yes/No	Comments
1	Have you read and understood the data COSHH sheet?		
2	Have you read and understood the risk assessment sheet?		
3	Have you put appropriate signage in place?		
4	Are you wearing the appropriate PPE?		

Pre-Disinfection Checks

Ref	Details	Yes/No	Comments
1	Was there water present in ductwork?		
2	Was drain glass trap clean? (i.e. transparent)		
3	Any sign of biological growth?		
4	Drainage trays clean and corrosive free?		

How long was 5ppm chlorine applied for before being washed off? ……hours.

Completion Checks

Ref	Details	Yes/No	Comments
1	All wetted areas dry?		
2	Was sample taken for analysis?		
3	All panels replaced and plant switched on?		
4	Entry made in local maintenance log?		

Comments:

Signed (Craftsperson) ……Date: ……..……

Accepted By (Supervisor): …….…… Date: ……..

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

BUILDING ENERGY MANAGEMENT SYSTEM
WATER SYSTEM ALARM/FAULT RECORD FORM (**GUHLRC21**)

Site/Premises		Plant Location	
Date / Time		Plant Reference	

Details of alarm condition:
Details of actual fault / alarm:
Action taken:
System back in operation at (date & time):

Signed: Craftsperson ……Date: ……
(reporting)

Signed: Craftsperson ……Date: ……
(who repaired)

Accepted By: **AUTHORISED PERSON (WATER)** ……Date: ……
(responsible)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

MONTHLY CHECKS OF WATER DRAIN TRAPS
ON VENTILATION PLANT FORM (**GUHLRC22**)

a) Visually inspect condition of drain trap assembly.
b) Top up any drain trap that is below minimum level.
c) Remove and clean any dirty glass drain traps.

CHECKED BY: .....……DATE:.....……

Location (Site/Block/ Plant Room)	Drain Ref No	Plant drain trap fitted to (or Plant Ref No)	Water level Y / N	Trap clean / dirty	Remarks

Accepted By: **AUTHORISED PERSON (WATER)**

……..……

Date: ……..…

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

WATER MAINTENANCE FREQUENCIES
RISK BASED ASSESSMENT FORM (GUHLRC23)

Site/Premises		Plant Location	
Date / Time		Plant Reference	
Maintenance Task being Accessed		Existing Frequency	
Brief description for change of maintenance frequency:			

Assessment

Patients/Staff Risk Rating (A) (tick). See Appendix A, Patient Risk Rating - "Guidance for Alterations to Water Systems)	**5 (high)**		**4.5 (med)**		**4 (low)**
Water System Risk Rating (B) (tick). Range 5 (high) – 1 (low)	**1**	**2**	**3**	**4**	**5**
Patients/Staff Risk Rating (A) x Water System Risk rating (B) = (C)	**5 or less**		**5 to 15**		**15 or more**

Check risk register database for all outstanding work required to the system	Database checked Yes / No		Amount of outstanding Items	
Existing paperwork, logs, forms and graphs checked and show consistent level of control against *Legionella* and any other harmful bacteria	Yes / No		Paperwork starting (date)	
Details of changes to frequency of task	Date changed		New frequency	

Comments:

Signed: **AUTHORISED PERSON (WATER)**…… Date:……
(Assessment carried out by)

Signed: **RESPONSIBLE PERSON (WATER)** …… Date: ……..……
(Agreed by Head of Maintenance)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

WATER DISINFECTION
RISK BASED ASSESSMENT FORM **(GUHLRC24)**

Site/ Premises:		Location of Work:	
Date:		Project Ref:	
Person Making Assessment: (Print Name)			
Brief description of work / upgrade:			

Assessment for Disinfection of System after Upgrade Completed
(refer to "Guidance for Alterations to Water Systems" Section 3 and Disinfection Assessment Risk Table on page 10) Circle appropriate level of risk.

A. Patients risk rating (see tables in Appendix A): 5, 4.5 or 4	**4**		**4.5**	**5**	
B. Water system risk rating (see tables in Appendix A):	**1**	**2**	**3**	**4**	**5**
C. Level of work being carried out (delete as required):	**1** Minimal (non intrusive or work at outlet)	**2** Moderate (intrusive work)		**3** Extensive (intrusive work taking more than 7 days)	
Risk Score = **A.** x **B.** x **C.** =					
Disinfection assessment (delete as required):	No action	Immersion or spray of fittings		Full disinfection	
Comments:					

Assessed by: (signed) ..... Date: .....
AUTHORISED PERSON (WATER) (Project/Estates Officer)

Approved by: (signed) ..... Date: .....
DEPUTY RESPONSIBLE PERSON (WATER)
(Head of Projects)

Accepted by: (signed) ..... Date: .....
AUTHORISED PERSON (WATER) (For the Written Scheme to accept the System back in use)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

DESIGN CHECKLIST FOR ALTERATIONS TO OR NEW WORK TO WATER SYSTEMS (GUHLRC25)

Site/ Premises		Location of Work	
Date		Project Ref	
Person Making Assessment (print name) as 'Designer' *in compliance with the Construction (Design and Management) Regulations: 2007.*			
Brief description of alteration/upgrade/project:			

Design Checklist:

Ref	Design, Planning and Construction	Yes	No
	General		
1	If you are altering an existing system, are all outstanding and retrospective issues in the *Legionella* Risk Assessment or Written Scheme accounted for in the project work to ensure the Temperature Regime works?		
2	If you are fitting a new system or new components to any existing system, do any of the materials or fittings to be used support the growth of micro-organisms?		
3	Are low corrosion materials used?		
4	Have arrangements been made to follow the requirements of SHTM 04-01 Part E (materials and filtration) and include the leachate flushing and disinfection regime?		
5	If fitted, are thermostatic mixing valves (TMVs) sited as close as possible to the point of use?		
6	Has the inclusion of flexible hoses been avoided (and any existing removed) in the project?		
7	Are all showers fitted with fixed heads to prevent backflow?		
8	Are all dead-legs and blind stub-ends/plugged-tees been removed from the system?		
9	At hand wash stations – has an assessment been made to ensure that the tap outlet is appropriate and suits the basin? i.e. is without requiring water straighteners to avoid splashing? – and water from the tap outlet does not flow directly into basin drain hole, whilst avoiding splashing?		
10	At hand wash stations, are soap dispensers/ alcohol hand rubs placed to avoid drips on taps or into the basin?		
11	Has the Written Scheme for the water system been *Legionella* risk assessed?		

12	Have arrangements for updating the Written Scheme for the water system been planned to take account of this project, including written operating instructions, accurate schematic and detailed as fitted drawings at handover?		
13	Is the water system connected to BEMS with the required performance parameters?		
14	Have arrangements been made prior to work commencing for water sampling and testing to follow the requirements of SHTM 04-01 Part C?		
15	Have arrangements been made for Palintest Chlorometer readings of the water system(s) prior to the project? **(GUHLR27)**		
16	Have arrangements been made for Palintest Chlorometer readings of the water system(s) to be included in the commissioning details for the project on completion? **(GUHLR27)**		
	Cold Water Systems		
17	Whether a BEMS is fitted or not – is a visible and accessible manual means of monitoring cold water system supply (at building block inlet or meter point), tank storage, flow (and return where appropriate) temperatures available?		
18	Is cold water stored and distributed to outlets at below 20^0C?		
19	Is the cold water circulated?		
20	If cold water is circulated will it require to be chilled to ensure distribution below 20^0C?		
21	Are low use outlets installed upstream of higher use outlets?		
22	Has cold water storage been assessed and minimised, i.e. holds enough for one days use?		
23	Is supply and distribution piping insulated and kept away from all heat sources?		
24	Is the cold water tank:		
a)	Fitted with a cover and insect screen(s) on any pipework open to the atmosphere?		
b)	Located in a cool place and protected from external temperature?		
c)	Accessible?		
	Domestic Hot Water Systems		
25	Whether a BEMS is fitted or not – is a visible and accessible manual means of monitoring domestic hot water system storage, flow and return temperatures available?		
26	Is domestic hot water stored and distributed above 60^0C as it enters the supply system and circulated at no less than 50^0C at the return into the calorifier?		
27	Does the calorifier storage capacity meet normal daily fluctuations in hot water use while maintaining a supply temperature of at least 55^0C to the furthermost draw-off (sentinel) point in the circulating system?		
28	Are the hot water distribution pipes insulated?		
29	If more than one calorifier is used, are they connected in parallel?		

30	Does the calorifier have the following fitted:		
a)	A drain valve?		
b)	A temperature gauge on the calorifier and on inlet and outlet pipework?		
c)	An accessible access panel?		
Assessment and any Comments *(to clarify assumptions, eliminate hazards and risks and provide information about any remaining risks)*:			

Assessed by: (signed)…… Date:
(print name)
(Designer)……

Co-ordinated by: (signed)…… Date:

(print name) ……

AUTHORISED PERSON (WATER) (Project / Estates Officer)

Approved by: (signed)…… Date:

(print name) ……

DEPUTY RESPONSIBLE PERSON (WATER) (Head of Projects)

Accepted by: (signed)…… Date:

(print name)……

AUTHORISED PERSON (WATER) (For the Written Scheme holder accepting PRE-START)

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

NHS BOARD

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

FLUSHING WATER OUTLETS
RECORD FORM (**GUHLRC26**)

Site / Premises :		**Ward / Dept :**	

Outlet being flushed	**Date flushed**	Initials

NB: This record to be retained for 5 years, to comply with regulations.

Accepted By (Supervisor): …… Print Name: ……
(signature)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

ESTATES CHLORAMINE RECORD FORM (GUHLRC27)

Site/Premises		Thermometer and Calibration No's.	
System(s)		Chlorometer No.	

Instructions for Palintest DPD Test Chlorometer PTH 045D:

1. Select an appropriate hot OR cold water outlet, representative of secondary distribution pipework system. Run hot water for 1 minute and cold water for 2 minutes before commencing sampling in Test A.
2. Test A Free Chlorine – rinse test tube with sample leaving 2 or 3 drops in the tube. Add one DPD No 1 Tablet, crush tablet, then fill to the 10ml mark. Mix dissolved tablet and ensure particles have settled. Take reading immediately and record.
3. Test B Total Chlorine - Using solution from Test A - Add one DPD No 3 Tablet, crush and mix to dissolve. Stand for 2 minutes. Take reading immediately thereafter and record.
4. Calculate Combined Chlorine – Subtract A from B and record. Readings should normally be just less than 1.0 mg/litre down to 0.4 mg/litre. If the reading is less than 0.4 mg/litre – inform the Authorised Person, who will investigate.

Data Recorded:

Ward / Dept	Room No.	Date and Time	Outlet Details				Palintest Readings			Comments Okay - Yes / No (tick / cross)
			WHB/ SINK/ BATH/ SHWR	HOT (tick)	COLD (tick)	Temp (°C)	Free Chlorine (Tablet No 1) (A) (mg/litre)	Total Chlorine (Tablet No 3) (B) (mg/litre)	Combined Chlorine (B – A) (mg/litre)	

Additional Comments / Actions

Readings Taken By: ……Print Name: ……..……

Accepted By (Supervisor): …… Print Name: ……
(signature)

AUTHORISED PERSON (WATER) Assessor (signature) and date	
RESPONSIBLE PERSON (WATER) Manager (signature) and date	

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

SAFETY CONTROL LOG
(including plant and maintenance) RECORD FORM (**GUHLRC28**)

Site/Premises			
Block/System		Plant Room	

Date (day/month/ year)	**Description / Comments**	**Actions To**	**Time of Record**	**Name & Signature**

Accepted By (Supervisor): ……Print Name: ……

(signature)

NHS BOARD
ESTATES DEPARTMENT

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

RECORD FORM FOR ACCEPTANCE OF WORK TO BE CONDUCTED AND CONFIRMATION OF WORK COMPLETED ON A WATER SYSTEM (GUHLRC29)

PRE-START:

Project Number:		Project Manager:	
Site / Block / Premises:		Location of Work (Ward/Department):	
Written Scheme Ref. No.:		**AUTHORISED PERSON (WATER)** The holder of the Written Scheme:	
Expected Start Date:		Project Designer:	
Anticipated Duration:		Project Contractor:	
Expected Completion Date:		Contractor(s) Working on the Water System:	
Reference Specification No.:		Reference Drawing No(s):	
Form **GUHLRC 24** Completed and attached:		Form **GUHLRC 25** Completed and attached:	
Water Quality Sampling Certificate and Palintest Results completed and attached:		Where required are - Leachate / Disinfection Test Results completed and attached:	
Confirmation that those working on the water system are Approved Plumbers (PILS):			
The Water System remains operational in **PART?** or **WHOLE?** or **NOT OPERATIONAL?**			
Date Form Compiled:		Water Quality acceptable prior to work commencing:	
AUTHORISED PERSON (WATER) From the Project Team compiling this Form and taking responsibility for the work:			
Summary Description of the Work / Project and the Area / Rooms affected:			

DUTY HOLDER(S) or their devolved Local Manager(s) informed and affected by the work / project are:

APPROVAL AND ACCEPTANCE OF WORK AND CONDITIONS:

Accepted by **DUTY HOLDER(S)** or their devolved Local Manager(s): (signed)…….. Date:

(print name)…….

(for those affected by the work / project)

Approved by: (signed)…….. Date:

(print name)…….

AUTHORISED PERSON (WATER) (Holder of the Written Scheme)

Accepted by: (signed)…….. Date:

(print name)…….

AUTHORISED PERSON (WATER) (From the Project Team accepting responsibility for the work, working with the holder of the Written Scheme – who remains responsible for the water system)

POST COMPLETION - CONFIRMATION OF WORK COMPLETED AND ACCEPTANCE:

Post Completion Checklist:

Ref	Design, Planning and Construction	Yes	No
	General		
1	Has **ALL** the work as described in the PRE-START Section been completed?		
2	Comments:	-	-
3	Where an existing system has been altered, are all outstanding and retrospective issues in the *Legionella* Risk Assessment or Written Scheme accounted for in the completed work to ensure the Temperature Regime works?		
4	Where a new system or where new components have been fitted to an existing system, do any of the materials or fittings to be used support the growth of micro-organisms?		
5	Have low corrosion materials been used?		
6	Have arrangements followed the requirements of SHTM 04-01 Part E (materials and filtration) and include the leachate flushing and disinfection regime?		
7	Where fitted, are thermostatic mixing valves (TMVs) sited as close as possible to the point of use?		
8	Has the inclusion of flexible hoses been avoided (and any existing removed) in the project?		
9	Have all showers been fitted with fixed heads to prevent backflow?		
10	Have all dead-legs and blind stub-ends/plugged-tees been removed from the system?		
11	At hand wash stations – has an assessment been completed to ensure that the tap outlet is appropriate and suits the basin? i.e. is without requiring water straighteners to avoid splashing? – and water from the tap outlet does not flow directly into basin drain hole, whilst avoiding splashing?		
12	At hand wash stations, have soap dispensers/ alcohol hand rubs been placed to avoid drips on taps or into the basin?		
13	Has the Written Scheme for the water system been updated to take account of this project, with written operating instructions, accurate schematic and detailed as fitted drawings provided at handover?		
14	Has the updated Written Scheme for the water system been *Legionella* risk assessed?		
15	Has the water system been connected to BEMS with the required performance parameters?		
16	Have arrangements been made after the work has been completed for water quality sampling and testing to follow the requirements of SHTM 04-01 Part C?		
17	Have arrangements been made for Palintest Chlorometer readings of the water system(s) after completion of the project? **(GUHLR27)**		

18	Have the Palintest Chlorometer readings of the water system(s) been included in the commissioning details for the project at completion? **(GUHLR27)**		
19	Has a certificate of disinfection to BS6700 (or BS EN 806) been provided?		
20	Whether a BEMS has been fitted or not – is a visible and accessible manual means of monitoring cold water system supply (at building block inlet or meter point), tank storage, flow (and return where appropriate) temperatures available?		
21	Is cold water stored and distributed to outlets at below 20^0C?		
22	Is the cold water circulated?		
23	If cold water is circulated – is it (or require to be) chilled to ensure distribution below 20^0C?		
24	Are low use outlets installed upstream of higher use outlets?		
25	Has cold water storage been assessed and minimised, i.e. holds enough for one days use?		
26	Has all supply and distribution piping been insulated and kept away from all heat sources?		
27	Is the cold water tank:		
a)	Fitted with a cover and insect screen(s) on any pipework open to the atmosphere?		
b)	Located in a cool place and protected from external temperature?		
c)	Accessible?		
	Domestic Hot Water Systems		
28	Whether a BEMS has been fitted or not – is a visible and accessible manual means of monitoring domestic hot water system storage, flow and return temperatures available?		
29	Is domestic hot water stored and distributed above 60^0C as it enters the supply system and circulated at no less than 50^0C at the return into the calorifier?		
30	Does the calorifier storage capacity meet normal daily fluctuations in hot water use while maintaining a supply temperature of at least 55^0C to the furthermost draw-off (sentinel) point in the circulating system?		
31	Have the hot water distribution pipes been insulated?		
32	If more than one calorifier is used, have they been connected in parallel?		
33	Does the calorifier have the following fitted:		
a)	A drain valve?		
b)	A temperature gauge on the calorifier and on inlet and outlet pipework?		
c)	An accessible access panel?		
34	Leachate / Disinfection Test Results completed and attached:		
35	Water Quality Sampling Certificate and Palintest Resulted completed and attached:		
36	Water Quality acceptable prior to returning the water system into use?		
Any other comments:			

CONFIRMATION OF WORK COMPLETED AND ACCEPTANCE:

This confirms compliance of all work described above, in accordance with the NHS Board - Management and Control of Water Safety Policy and associated Procedures. No other work has been carried out under this notification other than that described above.

Confirmed **ALL** Work Completed by: (signed) ..... Date: .....
(print name)
(Designer)

AND: (signed) ..... Date: .....
(print name)

AUTHORISED PERSON (WATER) (From the Project Team accepting responsibility for the work, completing work with an updated Written Scheme)

Approved and Accepted by: (signed) ..... Date: .....
(print name)

AUTHORISED PERSON (WATER) (Holder of the updated Written Scheme)

Accepted by **DUTY HOLDER(S)** or their devolved Local Manager(s) (signed) ..... Date: .....
(print name)

(for those that were affected by the work / project)

COMPLETED RECORD FORMS TO BE HELD IN WATER SAFETY LOG

Risk Assessment Form

Use this form for any detailed risk assessment unless a specific form is provided. Refer to your Summary of Hazards/Risks and complete forms as required, including those that are adequately controlled but could be serious in the absence of active management. The Action Plan and reply section is to help you pursue those requiring action.

Name of Assessor:	GGC	**Post Held:**	
Departments:	W & C Directorate Team Haematology/Oncology Clinical Team EFM Team/Capital Planning Infection Prevention and Control Team Microbiology Acute Division Senior Managers Authorising Engineer (AE Water) Authorising Person (AP Water)	**Date:**	**23 February 2022**

Subject of Assessment: E.g.: hazard, task, equipment, location, people

Ward 2A/2B provides the safest and most suitable environment in which to locate paediatric and young adult haematology oncology patients.

Hazards (Describe the harmful agent(s) and the adverse consequences they could cause)

Environmental micro-organisms

Detail is available in the embedded SBAR below:

2A SBAR_complete - numbered - Final dr

Description of Risk
Describe the work that causes exposure to the hazard, and the relevant circumstances. Who is at risk? Highlight significant factors: what makes the risk more or less serious – e.g.: the time taken, how often the work is done, who does it, the work environment, anything else relevant.

RISK; Exposure of neutropenic/ Immunocompromised patients to environmental micro-organisms that lead to infection.

Gram negative organisms from any source pose significant risk to patients who are profoundly immunocompromised. Providing the safest possible environment for these patients is critical to support patient safety and wellbeing. In 2018 issues with the quality of water were highlighted. As a consequence Wards 2A/B at the Royal Hospital for Children have been extensively refurbished. This project has been ongoing since June 2019. Due to environmental organisms there will always be a risk of infection in this patient population as this is a recognised risk for any patient undergoing this type of treatment.

There are a number of reasons why paediatric haematology oncology services in NHS GGC are better located in Ward 2a/2b than in the current arrangements of Ward 6A. These include

- Improved bed model and greater flexibility in use of beds –This reduces need to board out with specialty and delays to treatment
- Avoidance of diseconomies of scale in use of specialist medical, nursing and support services
- Closer adjacency and shorter response / journey times between Ward and specialist paediatric intensive care, 2222 response team, theatres, radiology, hospital at night, and specialist medical / surgical on call teams
- Use of specialist age appropriate facilities such as Teenage Cancer, 8-12 year old specialist play and family space providing a person-centred approach to care delivery and support
- Use of better office and touch down space for clinical staff. This is extremely important during period of COVID-19 restriction such as social distancing
- Aforementioned access to specialist facilities required for national commissioned services – stem cell, MIBG

Due to the complexity of this patient group, there is a lack of any benchmarking data in terms of background incidence of infection in this group of patients but also a lack of national guidance with regards to water standards to be achieved in this type of area. To date there is limited international guidance available to inform the building of a Bone Marrow Transplant Unit.

This lack of benchmarking information has resulted in a zero tolerance default position nationally which is unachievable both clinically and from an engineering perspective.

Existing Precautions

Summarise current controls In place	Describe how they might fail to prevent adverse outcomes.
W & C Directorate Team • Bed capacity • MIBG service • Transplant service • Patient journey	Ward 6A provides 26 beds for combined inpatient (16) and Daycare (10) provision. Ward 2A offers 26 inpatient beds and 10 Daycare beds. *Ward 4B under current configuration offers 4 specialist paediatric stem cell transplant beds. Gross impact on moving back to Ward 2A2B +6 beds. Ward 2A2B offers greater flexibility in the use of gross bed model for general paediatric haematology oncology but also specialist services like MIBG and Stem Cell transplant. MIBG is a recently commissioned national service provided by RHC. There is no other facility in Scotland that offers this treatment to children and young people. The service can only be provided from Ward 2A because of the specialist lead lined cubicle installed in the ward. Alternatives while service not operational are a sub-optimal treatment against protocol or referral to an English or European service. Due to COVID-19 and also changes to referral protocol services, NHS England are under significant pressure and cannot meet Scottish referrals timeously. Alternative treatment or referral to European centre as noted. Parents and families having to move to other areas in Britain or Europe would have a significant impact on families and their lives. HSCT – Transplantation has continued on ward 4B in co-location with the adult service. However this has been far from ideal .The impact of children being treated on an adult transplant ward during COVID-19 has been challenging for families. A national decision was taken during the worst of COVID pandemic only to transplant patients with life threatening disease or organ dysfunction if delayed. This has led to a heavy work plan scheduled for return to Ward 2A. The clinical Team are concerned about the safety of transplanting infants under 2 years of age on Ward 4B because of medical cover arrangements on a split ward configuration and a long way from PICU. The sustainability of the transplant service in Scotland is at risk if there are further delays in relocating to Ward 2A with patients having to be referred to England / Europe. Parents and families having to move to other areas in Britain or Europe would have a significant impact on families and their lives. There is a negative deficit in the number of beds available in Ward 4B compared to Ward 2A for treatment / follow up care. Also, current arrangements have children and young people being treated in an adult environment (SOP in place for child protection) which is not ideal. Ward4B/6A are a significant distance from PICU and other paediatric medical specialities. To continue the service must obtain JACIE accreditation. An application for renewed accreditation was recently submitted on the basis that the service would be returning to Ward 2A imminently. While the SOPs in place to manage current patient journey have been effective , the adjacency of wards in the RHC significantly reduce the risk of adverse event in patient going to and from theatres from inpatient bed

EFM Team/Capital Planning	
Ventilation The ward refurbishment involved the full replacement of the ventilation systems serving ward 2A to provide a fit for purpose environment for this patient group. Ward 2B was also subject to ventilation upgrades. The ventilation system minimises the ingress of particulates and micro-organisms within the air environment by virtue of filtration levels, pressure cascade and air change rates. The project introduced a pressure cascade system into Ward 2A (the inpatients ward), with all bedrooms individually balanced to ensure there is appropriate pressure differential to protect the patient within. All bedrooms are fitted with local alarms that sound if a door is left open or the differential threshold falls out with parameters. Double lock entrance doors are also fitted to both entrances of the ward to maintain the pressure cascade. Ward 2B is a day care ward and is not subject to the same requirements for a pressure cascade. Air changes within Ward 2A bedrooms and ensuites are all at a minimum of 10a/c per hour. All areas within both Wards 2A and 2B are now fed by HEPA filtered air and served by duty/standby Air Handling Units to ensure continuous ventilation can be provided whilst allowing for ongoing maintenance. Ward 2A comprises of 15 Haemato-Oncology/Teenage Cancer Trust bedrooms, 4 Positive Pressure Isolation Rooms (all with lobbies) and 3 Positive Pressure Ventilated Lobby (PPVL) rooms. The project has also introduced one Negative Pressure Ventilated Lobby (NPVL) room and upgraded the MIBG suite to isolation room standard which will allow this national service to be launched. Following commissioning, the ventilation system underwent a full independent validation exercise by an independently appointed validation engineers.	Ventilation A plant failure or performance degradation over time may compromise this provision. Additionally direct introduction of particulate and micro-organisms into the patient spaces via staff, visitors, material and the patients themselves may undermine the effects of the ventilation.
Drainage All ensuite wet rooms have been subject to a full refurbishment which has created adequate falls to drain which prevent any water from pooling on the floor or into the bedrooms when the shower is in use. The shower drain covers have been replaced with the flat cap type rather than the grille to reduce the risk of any splash back. Wash Hand Basins (WHB) throughout were changed to the fin type to further reduce splashing.	Drainage Drain blockages due to inappropriate disposal of material may lead to standing water within the WHBs and shower trays.
Water Section 18 of Part A Scottish Health Technical Memorandum SHTM04-01 details:- 18.5 As a minimum, for new installations or major refurbishment, the contractor should require the following documents and drawings to be supplied: • full manufacturing details, including batch numbers of all pipes and fittings • full records and certificates of pressure tests for all sections of pipework • settings of all balancing valves, with readings of flow rates where applicable • full details of each item of plant, including arrangement drawings and appropriate test certificates • as-fitted drawings showing clearly the location of balancing valves, flows and settings, isolation valves, drain valves Project Team complied with:-	Water The required documentation provides reassurance that the installation and testing has been completed according to the requisite standards. A Chlorine Dioxide plant failure or performance degradation over time may compromise this provision. Some bacteria are less easily killed by ClO_2

Part A SHTM04-01 details all of the activities which are required for major installations or major refurbishments. The installer will provide :- • schematic drawings for installation in plantrooms showing all valves and items of plant • full details of water treatment parameters and operating modes and settings • full details of maintenance requirements • detailed confirmation of disinfection procedures to BS EN 806-1-5: 2000-2012 and BS 8558: 2015, and results of post-disinfection microbiological analysis; • full records confirming that all materials and fittings hold WRAS or equivalent accreditation. After disinfection, microbiological tests for bacteria colony counts at 37°C and coliform bacteria, including Escherichia coli, should be carried out under the supervision of the infection prevention control team to establish that the work has been satisfactorily completed. Water samples were taken from selected areas within the distribution system. The routine sampling undertaken on this site far exceeds extant guidelines checking for Potable, Legionella, Pseudomonas, Gram Negative Bacilli (GMB), Yeasts and Moulds. Chlorine dioxide dosing is now well established throughout the hospital and secondary booster units will service Wards 2A and 2B to allow a higher degree of control of the dosing levels to these specific areas and allow a secondary back up in the event of main dosing system failure. DWS were commissioned in line with SHTMs and have been subject to further disinfection and extensive enhanced sampling thereafter. Brand new point of use filter will be fitted to all taps just prior to ward occupation and new shower heads and hoses will also be installed.	
IPCT Team • ARHAI methodology used to review rates of environmental and enteric gram negative organisms. • Clinical review done for each case identified. • IMT process in place to review and assess any potential incidents that occur. Process aligns to Chapter 3 of the NIPCM. • IMT process oversight by ARHAI. • Clinical review undertaken for every gram negative bacteraemia that occurs in this cohort of patients. • Output from the clinical reviews are considered by the W & C Case Note Review Group. • Monthly Hand Hygiene audits. • Six monthly SICPs audits. • Monthly clinical supervision assessments. • Alert organism surveillance is ongoing, aligned to Appendix 13 of the NIPCM. Incidents managed as per NHSGGC Incident Management Plan [redacted]	• Patients may present at other hospitals, but all positive samples taken in RHC will be referred to IPCT for review. • Not all clinical reviews identify a source so there may not be any shared learning or indeed a reason for an episode of sepsis. • Surveillance methodology although as current as any available within the UK may not pick up an incident over a prolonged period of time. • Hand hygiene, clinical supervision and SICPs audits are a snapshot in time and are not continuous.
Microbiology <u>Water testing</u> All of RHC has had intensive water sampling in place since 2018 and Ward 2A/2B has undergone intensive water sampling and microbiological testing since the end of refurbishment works in September 2021. Current testing regime includes samples from across the ward, collected four days per week,	<u>Water testing</u> Despite the extensive and frequent water sampling regime, the possibility remains that microorganisms that are present only transiently and/or are constrained to a specific outlet would not be detected.

with control samples taken from the floors below and above to differentiate between microbes present across the hospital water system and any that might be enriched in 2A/2B. Weekly testing of 2A/2B water with appropriate control samples from other floors is set to continue indefinitely.

Testing is carried out by the GG&C Environmental Laboratory, which is UKAS-accredited to ISO/IEC 17025:2017 for analysis of potable, endoscopy and renal waters, and air samples. Target microorganisms covered by this accreditation include Legionella species, coliforms and Escherichia coli, Pseudomonas species, atypical mycobacteria, as well as yeasts and moulds. Gram negative investigations are not specifically covered by the current UKAS accreditation but most of the methods involved are covered by other accredited protocols.
Water samples are subjected to the following microbiological tests: standard potable water tests (TVCs at 22°C and 37°C, coliforms, E.coli), Pseudomonas, fungi/yeasts/moulds (total counts at 22 and 30Centigrade), and gram negative bacteria (GNBs) including Cupriavidus, as well as periodic testing for atypical mycobacteria and Legionella. Microorganisms that grow on any of these tests are routinely identified to genus/species level.

This testing regime exceeds the guidance in SHTM 04-01 (Water safety) and the interim guidance in the National Infection Control Manual (NIPCM) (Prevention and management of healthcare water-associated infection incidents/outbreaks: https://www.nipcm.hps.scot.nhs.uk/media/1680/2019-08-water-incidents-info-sheet-v1.pdf) , in frequency of testing and in the breadth and specificity of the tests. However, this guidance is for healthcare settings in general, not specifically for areas with severely immunocompromised patients, for which there are no guidance documents or benchmarks for comparison.

2022-02-18_RHC_2A
_water_testing_resu

Furthermore, the logistics of sampling water in an occupied ward, for numerous types of microbiological tests, precludes taking pre-flush samples routinely, so very localised contamination of outlets, normally identified by comparing pre- and post-flush samples, could be missed, though this is mitigated by the use of POU filters.

Data analysis

There is a well-established process for dealing with out-of-spec results across the QEUH campus, detailed in WQS-017 Water Management Procedure, and this applies to samples from Ward 2A/2B, where the more stringent high-risk thresholds are applied.

In addition, since the end of refurbishment works in September 2021, a semi-automated data analysis workflow has been written that incorporates all new testing results as soon as they are available, providing ongoing, up-to-date spatial and temporal analysis of the water in Ward 2A/2B, including relevant factors such as the outlet type, water temperature and chlorine dioxide concentration. The workflow includes data visualisation, as well as statistical modelling, to allow rapid assessment of trends and look for early warning signs of developing problems. Results are shared at regular Water Technical Group meetings and with IPCT colleagues.

Whole genome sequencing (WGS) of isolates

All bacterial isolates obtained from water samples in Ward 2A/2B are preserved and stored indefinitely, and this practice is set to continue. Whole genome sequencing (WGS) of example isolates of the more common species detected in water samples across QEUH, including in Ward 2A/2B, is underway (*Cupriavidus pauculus* and *Sphingomonas paucimobilis*).

In the event of a clinical infection suspected to have come from an environmental source, WGS of the clinical isolate and of any relevant stored environmental isolates will be used to look for evidence of an epidemiological link.

Data analysis

Trend analysis in Ward 2A/2B and the floors below/above has shown that water testing results exhibit some day-to-day variability. In isolation, results from any one day are difficult to interpret, and several sampling days are required to ascertain system performance. This property of the data means there is a lag between first seeing some anomalous results and being confident that those results are indeed outside the normal variability. The smaller the change (e.g. slow colonisation of a specific area by a microorganism), the longer it will take to detect it, and some subtle changes might be below our limit of detection. However, significant changes in microbial activity would result in out-of-spec results, which automatically trigger remedial action.

Whole genome sequencing (WGS) of isolates

Species of environmental microorganisms, including those present in water systems, are not homogeneous, but rather consist of mixed populations with high genomic diversity and numerous sub-species or sub-types. Because of this diversity, which can continue to shift over time, a clear link between a clinical case and an environmental isolate might not be detected even if the clinical case is indeed from an environmental source.

Facilities • Hysan cleaning of sinks every week • Daily checks for leaking from POU filter to sink • SOP for dealing with Water Damage - https://www.nhsggc.org.uk/media/267103/sop-water-damage-v1-amended-may-20.pdf	
Estates <u>Ventilation</u> Maintenance and verification in accordance with SHTM 03-01. Ward telemetry would alert to any failure with ventilation. <u>Water</u> Ongoing sampling which exceeds extant guidelines on a monthly basis. - Potable, Pseudomonas, GNB and Atypical Mycobacterial Species (AMS) on ¼ of samples each month (rotating) Water Temperature & CLO2 level. Plant is also fitted monitoring alarms. POU filters will be fitted to taps and showers to achieve 0.2microns. These are changed every 62 days. Shower heads and hoses are changed every 62 days. This is more rigorous than that recommended within the L8 ACOP guidance. Compliance with L8 satisfies the requirements of the COSHH Regulations. All water systems within NHS GG&C are subject to a water risk assessment process which complies with the requirements COSHH Regulations, L8, HSG274 and SHTM 04-01. Service Provider checks connections to filter/tap as part of filter swap out and sampling. Markwik taps have been replaced as they were showing signs of dechroming on some of the internal surfaces. These taps will now be checked regularly to assess the internally chromed elements on an ongoing basis. Due to the spouts on the taps being removable it is important that Clinical staff regularly review that they have not been moved and reset if required. This message will be communicated to the clinical team regularly by EFM. Some of the artificial rubber type compounds present in the system are resulting in a staining on the surface of the sinks. This is currently under investigation but the mitigation is the placement of the POU filters which will prevent the escape of any material from the system. Despite the presence of this material, there is no indication from the laboratory that there is any impact on the microbiological growth in the water systems. Thermostatic Mixing Tap (TMT) maintenance schedule in place. ClO_2 maintenance programme. Other maintenance requirements as recommended by SHTM 04-01. NHSGGC Water Safety Policy http://www.staffnet.ggc.scot.nhs.uk/Acute/Facilities/Estates/Documents/GGC%20Water%20Systems%20Safety%20Policy%20January%202020%20Master%20(2)%20(2)%20r1.pdf	. <u>Water</u> A plant failure or performance degradation over time may compromise CWS and HWS provision. However management in accordance with SHTM 04-01 including Planned Preventative Maintenance (PPM) will minimise this eventuality. Failure to replace POU filter as per the agreed schedule may lead to a loss of filter integrity. POU filters can be sent for integrity testing. Failure to comply with schedule due to denial of access to clinical areas. Failure to comply with schedule due to denial of access to clinical areas. Taps will encourage biofilm production as they dechrome.

Level of Risk - Is the control of this risk adequate?

Give more than one risk level if the assessment covers a range of circumstances. You can use the 'matrix' to show how 'likelihood' and 'consequences' combine to give a conclusion. Also, be critical of existing measures: if you can think how they might fail, or how they could be improved, these are indications of a red or orange risk.

Risk Matrix

Likelihood	**Impact/Consequences**				
	Negligible	**Minor**	**Moderate**	**Major**	**Extreme**
Almost Certain	Medium	High	High	V High	V High
Likely	Medium	Medium	High	High	V High
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Low	Medium	**Medium**

Very High High **Medium** Low

Current risk level

Given the current precautions, and how effective and reliable they are, what is the current level of risk? **Green** is the target – you have thought it through critically and you have no serious worries. Devise ways of making the risk green wherever you can. **Yellow** is acceptable but with some reservations. You can achieve these levels by reducing the inherent risk and or by effective and reliable precautions.
High (Orange) or Very High (Red) risks are unacceptable and must be acted on: use the Action Plan section to summarise and communicate the problems and actions required.

Action Plan (if risk level is **High (Orange) or Very High (Red)**

Use this part of the form for risks that require action. Use it to communicate, with your Line Manager or Risk Coordinator or others if required. If using a copy of this form to notify others, they should reply on the form and return to you. Check that you do receive replies.

Describe the measures required to make the work safe. Include hardware – engineering controls, and procedures. Say what you intend to change. If proposed actions are out with your remit, identify them on the plan below but do not say who or by when; leave this to the manager with the authority to decide this and allocate the resources required.

Proposed actions to control the problem List the actions required. If action by others is required, you must send them a copy	**By Whom**	**Start date**	**Action due date**
Ongoing testing of the water outlets in 2A\2B	EFM/DME	In place and onging	Ongoing
Ongoing surveillance and clinical review with oversight at W & C Clinical Case Note Review Meeting.	PCT/W&C Directorate	In place and onging	Ongoing
Scheduled verification of ventilation or in response to any issues raised.	EFM	2023	2023
ClO_2 maintenance programme. *And all other items above which have been put in place but will be ongoing controls.*	EFM	In place and onging	Ongoing

Action by Others Required - Complete as appropriate: (please tick or enter YES, name and date where appropriate)

Report up management chain for action	YES – Director EFM & Executive Lead IPC, Director W & C
Report to Estates for action	In progress
Contact advisers/specialists	Authorising Engineer/DME
Alert your staff to problem, new working practice, interim solutions, etc	Not required.

Reply

If you receive this form as a manager from someone in your department, you must decide how the risk is to be managed. Update the action plan and reply with a copy to others who need to know. If appropriate, you should note additions to the Directorate / Service Risk Register.

If you receive this as an adviser or other specialist, reply to the sender and investigate further as required.

Assessed by / Job Title:	***Date:***	***Review Date:***
Ms Kirsty Strannigan, Head of Health & Safety Mr David Mains, Deputy Health and Safety Manager Ms S Devine, Acting Infection Control Manager Ms P Joannidis, Acting Associate Nurse Director IPC Ms D Chaput, Healthcare Scientist Diagnostics Prof A Leonard, Chief of Medicine Diagnostics Prof A Wallace, Executive Lead IPC Dr L Bagrade, Lead Infection Control Doctor Mr T Steel, Director of Facilities and Estates. Mr M Riddell, Assistant Director, Operational Estates Mr K Clarkson, Estates Manager and AP (Water) Mr D Kelly, Authorising Engineer (Water) Mr E Smith, Assistant Head of Estates (South) Ms K Correia, CSM, Women & Children Dr D Murphy, Consultant Oncologist Prof B Gibson, Consultant Haematologist Mr J Redfern, Director Women & Children Dr S Davidson, Deputy Medical Director Ms A O'Neil, Acting Director of Nursing Mr G Cox, Assistant Director Estates and Capital Ms J Rodgers, Deputy Nurse Director, Corporate & Community	23 February 2022	23 February 2023

QEUH Campus Water Systems

WRITTEN SCHEME

Controlling the risks of exposure to Legionella and other harmful bacteria in Water Systems

2021 Rev C

Reviewed by: E. Smith (RP)
K. Clarkson (DRP)
M. MacMillan (Lead AP)
A. Gallacher (Head of Compliance)
P. Urquhart (Compliance Manager)

An electronic copy of this document is held on the QEUH Shared Drive at folder path:
S:\SCART Compliance\22 Water\Water Written Schemes\

Table of Contents

1.0 GENERAL OVERVIEW

Note 1: No work will be carried out on the water system without the knowledge and written consent of the Authorised Person (Water).

Note 2: This Written Scheme document is to be read in conjunction with the Operational Procedures for the Written Schemes document and should also be read in conjunction with the Control of Water Records document. For any alterations to the Water System this Written Scheme Document is to be read in conjunction with the Guidance for alterations to water systems document.

1.1 Introduction

This document contains six sections which have been derived from the Risk Assessment to aid the design, installation, maintenance and operational mode of all domestic and process water systems within the premises with respect to the likelihood of the proliferation of waterborne micro-organisms. The assessment also considered the risk of infection presented to building users and the general populous at large, and derived a series of risk ratings and appropriate Remedial Actions and Control Measures, which should be implemented to minimise the presented risks. This Risk Assessment was carried out in a manner consistent with the requirements of *BS8580:2010 Water Quality – Risk Assessments for Legionella Control – Code of Practice*, and is reviewed whenever system alterations or operational considerations may effect a change in the risk.

Section 1 contains an Executive Summary of the recommended control measures and corrective actions together with an overview of the QUEH Site layout and accommodation.

Section 2 contains a record of the logbook inspection, details on the location of records, defects, non-compliance issues, correspondence and archived information.

Section 3 provides information on the management structure associated with the control scheme for the water system and clear definitions of responsibilities held by those named, details of training undertaken and a summary of the designated tasks as detailed in section 4.

This section also provides information on the details of the risk assessment values associated with representative outlets, systems and plant items undertaken since 2013. A generic risk assessment for any positive legionella test results within designated Low Risk locations and a description of the installed plant and equipment with associated schematic layout plans for each of the installed water systems within the site is also contained within this section.

Section 4 of the document details the safe operation of the system and all appropriate Maintenance Procedures (Control Measures) which were derived from the Risk Assessment and recommendations within NHS Greater Glasgow and Clyde Water Systems Safety Policy.

This section of the document contains a task description with associated record (Log) sheet relating to these activities. It should be noted however, that in certain circumstances, specialist contractors are required to implement some Control Measures, and records pertaining to these activities may be held under separate cover. Such activities would typically include those associated with chemical water treatment regimes and drinks vending machines sanitising maintenance.

Refer to Section 2 for the location of records and archived information associated with the maintenance procedures and other control measures.

Section 5 contains supporting information relating to the Control Scheme, and should typically include the recording of system alterations or remedial actions together with utilised materials. Ad hoc maintenance activities should also be recorded in this section, such as system sterilisations which may be required from time to time. This section of the document also contains a glossary of supporting publications, where additional information relating to the risks associated with waterborne micro-organisms, and water quality generally, may be found.

1.2 Executive Summary

The purpose of this Written Scheme document is to assist in the correct and safe operation of the water systems within the QEUH Campus. The document outlines the specific roles, responsibilities, training requirements and regular maintenance procedures to be followed in order to ensure compliance with statutory and mandatory guidance.

Risk Assessments for the water services have been carried out on the instruction of the Board Water Safety Group. DMA Canyon Ltd are presently the appointed Water Systems Risk Assessor and have carried out Risk Assessments within all individual buildings on the campus.

Additionally there are two Hydrotherapy Pools in operation on the campus. These are situated within the New Childrens Hospital, and Spinal Injuries Unit. Separate Risk Assessments have been carried out for both of these facilities by a specialist Swimming Pool Risk Assessment provider.

Risk Assessments require to be reviewed and updated to reflect any changes in-use and / or functions that have taken place since the date of the original Risk Assessment or in the event of control measures becoming ineffective, changes in key personnel or in the event of a case of legionnaires disease / legionellosis associated with the water system. Guidance on the Risk Assessment review procedure is given in Appendix 3.

All documentation and log sheets used to record maintenance activities follow the format contained within guidance document SHTM 04-01 Part G: *Operational Procedures and Exemplar Written Scheme.*

1.3 Overview of Site Accommodation and Premises

The main new-build Adult Hospital building comprises of 12 stories, with the basement housing FM areas and the new-build Childrens Hospital comprising of 4 stories.

On the retained estate there are individual buildings comprising of Neurology, Neurosurgery, Spinal Injuries Unit, PDRU, Maternity, Neo-Natal, Podiatry and Westmarc stand alone with the Teaching and learning and office block new additions.

Full descriptions and information on the individual written schemes are available in the Log book/Risk Assessment folders for each building.

The building codes are as follows:

AC – Minor Injuries Unit
AQ – Acute Medical Block (AMB)
AS – Central Medical Block (CMB)
BC – Neurosurgical Block (INS)
BL – Maternity
BW – Neurology
DA – Spinal Injuries
DB – Maternity Day Surgery
DD – Podiatry
DE – Physically Disabled Rehabilitation Unit (PDRU)
DI – WestMARC
EA – Neo Natal
FA – Multi Storey Car Park 2
FB – Multi Storey Car Park 1
GA – Laboratory Medicine
GB – Energy Centre
HA – Adults Hospital
HB – Childrens Hospital
IA – Teaching & Learning Centre
IB – Office Building
IC – Imaging Centre of Excellence (ICE)

NOTE: ICE building is owned by University of Glasgow (UoG). Facilities management and maintenance is carried out under contract by NHS GG&C on behalf of UoG.

Langland Building is managed via PFI by Serco and MDU is managed via Vanguard.

See Site Map in Appendix 1

2.0 RECORDING

2.1 Written Scheme Inspection Records

Anyone inspecting this written scheme (either as part of the Management Control System or otherwise) is invited to make an entry in this inspection record. **Under no circumstances may this Written Scheme or any part of it be removed from site.**

Date/Time	Comments	Signature	Position
June 2018	Written scheme has been reviewed and re-formatted into this current form (Revision D) by Colin Purdon as part of the water systems review.		Site Manager Operational Estates
Feb 2019	Written scheme has been reviewed and re-formatted into this current form (Revision E) by Colin Purdon as part of the water systems review.		Interim Sector Estates Manager (Deputy Responsible Person)
May 2019	Written scheme has been reviewed and re-formatted into this current form (2019 Rev A) by Colin Purdon as part of the water systems review.		Interim Sector Estates Manager (Deputy Responsible Person)
October 2020	Written scheme has been reviewed to reflect changes to staff personnel and a review of procedures.		Site Manager Operational Estates

Additional entries should be completed on a separate sheet and inserted in Section 2.1 with this sheet.

2.2 Location of Records and Correspondence

Details of any correspondence, including Risk Assessments/Reviews and Ongoing Monitoring Reports, relating to water services should be entered on the sheet below, recording where held and by whom.

Date	Procedure or Record ref	Description	Held by/location
16/07/18	Flushing Outlets 026	Email correspondence in relation to Flushing DCFP kitchen dishwasher and outlets with John Heron and Adam Wright	Colin Purdon email archive. Hard copy in correspondence logbook

Additional entries should be completed on a separate sheet and inserted in Section 2.2 with this sheet.

A49585984

2.3 Non-Compliance Issues and Fault Detail Log

Record Form 004

All non-compliance and fault details in relation to the individual systems in each building must be recorded on Record Form 004 and brought to the attention of the Water Systems Lead AP as soon as possible. This process ensures that all non-compliance issues are documented, managed effectively and tracked through to completion and close –out of the issue. Copies of Record Form 004 are to be stored within the shared drive. SCART Compliance/22 Water/.

The process for sampling out of specification is documented in WQS – 017 Procedures in the event of out of specification sample for Legionella and other monitored bacteria, moulds etc.

2.4 Archived Information Record Sheet

All records associated with the management or maintenance procedures within this Written Scheme should be kept for a period of five years after they are no longer current. Records should be kept locally within the main Estates Office. The details of any archived information held separately in secure storage should be recorded in the table below.

Date	Procedure or Record Reference	Description	Held By/Location

Additional entries should be completed on a separate sheet and inserted in Section 2.4

2.5 Equipment Calibration Records

All equipment used for the measurement of temperatures should be calibrated at least annually to ensure the accuracy and consistency of the recording procedures.

Calibration certificates for handheld thermometers are held in hard copy within the QEUH Campus Log Book suite in the main estates office. Electronic copies are also held on the QEUH Shared Drive>Water Quality folder.

3.0 MANAGEMENT ARRANGEMENTS

3.1 Roles & Responsibilities

NHS Greater Glasgow & Clyde Chief Executive – (Duty Holder)	The Chief Executive has ultimate responsibility / accountability for water system safety within NHSGG&C. The responsibilities of the Chief Executive include: • Responsibility for implementation of the relevant mandatory and statutory elements contained within the Health & Safety Commissions Approved Code of Practice and Guidance "Legionnaires Disease. The control of Legionella bacteria in water systems" L8 (ACOP L8), SHTM04-01: The control of Legionella, hygiene safe" hot water, cold water and drinking water systems and CEL 08(2013) water sources and potential risk to patients in high risk units – revised guidance. The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring that adequate resources are provided to meet the Water Systems Safety requirements of NHSGG&C estate. Ensuring that the Water Systems Safety Policy is being implemented at all levels. • Reviewing and monitoring the operation of the Water Systems Safety Policy through the Board Corporate Management Team and ensuring that clear guidelines are provided for this tasked with compliance of legislative and statutory standards. • Appointing the Designated person (Pseudomonas) and Designated Person (Water) to assist in the execution of these responsibilities, who for NHSGG&C are the Infection Control Manager (Pseudomonas) and the Director of Facilities (Water).
NHS Greater Glasgow & Clyde Director of Estates and Facilities – (Duty Holder)	The Director of Estates and Facilities is the Designated Person (Water). They shall be responsible for: • Ensuring that Facilities staff, through the general management structure is fully aware of the current statutory and mandatory requirements and standards for the provision and maintenance of safe water systems. • Ensuring with the Responsible Person (Pseudomonas) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person (Water) at sector level and Deputy Responsible Person(s) (Water) at site level. This shall be the Sector Estates Manager (SEM) and the relevant Site Manager Operational Estates (SMOE)/Site Estates Manager within the Facilities Directorate management structure.

3.1 Roles and Responsibilities (cont)

NHS Greater Glasgow and Clyde Infection Control Manager - Designated Person (Pseudomonas)	The Infection Control Manager supported by the Board Infection Control Doctor is the Responsible Person (Pseudomonas). They shall be responsible for: • Ensuring that Infection Control Teams are fully aware of current guidance on Legionella control matters and the minimisation of the risk of Pseudomonas aeruginosa infection from water. • The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring with the Designated Person (Water) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person(s) (Pseudomonas) at sector level. This shall be the relevant Infection Control Doctor.
Sector Estates Manager – Responsible Person (Water)	The Sector Estates Manager will be appointed as the Responsible Person (Water) at Sector level by the Director of Estates and Facilities in writing. The Sector Estates Manager is responsible for: • Ensuring the effective maintenance of engineering controls installed for the purposes of controlling water systems. • Ensuring that written schemes and risk assessments are in place and reviewed regularly. • Devising and maintaining procedures to ensure the quality of water on premises is maintained. • Ensuring operational procedures are carried out and documented. • Ensuring records are kept of all water systems and their purpose, giving locations recording and maintaining within the Boards estates management system. • Liaise closely with other professionals to ensure legislative and statutory compliance is maintained by the Board.
Authorising Engineer (AE)	An Authorising Engineer acts as an independent professional advisor to the healthcare organisation, appointed by the organisation with a brief to provide services in accordance with Scottish Health Technical Memorandum (SHTM) guidance. He will be appointed in writing by the Director of Facilities/General manager (Estates). The Authorising Engineer acts as an assessor, making recommendations for the appointment of Authorised Persons, monitoring the performance of the service and providing an annual audit to the organisation's Designated Person.

3.1 Roles and Responsibilities (cont)

Authorised Person (Water)	The Authorised Person (water) has the key operational responsibility for the service, qualified, sufficiently experienced and skilled for the purpose. They will be nominated by the Authorising Engineer and be able to demonstrate • They application through familiarization with the system and attendance at an appropriate professional course; • A level of experience; • Evidence of knowledge and skills. An important element of the Authorised Person (Water) role is the maintenance of records, quality of service and maintenance of system safety (integrity). The Authorised Person (Water) will also be responsible for establishing and maintaining the roles and validation of Competent Persons (Water) who shall be suitable trained employees of the organisation or appointed contractors. Larger sites may require more than one Authorised Person (Water) for a particular service. The Authorised Person (Water) will be appointed by the General Manager – Capital Planning.
General Manager – Capital Planning (Water)	The Head of Capital Planning will be appointed as the Deputy Responsible Person (Water) at Board level by the Director of Estates and Facilities in writing. The General Manager for Capital Planning is responsible for: • Ensuring that any new works undertaken or refurbishment within existing premises shall comply with the requirements of this Policy and the Written Scheme and Operational Procedure for managing Water Safety including The control of *Legionella*, hygiene, 'safe' hot water, cold water and drinking Water systems and The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring that all potential interfaces between an operating system and new and refurbishment works shall meet the approval of the Responsible Person (Water) and Authorised Person (water) as to methodology for making that interface. • Ensuring that any work involving the installation of water services or equipment requiring a water supply shall follow the guidance in SHTM 04-01 and HSE document L8 and shall be certified by the design Engineer as to that compliance. • Ensuring that any works which will affect an operational water service will be discussed with the Estates Authorised Person (Water) prior to arranging that work.

3.1 Roles and Responsibilities (cont)

Site Estates Manager Deputy Responsible Person (Water)	The Site Manager Operational Estates (SMOE)/Site Estates Manager shall be appointed in writing by the Director of Facilities/General Manager (Estates) in writing as the Deputy Responsible Person (Water) and will also act as the Designated Person Water in the absence of the Designated Person (Water). The Site Maintenance Manager/Site Estates Manager is responsible for: • Ensuring all staff conducting water system maintenance are competent to do so. • Ensuring water system maintenance records are maintained and kept up-to-date. • Regularly checking maintenance records. • Ensuring all work is completed in accordance with the NHS GG&C Estates Procedures.
Acute Services Directors CH(C)P Directors and Corporate Division Directors	As Senior Managers, NHSGG&C Directors play an intrinsic role in ensuring that water safety is embedded within the culture of the organisation. The responsibilities of Directors include: • Supporting the designated person (Water) and (Pseudomonas) in the development of the Board's overall strategy in relation to water safety and for ensuring implementation within their areas of responsibility; • Ensuring that all staff are made aware of their requirement to attend Water Safety training at the appropriate frequency, as per the NHSGG&C Water Safety Policy and Operational Procedures which underpin this by facilitating staff release from duties to attend training; • Supporting action to address staff who put themselves and/or others at risk from a real or potential water safety incident.
Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's	All managers who have a responsibility for the day to day management of facilities, staff or services, and/or premises, have water safety responsibilities that include: • Familiarise themselves with the NHSGG&C Water Safety Policy and local control measures including any water risk assessments for their area(s) of responsibility; • Ensuring that persons in the department, clinic or ward are fully aware of their responsibilities and duties in respect of Water Safety, in particular, the action required of them should the area be defined as High Risk by the local Water Safety Group • Ensure that persons in the department, clinic or ward are fully aware of the Infrequently Used Outlets definitions and Operating Procedure which underpins the NHSGG&C Water Safety Policy

3.1 Roles and Responsibilities (cont)

Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's (cont)	• Actively promoting Water Safety within the department or ward by maintaining good housekeeping within the department or ward at all times, ensuring that any flushing or documentation as described in the Water Safety Written Scheme and Operational Procedures documentation is completed on time • Responding appropriately to any water safety concerns that persons in the department, clinic or ward have; • Nominating a responsible person to complete the Monthly Infrequently Used Outlets Audit for each area, forwarding a copy to the Site Maintenance Manager, thereby assisting NHSGG&C to meet its statutory and mandatory requirements; • Ensuring that action is taken on a daily basis to address any access issues identified within the Cleaning Compliance Checklist Sign Off documentation retained in the Facilities Folder. • Liaising with the estates department as required
Legionella Risk Assessor	The NHS Board appoints in writing a Legionella Risk Assessor with terms of reference to provide services in accordance with BS 8580, SHTM 04-01 and HSE guidance under this Policy. He/she will be appointed in writing by the Director of Facilities/General Manager (Estates)
Competent Person (Water)	The Competent Person (Water) provides skilled installation and/or maintenance of the specialist service. He/she will be appointed, or authorised to work (if a contractor) by the Authorised Person Water). He/she will demonstrate a sound trade background and specific skill in the specialist service, working under the direction of the Authorised Person (Water) in accordance with operating procedures, policies and standards of the service.
Maintenance Tradesperson	A Maintenance Tradesperson is someone who has sufficient technical knowledge and the experience necessary to carry out maintenance and routine testing of the water supply, storage and distribution system.
Installer	The Installer is the person or organisation responsible for the provision of the water storage and distribution system.
Contractor	A Contractor is the person or organisation designated by management to be responsible for the supply, installation, validation and verification of hot and cold water services, and for the conduct of the installation checks and tests in relation to the control of *Legionella*. The NHS Board will expect potential contractors to have suitable qualifications (for example companies/individuals who are members of the *Legionella* Control Association).

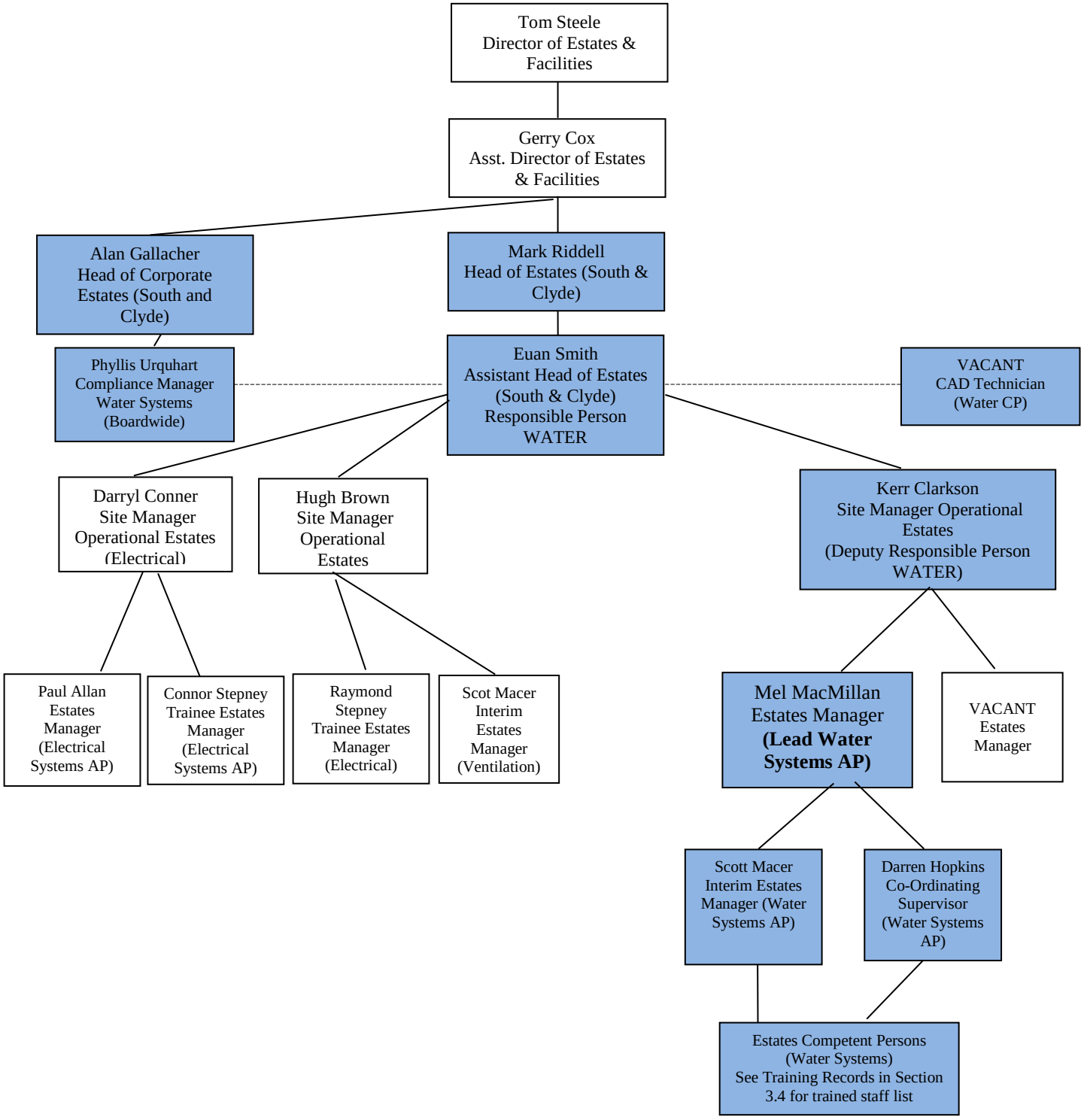
3.1 Roles and Responsibilities (cont)

NHS GG&C South Sector (QEUH) Hierarchy Appointment Table

Designation	Position	Name Tel Number
The Duty Holder	Chief Executive	Jane Grant
Designated Person (Water)	Director of Facilities/General Manager (Estates)	Alan Gallacher Mary-Anne Kane
Authorising Engineer (Water)	Legionella Control International Ltd	Dennis Kelly [redacted]
Legionella Risk Assessor	DMA Water Services Ltd	David Watson Mike Kinghorn Allan McRobbie [redacted]
Responsible Person (Water)	Sector Estates Manger (South)	Euan Smith *TBC in writing*
Deputy Responsible Person (Water)	Site Manager Operational Estates (Building)	Kerr Clarkson *TBC in writing*
Deputy Responsible Person (Water)	General Manager Capital Planning	Hazel McIntyre [redacted]
Lead Authorised Person	Estates Manager	Mel MacMillan
Authorised Persons	Estates Manager Co-ordinating Supervisor Co-ordinating Supervisor Co-ordinating Supervisor	Kerr Clarkson Scott Macer Darren Hopkins Frank Green
Competent Persons	CAD Technician	VACANT
Competent Persons	Plumbers/Engineers	See training records in Section 3.4
Others Involved		
Infection Control	Consultant Microbiologist	Alistair Leonard
Public Health		Dr Iain Kennedy
Laboratory Services		Janet Young

3.2 QEUH Estates Staffing

Management organogram for QEUH Estates Dept as of Oct 2019



3.3 Required Maintenance Tasks

The maintenance and management of the water systems throughout the QEUH Campus is undertaken by a combination of both NHS Staff and external Contractors at the frequencies identified in the following tables.

QEUH Management staff manage and oversee the following tasks:

Procedure Reference	Operation(s)	Record Form Ref	Frequency
P1C1	BMS Temperature Monitoring (**Carried out by NHS Estates**)	**Requires new number**	***Daily***
P1CC1A	Manual Temperature Monitoring for calorifiers (different form used ONLY REQUIRED if no BMS Monitoring	**(005a)**	***Daily***
N/A	Filtration Plant Checks (**Carried out by NHS Estates**)	**028c**	***Twice Daily***
WS01	Daily flushing of all outlets (**Carried out by NHS Facilities**)	**-**	***Daily***
WS01	Deluge shower/Eye wash flushing (**1 off carried out by NHS Estates and 1 off by DMA**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
P1C4	DHW Calorifier and Buffer Vessel Checks (**Carried out by NHS Estates**)	**(005)**	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
P1C12	Showerhead/hose replacement/disinfection (*No longer carried out as shower head and hoses replaced quarterly)*	**(005b)**	***Quarterly***
WS01	Review of Rarely Used Water Outlets and Changes In-Use (As required by NHS Estates)		***Quarterly***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
N/A	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates during calorfier checks, Plant Room checks and by DMA during Tank Room checks**)		***Annually***
N/A	Vibration coupling inspection (Carried out as part of checks on booster pumps) (**Carried out by NHS Estates**)		***Annually***
N/A	Carry out review of log books and Written Scheme		***Annually (Sep)***
N/A	Carry out review of drawings and schematics		***Annually (Sep)***

.3 Required Maintenance Tasks (cont)

In addition to the tasks undertaken by NHS directly employed Competent Persons, there are also tasks undertaken by Contractors on a selection of buildings within the campus.

Appointed Service Providers presently undertake the following tasks:

Procedure Reference	Operation(s)	Record Form Ref	Frequency
WS01	Deluge shower/Eye wash flushing (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
WS01	Flushing Deadlegs and drain valves (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
WS01	Flushing Intermittently used outlets (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
	External Water Mains Valve Operation and Flushing Routines		***Monthly***
PIC4	Temperature and CL02 monitoring of outlets (**Carried out by DMA**)	**DMA Records**	***Monthly***
-	PPM Schedule Monthly Visually inspect chemical delivery system, Check chemical suction and delivery lines for correct operation Chemical level check and refill , Cross check measured ClO2 / Chlorite residual test against analyser & Palintest Kit, Check and Adjust controller settings as required **(Carried out by ScotMas)**	**ScotMas Records**	***Monthly***
	PAL Filters on taps outlets (**Carried out by DMA**)	**DMA Records**	
	'TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)	Carried out 6 monthly	***Quarterly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK) **Carried out 6 monthly**		***Quarterly***
	Shower Head and Flexible Hose Exchange (**Carried out by DMA**)	**DMA Records**	***Quarterly***
WQS 001	HORNE Tap Flow Restrictor Exchange (**Carried out by DMA**)	**DMA Records**	***Quarterly***
	'TMV' Tap Outlet Sanitisation and Operational Checks (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
-	Maintenance of filtration units (**Carried out by Veolia**)	**Veolia Records**	***Six-Monthly***
-	6 Monthly Visit– All above, plus, Check ClO2 gas detector functionality and recording levels, Simulate fault circuitry and alarm on Sentinel Monitor, Change probe electrolyte and cross calibration test, Carry out manual Chlorate & Chlorite validation tests (12 representative outlets), Check water meter operation and report o Electrolyte top up, Probe calibrations (**Carried out by Scotmas**)	**ScotMas Records**	***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***

.3 Required Maintenance Tasks (cont)

	CWST Inspection **(Carried out by DMA)**	**DMA Records**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks **(NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING)**	**DMA Records**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required **(Carried out by Scotmas)**	**ScotMas Records**	***Annually***
P1C10	Representative Tap Temperature Monitoring Note all tap temperatures are checked through TMT/TMV maintenance **(Carried out by DMA)**	**DMA Records**	***Annually***
	BMS Sensors (**Carried out by Schneider and MCE BMS Providers for respective BMS**)	**Schneider &** **MCE records**	Annually

3.4 Training Records

The following NHS personnel are certified to have the required ability, experience, instruction, information and training to carry out the work associated with legionella precautions at QEUH Campus.

NAME	POSITION	NATURE OF TRAINING (QUALIFICATION, TRAINING COURSES ATTENDED)	DATE
Euan Smith	Sector Estates Manager RP	Responsible Person Course ENAP City & Guilds Authorised Person ENWS City & Guilds Managing Water Systems	
Kerr Clarkson	Site Manager Operational	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	
Mel MacMillan	Estates Manager AP		
Scott Macer	Estates Manager Lead AP Co-Ordinating Supervisor (Shifts)	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	
Darren Hopkins	Co-Ordinating Supervisor AP	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	

Copies of all relevant training records and appointment letters are held electronically on the QEUH Shared Drive within the folder path “Water Quality>Training and Appointments”.

The results achieved by each member of staff during their competency training are held on the central database managed by the Water Systems Compliance Manager.

NAME	POSITION	NATURE OF TRAINING (QUALIFICATION, TRAINING COURSES ATTENDED)	DATE
Martin Inglis	Tech Plumber	Competent Persons	
Andrew Hamilton	Tech Plumber	Competent Persons	
David Fickling	Tech Plumber	Competent Persons	
Peter McCabe	Tech Plumber	Competent Persons	
Mark McInally	Tech Plumber	Competent Persons	
Shawn O'Neill	Tech Plumber	Competent Persons	
Jason Weir	Tech Plumber	Competent Persons	
Paul Shorts	Tech Plumber	Competent Persons	
VACANT	CAD Technician	Competent Persons	

Copies of all relevant training records and appointment letters are held electronically on the QEUH Shared Drive within the folder path "Water Quality>Training and Appointments".

The results achieved by each member of staff during their competency training are held on the central database managed by the Water Systems Compliance Manager.

3.5 Training Requirements

A programme of training and procedures to assist in assessing and ensuring the competence of ALL persons responsible for the operation, maintenance, repair and alteration to the water distribution system and associated plant and equipment requires to be progressed, developed and implemented.

QEUH Estates Staff - Interim Training Requirements:

Item	Training Requirement	Applicable to	Target Date for Completion	Date Completed
1	Toolbox talks on Written Scheme Section 4 for staff.	All plumbers		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

NOTE:- This table should be updated on a regular basis as part of the review process described in **Section 3.10.**

3.6 Water Systems Risk Assessment

The duly appointed *Legionella* Risk Assessor for *Legionella* and Water Systems Safety will update the *Legionella* risk assessment database as directed by the board.

Risk assessments for each building have been conducted by DMA Water Ltd and are filed in the main Estates Office at QEUH. Each contains details of individual systems and a summary of the associated risks. The risk assessments each contain unique information in regard to the water distribution systems in the buildings and also guidance on the recommended maintenance procedures for mitigating risk.

Risk Assessment Review-Escalations

During the Risk Assessment, whenever an anomaly is discovered on either the hot or cold water systems, the Risk Assessors e-mail the AP (water) with their findings. These anomalies are actioned by creating a FM job for the onsite CP Plumbing Technician. The findings are held in the Estates office in the folder named (Pre Risk Assessment Jobs completed).

Risk Assessment Process for Removal of Identified Items

Points are actioned that have been identified in the Risk Assessment, all drawings are updated to reflect the changes and the Risk Assessment action point is closed.

Risk Assessment Review Schedule

A review of the Risk Assessments MUST be carried out after or during the following:

A change to the water system or its use

A change to the use of the building/ward/clinic/dept etc.

Changes in legislation or updates in control measures

Changes in immediate management or key personnel

Control measures becoming ineffective

Increased micro-bacterial levels found in the water system or a case of legionnaires disease/legionellosis associated with the water system.

Action plan details for each risk assessment are summarised on the Smartsheet tool.

Electronic copies of the Risk Assessments are also held on the QEUH Shared Drive at the folder path

“Water Quality>Risk Assessments”

Further information on reviewing Risk Assessments is detailed in Appendix 3.

3.7 Plant Description and Schematics

Details of the plant in each building and schematic layouts are contained within the individual log books/risk assessments for each building. The log books/risk assessments are stored in the main Estates Office at QEUH.

These details are also held on the Shared Drive

All plant details and system schematics and as-fitted drawings for the Adult & Childrens Hospitals are contained in the ZUTEC cloud based document management system. All Estates Managers and Supervisors have access to these systems.

Additional access accounts can be set up at the request of the QEUH Site Manager Operational Estates.

Brendan.egan[redacted]

3.8 Water Systems Audits/Review Procedures

A duly appointed Authorising Engineer (Water) will audit the entire Water Safety procedures within *NHS Board* annually.

The appointed Authorising Engineer for Water Safety will produce an annual report for management review. *See Section 3.1 pg 18 for current appointments.*

AE Audit

The Lead Authorised Person (Water) must regularly gather and maintain all the relevant information and records, including relevant Water Safety Risk Assessments and Written Schemes.

Working with the Authorising Engineer (Water) and Responsible Person (Water), the relevant Authorised Person (Water) will review and analyse all records for compliance with *Legionella* and other water safety parameters.

The relevant Authorised Person (Water) will detail on these records any deviations from the *Legionella* and other water safety parameters giving a brief description as to the reason for this deviation.

The Audit Programme will consist of planned audits on the following elements, for example:

Risk Assessments;

All documentation associated with this Written Scheme

training review and records;

schematic drawings;

Water Safety Log Books/Maintenance records;

BMS trend log comparison.

A report will be produced summarising the audit for submission to the Sector Water Safety Group.

The Lead Authorised Person (Water) will file locally, all relevant information and maintain hard copy records in the Water Safety Log Books stored within the main Estates Office. All actions identified should be tracked to ensure completion and closure.

Summary of Internal/External Audit Procedures

Frequency	Task	By Whom
Annually	Carry out Authorising Engineers Audit and produce report for submission to Sector Water Safety Group (Section 3.8 WS)	Lead AP, AE,
Annually/May	Carry out annual review of written scheme and produce report for submission to Sector Water Safety Group (Section 3.9 WS)	RP/DRP, Lead AP, Compliance Mgr
6 monthly	Carry out management review (Section 3.10 WS)	RP/DRP, Lead AP, Compliance Mgr
Monthly	Carry out regular audit of SCART topic and update database (Section 3.11 WS)	Lead AP
Monthly	Conduct contractor meetings/audits to ensure compliance with legislation and training requirements.(Section 3.12 WS)	Lead AP

3.9 Written Scheme Audit Procedure

The Written Scheme will be audited at agreed intervals but should be at least annually.

An audit schedule will be prepared to ensure the entire procedure is audited. This should be done in conjunction with the Lead AP (Water Systems), Compliance manager, and Responsible Person (Water Systems). A report should be produced and submitted to the Sector Water Safety Group.

3.10 Management Review

The Responsible Person (Water) will hold regular review meetings to confirm current compliance with Water Safety System requirements, identification of any deficiencies and actions required to resolve staff training needs.

The management review will be based on following:

- Results of internal audits;
- Results of external audits;
- Staff suggestions;
- Training records;
- Operation of the system and procedures over a reasonable historic period (6 to 12 months)

3.11 Water Systems SCART Report

The Lead Authorised Person (Water) must regularly gather and maintain all the relevant information for import into the Campus SCART system.

All evidence confirming the SCART position and justification for risk rating adjustments should be uploaded to the SCART database in electronic format.

3.12 Contractor Management & Audit Report

Contractor Management Process

Regular review meetings should be set up with any contractors working on the water distribution system. Minutes of the meetings are held on the QEUH Estates Shared Drive at the path: SGH Estates>Water Quality>Contractor Meetings.

Discussions should include:

Ongoing works;
Future task programme;
Recording procedures;
RAMS;

Contractor Competency

Regular checks should be performed to ensure that any contractors working on the water distribution system are deemed competent and all operatives are suitably trained to conduct the delegated tasks. Copies of all Risk Assessments and Method Statements should be refreshed and all training records reviewed by the Water Systems AP. Copies are stored on the QEUH Campus Shared Drive in Water Quality.

Contractor Audit Report

A report should be produced at least annually to record the findings of the audit.

3.13 Permit to Work, Water Systems.

The Permit to Work Water Systems as per this written scheme is solely intended to be used when works on the hot and cold water systems and its ancillary equipment are to be completed within the QEUH and RHC campus. This includes break-ins to existing pipe work, removal of dead legs and any new installation works.

The Permit to Work may only be issued to Competent Persons (L8 approved) by the Authorised Person (AP) for water. This includes in house maintenance staff and approved contractors.

The Permit to Work form will include the following;

- Name of the organisation issuing the permit.
- Permit number.
- Name of Authorising Person (AP), including emergency contact details.
- Reasons for the works on the water system, (Plant Preventive Maintenance, Planned repairs or Emergency works).
- Exact location of the works
- Reference to any as built drawing numbers, (for update purposes).
- Name of Competent Person (CP) undertaking the works.
- Hazards and Risks, (copy of Risk assessment and Method Statements (RAMS) to be submitted for approval before start of works)
- Commissioning and Testing.

The above points on the Permit Work are broken into five categories, namely;

Part 1 Description of work and authorisation/permission to proceed.

Part 2 CP acceptance of work and conditions.

Part 3 Confirmation of work completion and engineering test results.

Part 4 Authorisation to use a system.

Part 5 Acceptance of system status by Nurse Manager.

Procedure to be followed for Permit to Work on water systems within the QEUH and RHC;

Sign into Estates office within the Laboratory building on the QEUH and RHC campus.

Receive induction from Authorised Person water.

Provide L8 Competent Person certification to Authorised Person water.

Provide applicable RAMS for the works to be completed.

3.14 Tool Box Talk, Hot and Cold Water Systems.

Estates Tool Box Talk on Hot and Cold water Systems is located on the shared drive / water quality / Estates Tool Talk. This is carried out in the form of a power point presentation.

4.0 MAINTENANCE PROCEDURES

Procedure Reference	Operation
4.1	SYSTEM INFORMATION
4.2	MAINTENANCE PROCEDURES SUMMARY
4.3	WEEKLY MAINTENANCE TASKS
4.4	MONTHLY MAINTENANCE TASKS
4.5	QUARTERLY MAINTENANCE TASKS
4.6	SIX MONTHLY MAINTENANCE TASKS
4.7	ANNUAL MAINTENANCE TASKS
4.9	BI-ANNUAL MAINTENANCE TASKS

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.1 System Information

4.1.1 Correct and Safe Operation of the System

Measures should be in place to ensure that the water system is operated within the specific parameters as detailed in the following paragraphs:

4.1.2 Hot Water System

The storage of domestic hot water should be arranged to ensure that a water outflow temperature of at least 60ºC is achieved. No two water systems are the same and through periodic monitoring operational system performance, the system outflow temperature should be set to over 60ºC to ensure an outflow of 60ºC is achieved under normal draw-off demand and achieve 55°C at the supply to the furthermost draw-off point in the circulating system. It is important to maintain temperatures at above this figure (Legionellae organisms will survive for only a short period of time above this temperature - approximately two minutes).

Periodic performance monitoring and a system of continuous monitoring and recording of water temperatures via a building management system (BEMS) or data logger is essential to ensure compliant system performance.

The outflow water temperature, under prolonged maximum continuous demand (at least 20 minutes) from calorifiers should not be less than 60ºC.

While it is accepted that occasionally under peak instantaneous or prolonged demand the water outflow temperature will fall, it is not acceptable if this occurs frequently (more than twice in any 24 hour period) and/or for long periods (exceeding 20 minutes).

Under no circumstances should the domestic hot water flow temperature fall below 55ºC.

It is recommended that disinfection by pasteurisation is undertaken if the water temperature of the calorifier falls below 45ºC. A minimum domestic hot water circulation (return) temperature of 55ºC shall be maintained during the hours of occupancy.

4.1.3 Cold Water System

All domestic cold water storage cisterns and tanks shall comply with the requirements of the Scottish Water Byelaws.
Duplicate tanks often create a risk of water becoming stagnant in one of them, leading to risk of Legionella, Pseudomonas Spp or similar contamination. Consideration should be given to taking one of the tanks out of service. See guidance in “Guidance for Alterations to Water Systems”.

All cold water storage tanks are to be examined and the temperature tested on a regular summer / winter six monthly cycles and cleaned on an annual basis as required.

Temperatures in cold water storage tanks and the mains inlet to them should be checked during periods of high ambient temperatures (e.g. summer afternoons between June and August). Water temperatures should be less than 20ºC.
At the same time, the furthest and nearest draw off points in the system should be checked to ensure that the water distribution temperatures are less than 20ºC within 1 minute of running the water (at full flow). A similar temperature check regime should be undertaken during the winter months to identify the performance of cold water distribution systems and the impact of heat gain from heating systems.

4.1.4 Cold Water System Dump Valves

The cold water system installed in the Adult & Childrens Hospitals has a dump valve arrangement incorporated into the ground floor, 1st floor and 2nd floor layouts. The positions of the dump valves are shown on the Schneider BMS STRUXUREWARE system and connected via the KNX network.
Operating parameters for the dump valves are as follows:
Open at 23ºC
Close at 20ºC

4.1.5 End of Line Sensors (EOLs)

The hot and cold water system also incorporates End of Line (EOL) sensors which monitor the temperatures at specific sentinel points across all 11 floors of the Adult & Childrens installation. These can also be viewed via the Schneider BMS system.

4.1.6 Sampling

General microbiological and Legionella sampling in hot & cold water systems

Circumstances under which samples are taken:

- prior alterations to an existing water system;
- as part of commissioning process, prior to handover of a new building or introduction of a (altered, refurbished or new) water system into use;
- one week following handover of a new building or new water system;
- as part of the tank cleaning and disinfection process;
- as part of an assessment programme;
- in response to taste, odour or sustained discoloured water complaints.

When such samples are taken, a mains supply sample should be taken as a control to verify whether the supply could be the source of the identified problems. Scottish Water should also be contacted for distribution zone water quality data.

4.1.7 WS01 – Little Used Outlets

Control of Legionella in Water Systems, Intermittently used Water Outlets and Showers, Standard Operating Procedure WS01.

The Estates department is required to ensure that on a quarterly basis the list of ‘intermittent’ or ‘infrequently’ used water outlets or showers is reviewed to ensure it is accurate and up to date. Records of these reviews will be held within the system logbooks held locally.

If after investigation the taps or appliances identified within the reviewed list are deemed not necessary wherever possible the supply should be cut and the appliance removed from the water system. Where this is not possible then pipe work shall be cut back as close to the main circulating line as practicable to ensure that any dead-leg formed is minimised.

Nursing and other staff must be made aware of the issues surrounding legionella contamination and the link to low and underused water outlets and their assistance in formally identifying these possible outlets are sought.

Upon acknowledgement from the clinical staff of any intermittent or infrequently used outlets, the records are held on the Estates shared drive under Water Quality / WS01.

Any request from clinical staff regarding the removal of any intermittent or infrequently used outlets is assessed and surveyed by the AP (Water). If deemed appropriate a job is raised on FM for the Plumbing Technicians to remove, this is documented in the WS01 Records file in the Water Quality file on the shared drive. Subsequent hot and cold water pipe drawings are updated by the CAD Technician CP (water) where and when appropriate.

FILLING IN LOG SHEETS

Good water hygiene depends on maintaining high standards of cleanliness and freshness, together with careful temperature control. This section contains details of checks and recording sheets (marked "Log Sheets") to be filled in when checks and measurements are made to show that the necessary standards are being kept up. Alternatively, where an electronic PPM system is used, Procedure references should be entered.

Follow the instructions within the boxes and make entries as each task is completed. The tasks are all listed at the front of each section e.g. weekly tasks at the front of the weekly section, monthly section, quarterly 6 monthly etc. The summary list of tasks in this section is to remind you of what is required.

The Task and Log Sheets can be copied as required, completed Log Sheets will be filed where indicated in Section 2. **FM First ticket number MUST be included in all logsheets.**

PLANNING

The tasks and forms are organised into weekly, monthly, quarterly and annual sections. Always aim to carry out tasks early in the period when they are due to leave an opportunity to do them later if an emergency delays your plans.

ASK

If you have difficulties with the forms or do not understand the tasks, ask your Supervisor or line manager for clarification or guidance.

CHECKING

Incomplete or incorrect records are unacceptable in that they are misleading and do not do justice to the effort put in to achieve standards. Each log sheet includes a space for comment and tells you to check that all the boxes are complete: do make use of the comment space and double check the form, otherwise the record will have gaps and whoever is responsible for auditing will concentrate on what is missing and may not give you credit for the work that has been done.

LOG INSPECTION

Anyone inspecting this log (either as part of the Management Control System or not) is invited to make an entry in the inspection of Log Book record in front of Section One.

SURVEY

For survey purposes all surveys will be carried out starting left to right, where 2 off access doors are available the left access shall be taken first. Surveys shall be undertaken from top to bottom.

EQUIPMENT FITTINGS AND MATERIALS

Prior to carrying out alterations/ additions to distribution systems, the Water Fittings and Materials Directory published by the Water Regulations Advisory Scheme, should be consulted. This directory lists all materials and fittings approved for use to satisfy the requirements of current Water Byelaws.

Details of all new materials and fittings used in installations should be noted and recorded on the specific work document or project file for future reference.

SYSTEM ADDITIONS AND ALTERATIONS

Any additions, modifications or improvements to the water distribution system are to be noted and recorded and system record's amended to reflect such changes.

HYGIENE PRACTICES

Care should be taken to ensure high levels of personal hygiene, clean hands, clean clothing and PPE or gloves is maintained at all times when working on wholesome water operations. Tools, equipment, instrumentation and material's shall be free from contamination and appropriately disinfected before use.
Items such as pumps and hoses used in contact with water used for domestic purposes must be stored separately, clearly identified (ie colour coded or labelled) and **MUST NOT BE USED FOR ANY OTHER PURPOSE.**

Refer to Section 2.2 for location of maintenance records for the above.

4.2 Maintenance Procedures Summary

This section contains information in relation to the operational and maintenance checks managed by QEUH NHS Staff and appointed contractors to minimise the risk of exposure to *Legionella* and other waterborne micro-organisms within the domestic water systems, and to improve water quality. Procedures are as per the recommendations and exemplar models given in SHTM 04-01 Part G.

Procedure Reference	Operation(s)	Record Form Ref	Frequency
P1C1	BMS Temperature Monitoring (**Carried out by NHS Estates**)	**Requires new number**	***Daily***
P1CC1A	Manual Temperature Monitoring for calorifiers (**different form used ONLY REQUIRED if no BMS Monitoring**)	**(005a)**	***Daily***
N/A	Filtration Plant Checks (**Carried out by NHS Estates**)	**028c**	***Twice Daily***
WS01	Daily flushing of all outlets (**Carried out by NHS Facilities**)	**-**	***Daily***
WS01	Deluge shower/Eye wash flushing (**1 off carried out by NHS Estates and 1 off by DMA**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
P1C4	DHW Calorifier and Buffer Vessel Checks (**Carried out by NHS Estates**)	**(005)**	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
P1C12	Showerhead/hose replacement/disinfection (***No longer carried out as shower head and hoses replaced quarterly***)	**(005b)**	***Quarterly***
WS01	Review of Rarely Used Water Outlets and Changes In-Use (**Carried out by NHS Estates**)		***Quarterly***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
N/A	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates**)		***Annually***
N/A	Vibration coupling inspection (Carried out as part of checks on booster pumps) (**Carried out by NHS Estates**)		***Annually***
N/A	Carry out review of log books and Written Scheme		***Annually (Sep)***
N/A	Carry out review of drawings and schematics		***Annually (Sep)***

.3 Required Maintenance Tasks (cont)

In addition to the tasks undertaken by NHS directly employed Competent Persons, there are also tasks undertaken by Contractors on a selection of buildings within the campus.

Procedure Reference	Operation(s)	Record Form Ref	*Frequency*
	CWST Inspection **(Carried out by DMA)**	**DMA Records**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks (**NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING**)	**DMA Records**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required **(Carried out by Scotmas)**	**ScotMas Records**	***Annually***
P1C10	Representative Tap Temperature Monitoring **Note:** All tap temperatures are checked through TMT/TMV maintenance **(Carried out by DMA)**	**DMA Records**	***Annually***
P1C1 4.3.1	Daily BMS Temperature Monitoring (**Carried out by Estates**)	**(021)**	***Daily***
P1CC1A 4.3.2	Manual Temperature Monitoring ***(only required in absence of BMS)*** (**Carried out by NHS Estates**)	**(005a)**	***Daily***
4.3.3	Filtration Plant Checks (**Carried out by NHS Estates**)	**(028c)**	***Twice Daily***
-	Flushing all outlets (**Carried out by NHS Facilities**)	-	***Daily***
WS01	Flushing Intermittently used outlets (**Carried out by DMA**)	-	***Twice Weekly***
WS01	Flushing Deadlegs and drain valves (**Carried out by DMA**)	-	***Twice Weekly***
WS01	Deluge shower/Eye wash flushing (**Carried out by DMA and NHS Estates**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
-	Temperature Recording of Sentinel Hot and Cold Water Outlets for CL02 (**Carried out by DMA**)	-	***Monthly***
P1C4	DHW Calorifier and Plate Heat Exchanger Checks (Carried out by NHS Estates)	**(005)**	***Monthly***
-	PPM Schedule Monthly Visually inspect chemical delivery system, Check chemical suction and delivery lines for correct operation Chemical level check and refill , Cross check measured ClO2 / Chlorite residual test against analyser & Palintest Kit, Check and Adjust controller settings as required (**Carried out by ScotMas**)	-	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing. (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
	Replacement of PAL filters (**Carried out by DMA**)		***31 Days or 62 Days***

Procedure Reference	Operation(s)	Record Form Ref	*Frequency*
WQS 001	HORNE Tap Flow Restrictor Exchange (**Carried out by DMA**)		***Quarterly***
	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK)		***Quarterly***
	'TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)		***Six-Monthly***
	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)		***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (Carried out by DMA) (**Carried out by DMA**)	**(003)**	***Six-Monthly***
	TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
-	Maintenance of filtration units (**Carried out by Veolia**)	**Veolia Records**	***Six-Monthly***
-	6 Monthly Visit– As per monthly, plus, Check ClO2 gas detector functionality and recording levels, Simulate fault circuitry and alarm on Sentinel Monitor, Change probe electrolyte and cross calibration test, Carry out manual Chlorate & Chlorite validation tests (12 representative outlets), Check water meter operation and report o Electrolyte top up, Probe calibrations (**Carried out by Scotmas**)	**ScotMas Records**	***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
	CWST Inspection (**Carried out by DMA**)	**-**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks (NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING)	**-**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required (**Carried out by Scotmas**)	**-**	***Annually***
P1C10	Representative Tap Temperature Monitoring Note all tap temperatures are checked through TMT/TMV maintenance (**Carried out by DMA**)	**-**	***Annually***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates**)		***Annually***
P1C10	Representative Tap Temperature Monitoring (**Carried out by DMA as part of TMV checks**)	**(005)**	***Annually***
	Vibration coupling inspection Carried out monthly as part of checks of Booster sets (**Carried out by NHS Estates**)		***Annually***
	BMS Sensors (**Carried out by Schneider and MCE BMS Providers for respective BMS**)		***Annually***

4.3 Daily Maintenance Tasks

Reference	Operation
4.31	BMS Temperature Monitoring
4.32	Manual Temperature Monitoring
4.33	Filtration Plant Checks

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.31 – BMS TEMPERATURE MONITORING

DAILY

FM First Template No 826

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 26 para 3.11

RECORD FORM - (021)

PROCEDURE REF - P1C1

SCHEDULE REF – BMS 01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **DAILY** as a minimum:

Description of Works

- Refer to the BMS Temperature Monitoring Schedule BMS 01.
- Log onto both STRUXUREWARE BMS and DISTECH BMS front ends and check all temperatures from listed locations.
- Complete Schedule BMS 01 to confirm all temperatures have been checked.
- Any temperatures found outside the defined parameters stated on the BMS Temperature Monitoring Schedule should be investigated and resolved immediately. Details must be entered on Record Form (021) and escalated to the Water Systems AP.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Schedule BMS 01 and Incident form **04** if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return forms to the Water Systems AP.

NOTE: Both Struxureware and Distech BMS systems are capable of generating temperature trend logs. These logs will be checked on a regular basis by the Water Systems AP to confirm accuracy of information.

4.32 – MANUAL TEMPERATURE MONITORING (in absence of BMS)

DAILY

FM First Template No 830

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 26 para 3.15

RECORD FORM – (005a) (021a)

PROCEDURE REF - P1CC1A

SCHEDULE REF – MTM 01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **DAILY** as a minimum:

Description of Works

- Refer to the Manual Temperature Monitoring Schedule MTM 01.
- MANUALLY visit each location and obtain and record temperatures from all plant as listed on Schedule MTM 01.
- Any temperatures found outside the defined parameters stated on the MTM 01 Temperature Monitoring Schedule should be investigated and resolved immediately. Details must be entered on Incident Form (004a) and escalated to the Water Systems AP.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (005a) and (004) if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.33 – FILTRATION PLANT CHECKS

TWICE DAILY

FM First Template No 836

IN ACCORDANCE WITH BOARD POLICY

RECORD FORM – (028c)

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE DAILY** as a minimum AM and PM:

Description of Works

- Refer to the Filtration Plant Daily Checks Log sheet (028c).
- Complete all listed checks and ensure plant is running if selected as DUTY, or available to run if selected as STAND-BY.
- Details must be entered on Record Form (028c) and any issues escalated to the Water Systems AP immediately.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (028c) if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.4 Weekly Maintenance Checks

Reference	Operation
4.41	Flushing of Rarely Used Water Outlets (Twice Weekly)
4.42	Flushing of Deadlegs & Drain Valves (Twice Weekly)
4.43	Rotation of Water Services Duty/Stand-By Pumps
4.44	Operation and Checks to Emergency Deluge Shower/Eye Wash (Twice Weekly)

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.41 – FLUSHING OF INTERMITTENTLY USED WATER OUTLETS

FM First Template No 824

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 101 para 6.36

RECORD FORM - (DMA)

PROCEDURE REF - WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE WEEKLY** as a minimum:

Description of Works

- Refer to the locations listed by DMA.
- Estates to arrange for the Schedule to be updated to record on a regular basis.
- Flush water from ALL outlets identified at a minimum frequency of Twice Weekly for a minimum period of 3 minutes per tap outlet taking care not to cause splashing or exposure to water aerosols / droplets.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form ensuring that you date, sign it.
3. DMA to send flushing records to Water Systems AP.

NOTES:

In circumstances where there has been a lapse in the flushing regime, the stagnant and potentially contaminated water from within the shower or tap and associated dead leg should be purged to drain without discharge of aerosols before the appliance is used.

NHSGG&C consider the cleaning of wash hand basins, toilets and showers etc by Domestic Services staff to fulfil the criteria of having been used /flushed.

As part of the ward/departments standard cleaning schedule Domestic Services staff will clean all wash hand basins, showers, baths, WC's and bidets. For the purposes of Legionella and Pseudomonas control the Board deems this to be considered adequate to fulfil guidance on the use of water outlets.

Facilities Management send on flushing records of all taps to Water Systems AP monthly.

Refer to Facilities Procedure - Wash Hand Basin Cleaning (including point of use filter).

4.42 – FLUSHING OF DEADLEGS & DRAIN VALVES

FM First Template No 827

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 101 para 6.36

RECORD FORM - DMA

PROCEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE WEEKLY** as a minimum:

Description of Works

- Refer to the locations listed on Record Form (DMA).
- Estates to arrange for the Schedule to be updated to record on a regular basis.
- Flush water from ALL outlets identified on Record Form on a Weekly basis for a minimum period of 3 minutes per tap outlet taking care not to cause splashing or exposure to water aerosols / droplets. Drain Valves to be purged to ensure the removal of any built up residue in the line.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record ensuring that you date, sign it and Complete FM work request.
3. Return form to the Water Systems AP.

4.43 – ROTATION OF WATER SERVICES DUTY/STAND-BY PUMPS

FM First Template No 820

WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 27 para. 3.24

RECORD FORM - (028a)

PROCEDURE REF - P1C3

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **WEEKLY**:

Description of Works

- Inspect and confirm operation of all listed duty/stand-by pumps by interrogating the programmer to check hours run for each pump motor.
- Check pump rig and associated valves for correct operation, signs of damage, leakage or corrosion.
- Record all details on Record Form (028a)

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (028a) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.44 – OPERATION AND CHECKS TO EMERGENCY DELUGE SHOWERS/EYE WASH

FM First Template No 825

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 57

RECORD FORM - (026c) and DMA record for separate shower.

PRECEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

RISK CONTROL NOTICE - RCN 11/04

The following actions must be undertaken **TWICE WEEKLY**:

Description of Works

- Refer to the locations listed on Record Form (026c) NHS only (DMA complete flushing records).
- Operate shower for a minimum period of 3 minutes taking care not to cause splashing or exposure to water aerosols / droplets. Measure and record temperatures until discharge water drops to the same temperature as the incoming mains water.

  NOTE: For thermostatic showers and taps, the outlet should be flushed on the full cold setting for 2 minutes, then again on the full hot setting for a further 2 minutes, using override setting where available. Cold water should be less than 20^{o}C, Hot water should be between 55^{o}C and 60^{o}C, and Mixed water in the range 41-43°C.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (026c) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.5 Monthly Maintenance Checks

Reference	Operation
4.51	Sentinel Outlet Temperature Recording
4.52	DWS Calorifier – Temperature Checks & Blowdown
4.53	CL02 checks

NOTE:

Completed Log Sheet to be submitted to Site Estates Manager / Authorised Person (Water) for authorisation and copies filed as indicated in Section 2.20.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.51 – SENTINEL OUTLET TEMPERATURE RECORDING

MONTHLY

FM First Template No 828

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 28 para 3.27

RECORD FORM - (005c)

PROCEDURE REF - P1C4

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- Check the temperatures at the sentinel taps as defined in the local plan of the system being checked. NOTE: Where the sentinel is a TMV or TMT the temperature readings should be taken from the pipework or directly from the hot and cold supply.
- Using a calibrated temperature probe, check the temperature of water from the cold water tap does not rise above 20ºC after running the tap for 2 minutes.
- Using a calibrated temperature probe, check the temperature of water from the hot water tap does not drop below 55ºC whilst running the tap for 1 minute.
- Record all temperatures on Record Form (005c).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form **(005c)** ensuring that you date, sign it and enter FM First ticket number. Complete FM Work Request.
3. Return form to the Water Systems AP.

4.52 - DWS CALORIFIER – TEMPERATURE CHECKS & BLOWDOWN

FM First Template No 821

MONTHLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 28 para 3.30

RECORD FORM - (005)

PROCEDURE REF - P1C4

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- MANUALLY CHECK and record the flow and return temperatures on the domestic hot water system as defined on Record Form (005), using the temperature gauges fitted or a suitable surface temperature probe.
- MANUALLY CHECK and record the calorifier storage temperature at top and bottom gauges if fitted.
- The flow temperature to be at least 60ºC and the return temperature shall be no less than 55ºC
- MANUALLY CHECK and record the cold water feed temperature using the temperature gauges fitted or a suitable surface temperature probe.
- Blowdown drain valves (if fitted) on all calorifiers and expansion vessels by opening the drain valve 3 times, each time for a 3 minute period. Where required, the hose from the drain valve connection should be discharged to the nearest drain/gulley. If there is no drain valve make note on Record Form 005.
- Check all local pipework to and from calorifier is in good order and all insulation is intact.
- Operate all isolation valves through their full range of motion.
- Check, confirm and record operation of de-stratification pump.
- Record all information on the Record Form (005).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.

2. Complete Record Form (**005**) ensuring that you date, sign it and enter FM First ticket number.

3. Return form to the Water Systems AP.

4.53 – CL02 PLANT CHECKS

MONTHLY

FM First Template N/A

IN ACCORDANCE WITH SHTM 04-01

RECORD FORM – N/A

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- PPM Schedule Monthly Visually inspect chemical delivery system.
- Check chemical suction and delivery lines for correct operation Chemical level check and refill.
- Cross check measured ClO2 / Chlorite residual test against analyser & Palintest kit.
- Check and Adjust controller settings as required.

CHECK

1. Record all details of any fault or discrepancies and report to Water Lead AP who will complete Incident Form (04).

4.6 Quarterly & Other Maintenance Checks

Reference	Operation
4.61	Shower Head and Flexible Hoses Disinfection/Replacement
4.62	DHWS Calorifier and Expansion Vessel - Flush
4.63	HORNE Tap Flow Restrictor Exchange
4.64	Review of Rarely Used Water Outlets and Changes In-Use
4.65	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK)
4.66	PAL filter replacement

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.61 SHOWER HEAD AND HOSE REPLACEMENT

FM First Template No 869
Schedules: 1997 to 2724

QUARTERLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 32 para 3.51

RECORD FORM -See DMA records
PROCEDURE REF - P1C12 CURRENTLY CONTRACTED TO DMA CANYON WATER

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

NOTE: If PALL filter is fitted it must be left in place and recorded as such on DMA records)

Description of Work

- Exchange shower head and hose assembly inc sealing washers with new disposable unit. Place old shower head and hose assembly into re-sealable plastic bag.
- Check that the new head and hose package is intact;
- Open replacement new shower head and hose assembly sealed packaging, remove and fit following the manufacturer's instructions;
- Run water and flush for 3 minutes in accordance with Legionella Risk Assessment in such a way as to avoid the creation of aerosols;
- Check final temperature for compliance and working order and return shower appliance to use.
- Return redundant sealed bag with shower head and hose assembly to collection point for recycling in accordance with Waste Procedures;
- Record all actions on the Record Form (005b).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (005b) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

NOTE: This procedure replaces the previous Clean & Disinfect method from 1st April 2019

4.62 - DWS CALORIFIER AND EXPANSION VESSEL - FLUSH

FM First Template No 821

QUARTERLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 29 para 3.34

RECORD FORM - (006) and (023)

PROCEDURE REF - P1C6

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Flush each Domestic Hot Water Calorifier and Buffer Vessel through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. Where required, the hose from the drain valve connection should be discharged to the nearest drain/gulley.
- Record all actions on the top section of Record Form(006).
- Where the domestic hot water system has a stratification pump(s) fitted to circulate the hot water from the top to the base of the calorifier or the storage/buffer vessel, and the history data shows no sludge deposits during flushing, then this procedure should be risk assessed to determine if the maintenance frequency can be changed. This assessment should be recorded on Record Form (023).

NOTE: this flushing process can air lock the hot water system, so only carry it out when there is no hot water demand and the calorifier is valved off from the system.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (006) and/or (023) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.63 – HORNE TAP FLOW RESTRICTOR EXCHANGE

FM First Template No N/A

QUARTERLY

IN ACCORDANCE WITH IC GUIDANCE

RECORD FORM – (See DMA Records)

PROCEDURE REF – WQS 001

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

PPE:- Surgical gloves should be worn when carrying out this task. Cross contamination of the replacement flow restrictor should be considered and avoided at all times.

Restrictor should only be replaced at outlets without PALL filters. If PALL filter is fitted it should be left in place and noted on Record Form.

- Assemble all tools and materials required to complete task.
- Check with ward staff to ensure access can be granted to each area without Infection Control restriction.
- Remove existing restrictor using the appropriate tool and dispose of the restrictor in general waste.
- Use disinfectant wipes to sanitise tap outlet and tools used before re-fitting new restrictor.
- Change gloves to avoid cross contamination of new components and tools.
- Unpack new restrictor components and insert into tap as per the manufacturer's instructions.
- Test on completion and fill out log sheet to record all relevant information.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (DMA WATER) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.64 - REVIEW OF INTERMITTENTLY USED WATER OUTLETS/CHANGE IN-USE

IN ACCORDANCE WITH BOARD POLICY

QUARTERLY

RECORD FORM – (001) (026)

PROCEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Liaise with Site Facilities Manager and Heads of Department to review existing accommodation occupancy and usage on a 3 monthly basis.
- Issue Quarterly circular email to all HoDs
- Identify any water services outlets that are not used OR changes to the occupancy.
- Schedule to be updated to record all areas which change in-use, become unoccupied or otherwise out of use.

CHECK

1. Record all details of any dept closures or little used outlets on Record Form (001) and add outlets to flushing register.
2. Ensure outlets are brought to the attention of the maintenance person carrying out the flushing activity and details added to Record Form (026) or arrange with DMA to add to flushing requirements.
3. All completed Record Forms to be stored in the building specific Log Book.

4.65 – TMV/TMT & THERMOSTATIC SHOWER DISINFECTION AND FUNCTION TEST (HIGH RISK)

QUARTERLY

FM First Template No

IN ACCORDANCE BOARD POLICY

RECORD FORM - REQUIRES CONFIRMATION IF THIS SHOULD BE CARRIED OUT THREE MONTHLY

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Examine all thermostatic taps for scale build-up or other deposits. De-scale any which are not clean.
- Check and remove any installed plastic flow straighteners from tap outlet
- Inspect and Clean and Disinfect filters / strainers by removing and immersing in a solution of 1000ppm free residual chlorine (50cc CLO2 in 5 litres of water) in water for 5 minutes.
- All HORNE Optitherm taps MUST have the flow straightener replaced during three monthly service tasks.
- Pasteurise outlets by over-riding thermostatic controls drawing water through each thermostatic tap until a temperature of 60°C is achieved. Run the tap at this temperature for five minutes. If this is not possible disassemble tap assembly and spray all accessible components with 'Shower Head plus' mixed to a 1:3 solution, (one part chemical, 3 parts water) or equal and approved and let stand for 5 minutes.
- Reassemble and verify fail safe operation by isolating hot and cold water supplies separately.
- Ensure thermostatic controls are re-adjusted to permit blending.
- Should controls not be able to be over-ridden, verify the temperatures at the inlet connections to the thermostatic valve utilising a contact type probe and electronic thermometer.
- Run and test tap and record hot and cold water inlet temperatures and mixed water outlet temperature.
- Log all actions.

4.66 – PAL FILTER REPLACEMENT

FM First Template No

31& 62 Day

IN ACCORDANCE WITH AGREED FILTER LOCATIONS

RECORD FORM - DMA RECORDS

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **31 Days or 62 Days based on filter types and locations**:

Description of Work

- Replace filters prior to end date on tap and shower filters as per programme.
- Process for replacement as per DMA Procedures.
- Log all replacements as per DMA Procedures and record in DMA Records.
- Any issues should be reported to Water Lead AP.

A49585984

4.7 Six Monthly Checks

Reference	Operation
4.71	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK)
4.72	CWST Inspection and Temperature Monitoring
4.73	Maintenance of filtration units
4.74	CL02 checks

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.71 – TMV/TMT & THERMOSTATIC SHOWER DISINFECTION AND FUNCTION TEST (NON HIGH RISK)

IN ACCORDANCE WITH BOARD POLICY

SIX MONTHLY

RECORD FORM -

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- Examine all thermostatic taps for scale build-up or other deposits. De-scale any which are not clean.
- Check and remove any installed plastic flow straighteners from tap outlet
- Inspect and Clean and Disinfect filters / strainers by removing and immersing in a solution of 1000ppm free residual chlorine (50cc CLO2 in 5 litres of water) in water for 5 minutes.
- All HORNE Optitherm taps MUST have the flow straightener replaced during three monthly service tasks.
- Pasteurise outlets by over-riding thermostatic controls drawing water through each thermostatic tap until a temperature of 60°C is achieved. Run the tap at this temperature for five minutes. If this is not possible disassemble tap assembly and spray all accessible components with 'Shower Head plus' mixed to a 1:3 solution, (one part chemical, 3 parts water) or equal and approved and let stand for 5 minutes.
- Reassemble and verify fail safe operation by isolating hot and cold water supplies separately.
- Ensure thermostatic controls are re-adjusted to permit blending.
- Should controls not be able to be over-ridden, verify the temperatures at the inlet connections to the thermostatic valve utilising a contact type probe and electronic thermometer.
- Run and test tap and record hot and cold water inlet temperatures and mixed water outlet temperature.
- Log all actions.

4.72 – CWST INSPECTION AND TEMPERATURE MONITORING:

FM First Template No 819

SIX MONTHLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 29 para 3.37

RECORD FORM – Carried out by DMA – refer to records

PROCEDURE REF – P1C7

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **SIX MONTHS** seasonally during Summer and Winter:

Description of Work

- Inspect the tank and associated pipework including insulation, valves etc for damage or corrosion and sediment.
- Operate all isolation valves through their full range of motion.
- Check the operation of the ball-valve by pressing down on it and lifting the float to confirm that water flows and stops.
- Inspect the tank overflows if visible. Confirm that there is no blockage or other foreign material and that the mesh screen is not damaged.
- Measure and record the temperature of the water in the tanks, by dipping the thermometer into the top as far from the ball-valve as possible.
- Check and record ambient outside air temp and tank room temp.
- Check the flow and record the temperature of water feeding the tanks. There should be a steady rapid flow when the ball float is down.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Records and send information to Water Systems AP.

4.73 – MAINTENANCE OF WATER FILTRATION UNITS:

FM First Template N/A

SIX MONTHLY

N/A

RECORD FORM – Carried out by Veolia– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- Check on feedwater quality
- Check on treated water quality & flows
- The condition of valves & diaphragms
- Operational cycle simulation
- General plant condition & safety
- The condition of system pumps
- The condition of the pre-filters
- Level control function

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.74 – MAINTENANCE OF CL02 PLANT:

FM First Template N/A

SIX MONTHLY

N/A

RECORD FORM – Carried out by Scotmas– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- As per monthly plus :-
- Check ClO2 gas detector functionality and recording levels.
- Simulate fault circuitry and alarm on Sentinel Monitor.
- Change probe electrolyte and cross calibration test.
- Carry out manual Chlorate & Chlorite validation tests (12 representative outlets).
- Check water meter operation and report on Electrolyte top up, Probe calibrations

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.8 Annual Maintenance Checks

Reference	Operation
4.81	DWS Calorifier / Expansion Vessel Inspection
4.82	Water Services Pipework and Distribution System Checks
4.83	Representative Tap Temperature Monitoring
4.84	Vibration coupling inspection
4.85	BMS Temperature Sensor Test and Calibration

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.81 - DWS CALORIFIER/EXPANSION VESSEL INSPECTION

FM First Template No 821

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 31 para 3.44

RECORD FORM - (006)

PROCEDURE REF - P1C9

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**

Description of Work

Follow the manufacturers' maintenance instructions from O&M manuals. Record all actions where applicable on Record Form (006) for each system.

- Isolate domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel service valves;
- Heat any domestic hot water calorifier or hot water storage/buffer vessel up until the contents has reached 60ºC and hold at this temperature for a period of at least 1 hour;
- Drain domestic hot water calorifier and expansion vessel and remove inspection hatch;
- Hose out the domestic hot water calorifier or hot and expansion vessel to remove any debris, scale or other deposit. Care should be taken to keep aerosols to a minimum.
- If the domestic hot water calorifier or expansion vessel does not have an inspection hatch, the pipework at the top of the vessel should be disconnected to allow the insertion of a water hose to allow debris to be washed down off internal surfaces;
- Examine the internal and external condition of the domestic hot water calorifier and expansion vessel and pipework, any defects should be reported in writing to the relevant Authorised Person (Water). The safety valve should be checked, overhauled and reset as necessary. The temperature and pressure gauges to be checked for operation.
- On completion of examination and any repairs, the domestic hot water calorifier and expansion vessel should be re-assembled and the following sequence must be undertaken:
- Refill with cold water;
- Drain the domestic hot water calorifier and expansion vessel;
- Refill with cold water, leave cold feed valve open;
- Run domestic hot water calorifier or hot water storage/buffer vessel at a temperature of 60ºC for at least 1 hour. Test the operation of high limit cut-out system if fitted. Check the temperature of the calorifier/vessel top and bottom with a surface thermometer;

- Adjust any controls as necessary.
- Take bacteriological samples from the base of the calorifier and submit to GRI Water Lab for analysis. (THIS TASK TO BE CARRIED OUT BY DMA CANYON WATER)

NOTE: this flushing process can air lock the hot water system, so only carry it out when there is no hot water demand and the calorifier is valved off from the system.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (006) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

A49585984

4.82 - PIPEWORK AND DISTRIBUTION SYSTEM CHECKS

FM First Template No 829

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 31 para 3.

RECORD FORM - (0)

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Estates Manager or Water Systems AP will define areas to be checked in each building.

Description of Work

- Check all accessible pipework for damage, or corrosion.
- Check for missing or damaged pipework insulation
- This is carried within the Tank Room by DMA during sampling and tank inspections monthly.
- This is carried out by NHS Estates within Plantrooms during plantroom inspections monthly
- This is carried out as per above procedures and noted on FM First PPM's..

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms as per above procedures ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.83 – REPRESENTATIVE TAP TEMPERATURE MONITORING

FM First Template No 917

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 32 para 3.39

RECORD FORM - (005d)

PROCEDURE REF – P1C10

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken at regular intervals throughout the year to ensure 20% of the requirement is completed **ANNUALLY**:

Description of Work

- OBJECTIVE: Carry out water temperature monitoring to ensure consistency and performance of the system as per design. 20% of all outlets to be assessed annually to ensure entire system is completed within a 5 year period (*ref: SCART2 Question 54)*
- Check the temperatures at a representative number of hot and cold outlets on a rotational basis as defined in the local plan of the system being checked. Lead AP (Water) to define areas to be checked each month.
- Using a temperature probe check the temperature of the cold water tap does not go above 20ºC after running the tap for 2 minutes;
- Using a temperature probe check the temperature of the hot water tap does not go below 55ºC within running the tap for 1 minute;
- If the outlet being tested is protected by a TMV/TMT then temperatures should be taken directly from the supply pipework or by bypassing the thermostatic device by use of an appropriate purging kit.
- Record all temperatures and locations tested on the Record Form (005d) or if carried out by DMA to reflect in records.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (005d) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.84 - VIBRATION COUPLING INSPECTION

FM First Template No 831

ANNUALLY

IN ACCORDANCE WITH HSG 274 Part 2 *(2014)* Page 19 para 2.35

RECORD FORM - (008)

PROCEDURE REF – WQMS 001

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Refer to list of vibration coupling locations to be assessed.
- Visually check the condition of the coupling for any signs of leakage, deterioration or corrosion.
- Ensure flexible portion of coupling is intact and free from damage or deterioration.
- Carried out on Cold Water Booster sets as part of the inspection.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.85 – BMS TEMPERATURE SENSOR CALIBRATION

ANNUALLY

FM First Template No

IN ACCORDANCE WITH

RECORD FORM -

PROCEDURE REF –

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- This task should be included in the BMS Service Contract Specification.
- All temperature sensors related to domestic hot and cold water services to be checked and calibrated annually.
- All calorifiers, storage tanks, flow and return monitoring devices.
- Include all End of Line (EOL) sensors and cold water flushing devices.
- Records should be kept and made available to the estates dept on request.

4.86 – MAINTENANCE OF WATER FILTRATION UNITS:

FM First Template N/A

ANNUALLY

N/A

RECORD FORM – Carried out by Veolia– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken **ANNUALLY**:

Description of Work

- As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement.
- Dosing Pump diaphragm valve replacements.
- Replace ClO2 gas detector cartridge if required

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.9 Bi-Annual Maintenance Checks

Reference	Operation
4.91	Flexible Hose/Connection Inspection and Exchange
4.92	CWST Drop Test

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.91 – FLEXIBLE HOSE/CONNECTION INSPECTION AND EXCHANGE

FM First Template No **BI-ANNUALLY**

IN ACCORDANCE WITH QEUH RISK ASSESSMENT RECOMMENDATIONS 2017

RECORD FORM - (009)

PROCEDURE REF – WQMS 002

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Refer to list of flexible connection locations to be assessed as per WQMS 002.
- Visually check the condition of the coupling for any signs of leakage, deterioration or corrosion.
- Safely isolate the water services and exchange the flexible connection with a BRAND NEW UNUSED replacement.
- Apply tag/label to indicate the intended date of future replacement (todays date + 24 months)
- Record all details on the Record Form (009).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (009) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.92 – CWST DROP TESTS

BI-ANNUALLY

FM First Template No 819

IN ACCORDANCE WITH

RECORD FORM -

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Shut off mains cold water supply to tank.
- Record the start time and allow tank to drain naturally through usage. DO NOT OPEN THE DRAIN.
- Periodically monitor the tank until usage has reduced tank to exactly half of its starting capacity.
- Record the stop time and estimate the number of hours of storage of water in the tank.
- Record all inspection details on the Record Form (010).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (010) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

5.0 INCIDENT AND EMERGENCY PROCEDURES

Procedure Reference	Operation
5.10	FAILURE OF CONTROL MEASURES
5.20	HIGH COLD WATER SUPPLY TEMPERATURE TO OUTLET
5.30	LOW HOT WATER SUPPLY TEMPERATURE TO OUTLET
5.40	CALORIFIER OR HEAT EXCHANGER TEMPERATURE FAULT
5.50	POSITIVE LEGIONELLA TEST RESULT
5.60	IDENTIFICATION OF LITTLE USED WATER OUTLET
5.70	EMERGENCY REPAIRS
5.80	DISINFECTION OF WATER SYSTEM
5.90	PSEUDOMONAS

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

THE FOLLOWING PAGES DESCRIBE REMEDIAL ACTIONS TO BE TAKEN IN THE EVENT OF AN INCIDENT, EMERGENCY, OUT-OF-SPECIFICATION TEST RESULT AND / OR WHERE *LEGIONELLA* HAS BEEN IDENTIFIED AND/OR BACTERIA COUNTS BEING INEXCESS OF THE RECOMMENDED LIMITS IN THE WATER SYSTEM ARE IDENTIFIED.

The Health and Safety at Work Act places a duty on employers to ensure, so far as is reasonably practicable, the maintenance of safe working conditions without risks to health, not only to employees, but also to the general public.

The risk to personnel associated with the presence of *Legionella* depends on a number of variables and may be quite low. However, since the actions to eradicate it are straightforward and reasonably practicable, it would be wise to put them in hand without delay if *Legionella* has been identified.

When analysis confirms that the levels of bacteriological contamination are in excess of acceptable limits, and/or the presence of Coliforms or *E.coli* is identified, the procedures recommended in this section should be applied.

5.1 Failure of Control Measures:

Where any reported test result, non-compliance issue or defect is made known which affects the integrity of the water system and indicates the failure of Control Measures and / or increased risk of Legionella the following procedures shall be followed and duly recorded within Section 2.3 of this document and brought to the attention of the relevant Infection Control Team and Water Management Group.

IN ALL CASES THE INCIDENT RECORD FORM (004) SHOULD BE COMPLETED AND INSERTED IN THE BUILDING SPECIFIC WATER SAFETY LOG BOOK.

5.2 High Cold Water Supply Temperature

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the QEUH campus served by the same mains lines) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as "out-of-specification" mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:

    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);
    - any water sampling results;
    - system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
    - recent maintenance history; recent alterations, changes or additions to the water system;
    - any other changes made by Duty Holders or users of the water system; On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Water Safety log book.

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment

Stage 3 - Water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.

Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;

  - thereafter the tank/local area being disinfected shall be brought back into service;
  - finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible.

5.3 Low Hot Water Supply Temperature

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the Southern General Hospital served by the same mains lines8) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as “out-of-specification” mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:

    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);

- any water sampling results;
- system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
- recent maintenance history; recent alterations, changes or additions to the water system;
- any other changes made by Duty Holders or users of the water system;

On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Logbook via Incident form (04).

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment.

Stage 3 - water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.

Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;

- thereafter the tank/local area being disinfected shall be brought back into service;
- finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible. Record on Incident form (04).

Hot Water Services

When hot water storage or distribution temperatures fall below those required (60°C storage, 55°C at outlets and returning to calorifier) these will almost inevitably be caused a mechanical fault. Appropriate maintenance procedures, including the Mercury Fault Finding guidance documents, should be created and referenced to assist in timely rectification.

This escalation procedure (taken from SHTM 04-01 Part G (Draft)) should be employed if the Calorifier/Plate Heat Exchangers outflow temperature falls below 45ºC.

The table below should be used to decide on the actions necessary in the event of a plant breakdown such as power failure or gas supply failure.

Breakdown leading to temperature <45ºC, lasting for:	Risk Category	Action
<12 hrs	High	Verify
	Significant	Verify
	Moderate	Verify
>12 hrs	High	Thermally pasteurise
	Significant	Verify
	Moderate	Verify
>24 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Verify
>72 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Thermally pasteurise

In the event of a reduction in domestic hot water temperature the **Authorised Person (Water)** should be notified in writing as soon as possible. The reason for failure must be identified and rectified as soon as possible.
The **Authorised Person (Water)** shall notify the **Duty Holder** and users on the failed system that they must not draw off any hot water from the affected services until further notice.
The relevant **Duty Holder** shall ensure that their staff are aware of the situation, and that they in turn shall prevent patients from using affected services.

Where thermal pasteurisation is to be carried out, the temperature of the calorifier or plate heat exchanger shall be raised to 70ºC, and the water shall be circulated throughout the affected distribution system for at least one 1 hour. Each tap or appliance should be run in sequence until full temperature is achieved (this should be measured). To be effective the temperature in the calorifier or plate heat exchanger should be high enough to ensure that all distribution outlets receive water at a temperature of greater than 60ºC. Ensure the return flow to the calorifier or plate heat exchanger is no less than **55ºC**.

The **Authorised Person (Water)** shall inform users that the system is back in operation.
Bacteriological samples should be taken in consultation with the Infection Prevention and Control team.
The **Authorised Person (Water)** shall complete an Incident Report Record and ensure the **Responsible Person (Water)** is notified in writing as soon as possible. Maintain hard copy records in the Water Safety Log.

5.4 Positive Legionella Test Result

Microbiological Sampling (Legionella)

Sampling requirements and frequency are to be formulated by NHS GG&C and written scheme should be updated as appropriate.

Legionella testing may be required:

- In systems where the temperature control regimes are not consistently achieved, frequent testing e.g. weekly should be carried out to provide early warning of loss of control. Once the system is brought back under control as demonstrated by monitoring, the frequency of testing should be reviewed
- Weekly checks are recommended until the system is brought under control;
- When an outbreak is suspected or has been identified;
- In wards with at-risk patients – for example those who are immuno-compromised ("high risk patient" areas still to be confirmed to DMA).

As a minimum, samples should be taken as follows:

- From the cold water storage and the furthermost outlet from the tank, on every loop;
- From the calorifier flow, or the closest tap to the calorifier, and the furthermost tap on the hot water service circulating system (these should be identified on sentinel outlet register);
- Additional samples should be taken from the base of the calorifier via drain valves;
- From areas where the target control parameters are not met (i.e. where temperatures are below 55°c for hot water systems or ≥20°c for cold water systems);
- From areas subject to low usage, stagnation, excess storage capacity, dead legs, excessive heat loss, crossflow from the water system or other anomaly.
- High Risk Patient Areas
- Additional random samples may also be considered appropriate where systems are known to be susceptible to colonisation.

The temperature control regime is the preferred strategy for reducing the risk from *Legionella* and other waterborne organisms in water systems. This will require monitoring on a regular basis. The recommended test frequencies for various outlets are set out in Table 2 in Section 7.

HSG 274 Part 2 Table 2.3 Actions to be taken following legionella sampling in hot and cold water systems in healthcare premises with susceptible patients

Legionella bacteria (cfu/Litre)	Action required
More than 100 but less than 1,000	Low risk area Estates action only If only one or two samples are positive, system should be re-sampled. If a similar count is found again, a review should be carried out to identify any remedial actions a) If the majority of samples are positive, the system may be colonised, albeit at low level, with Legionella. Disinfection of the system should be considered but an immediate review of control measures and risk assessment should be carried out to identify any other remedial actions required. If remedial action is ineffective further measures will be discussed and approved by the Board Water Safety Group
More than 100 but less than 1,000	High Risk areas Impact on patient care Discuss results with ICD and agree actions and any closure of area.
More than 1,000	Low Risk Estates action only The system should be re-sampled and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection of the system. If remedial action is ineffective further measures will be discussed and approved by the Board Water Safety Group
More than 1,000	High Risk areas Discuss results with ICD and agree actions and any closure of area.

Communication pathway for Legionella results from water samples:

Water samples are sent to; UKASS-accredited laboratories which provide this service for NHS and other organisations that manage buildings. Reports will come back initially to the estates department.

Negative water samples are recorded as part of the documentation of Legionella control. If they are related to investigation of an "incident" such as a clinical case or a previous positive sample then these results are communicated to those managing that incident.

The information on the report which needs to be communicated is:

- Date of sampling
- Location and type of water outlet
- Identification of the organism, (Legionella pneumophila with serogroup, or Legionella species other than L pneumophila.)
- Count of organisms per Litre.

Estates will

- Inspect the system and take further action in accordance with HSE guidance and locally agreed procedures
- Inform Charge Nurse and or Clinical Nurse Manager of the Clinical Area concerned if appropriate of any control measures being taken/required
- Inform GM for the Sector if appropriate.

The results of this initial risk assessment must be communicated to all those noted above and also to the Facilities General Manager for the site involved.

The Infection Control Manager for Infection Prevention and Control will inform NHS GG&C

If there is impact on patient care then an Incident Management Team (IMT) may be convened to assess the risk and further actions.

Refer to WQS – 017 for out of spec procedure

See table in Appendix 2

5.5 Intermittent or Infrequently Used Water Outlets

If after investigation the taps or appliances identified within the reviewed list, to be updated on a quarterly basis, is deemed not necessary wherever possible the supply pipe work shall be cut back as close to the main circulating line as practicable to ensure that any dead leg formed is minimised and the appliance is removed from the water system.

In circumstances where there has been a lapse in the flushing regime, the stagnant and potentially contaminated water from within the shower or tap and associated dead leg should be purged to drain without discharge of aerosols before the appliance is used.

Where a ward or department is closed or taken out-of-use for an extended period of time e.g.: pending refurbishment, change in-use or other reason, arrangements shall be put in place to ensure the regular flushing and recording of water outlets within such areas. If such closures are considered to be long term or permanent consideration should be given to the disconnection of all water services to the affected areas.

5.6 Emergency Repairs

Emergency repairs may be required at any time and should be undertaken by trained and competent personnel. Such repairs can vary from a simple repair to a section of pipework, replacement of a component or major burst or loss of service. In all such cases the integrity and safety of the water distribution system must be maintained at all times.

5.7 Disinfection of Water System and Components

There are a number of different chemical and thermal disinfection methods available ALL of which shall be undertaken by trained and competent personnel in strict accordance with all Statutory Requirements, Safety Precautions and Manufacturers Instructions.

Disinfection - is the process of destroying or inactivating Pathogenic organisms and is generally applied to the water supply.

Sterilisation – is the process of destroying or inactivating all Organic Life Forms and is generally applied to all systems of transmission and storage materials.

In ALL instances no matter what disinfection method is employed, due regard shall be taken of patient groups, specialist equipment and processes which may be sensitive to the disinfection process being used – eg Renal Dialysis patients **must not** be exposed to Silver Hydrogen Peroxide chemicals as such the RO Water Treatment Plant and Dialysis Machines must be disconnected from the water system until the disinfection process is completed.

Silver Hydrogen Peroxide should NOT be used for a period of 90 days or longer, as required by the Drinking Water Inspectorate.

The disinfection process may be required for the following situations:

REPAIRS -	Repair fittings and exposed pipe ends should be clean and disinfected before use. Such items should be sprayed with a suitable disinfection solution such as a Sodium Hypochlorite @ a strength of 1000 mg/l (1000ppm) with a minimum contact time of 5 minutes or equal and approved.
MINOR ALTERATIONS -	Pipework should be cleaned internally by spraying with a suitable disinfection solution such as a Sodium Hypochlorite @ a strength of 1000 mg/l (1000ppm) or where pipes are long and internal surfaces cannot be reached with sprays then a swab soaked in a solution of 50mg/l (50ppm) with a contact time of one hour or equal and approved.
NEW SUPPLY PIPEWORK -	Pipes are filled with a solution such as a Sodium Hypochlorite @ a strength of 20 mg/l (20ppm) with a contact time of 24 hours. Or Sodium Hypochlorite and water at a strength of 50mg/l (50ppm) for a contact period of one hour. Minimum free chlorine after one hour – 30mg/l (30ppm) or equal and approved
SYSTEM DISINFECTION -	This will include water storage tanks and possibly the water distribution system. The advice and use of Legionella Control Association (LCA) approved contractors will be used for this purpose

NOTE:

Appropriate Method Statements and Risk Assessments will be compiled and obtained prior to any disinfection process commencing. Water Disinfection Risk Based Assessment Form (024) should be completed prior to any disinfection process being carried out. *(SHTM 04-01 Part G (V1 July 2015) Page 38 para 5.9)*

An alternative to chemical disinfection is to pasteurise the system. This involves increasing the temperature to greater than 60°C by increasing the thermostat setting at the calorifier or boiler and recirculation as necessary to maintain this temperature throughout for at least one hour. This should effectively sterilise the calorifier, and kill any *Legionella* organisms present.

The water should be flushed through the system more than once. It is important that all taps are run for at least 5 minutes (preferably longer) at full temperature to ensure that the complete system is pasteurised and that the hot water has reached all parts of the system.

5.8 Pseudomonas SOP

Standard Operating Procedure for minimising the risk of Pseudomonas

This SOP provides direction and guidance for ward based staff to meet their responsibilities as stated in *HPS(2013) Guidance for neonatal units (NNUs) (levels 1,2&3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water.* This document refers to critical control points 2 – 4 (inclusive) only. (Critical points 1, 5 and 6 are considered in the NHSGGC Water Safety Policy 2013.

*High Dependency Units (HDUs) which are adjoining/ integrated with an ICU should be included in this guidance.

Responsibilities:

Senior Charge Nurses (SCNs) must:

- Follow this SOP.
- Ensure that they are aware of access issues to wash hand basins. Where access is an issue they must arrange for flushing to occur and document this.
- Keep records of daily flushing for at least one month within the Facilities Folder.
- Inform a member of the local Estates Team if this SOP cannot be followed in relation to flushing water outlets.
- Inform a member of the local Estates Team of infrequently used outlets which could be removed.
- Allow members of the local Estates Team access to complete maintenance as appropriate.

Estates must:

- Undertake actions deemed the responsibility of the local Estates Department as per the Water Safety Policy.
- Keep a record of outlets reported that are deemed to be infrequently used and actions taken by them to remove this risk.
- Provide a report of maintenance actions and issues/ anomalies to the Sector Water Safety Group.
- Support staff locally to undertake their responsibilities in terms of reducing risk associated with pseudomonas.

Domestic Services must:

- Ensure that water outlets are flushed at full flow for 1 minute (not causing splashing) as part of the cleaning process and to ensure for Mixer taps that this ensures and equal mix of cold and hot. If full flow cannot be achieved taps should be flushed for a longer period.
- Ensure this is the first task completed of the day.
- Record this in the Domestic services Compliance Checklist "Water Outlets"
- Ensure the Checklist is retained within the facilities Folder at ward level for one month.
- Send a copy of flushing records to Water AP and to ensure any rooms/areas which were not flushed are identified.

Managers must:

- Make this SOP available to their staff.
- Support SCNs in following this SOP.

Water Systems Group must:

- Keep this SOP up-to-date.
- Audit compliance with this SOP.
- Provide guidance via the Water Systems Policy.

Flushing Water Outlets

Flushing of water outlets is necessary to control the build-up of biofilm in water systems to reduce the risk of transmission of pathogens via the environment and equipment to patients.

The Senior Charge Nurse (SCN) in each unit has responsibility (under current guidance) to ensure that the following recommendations are complied with in their area. The SCN should ensure that:

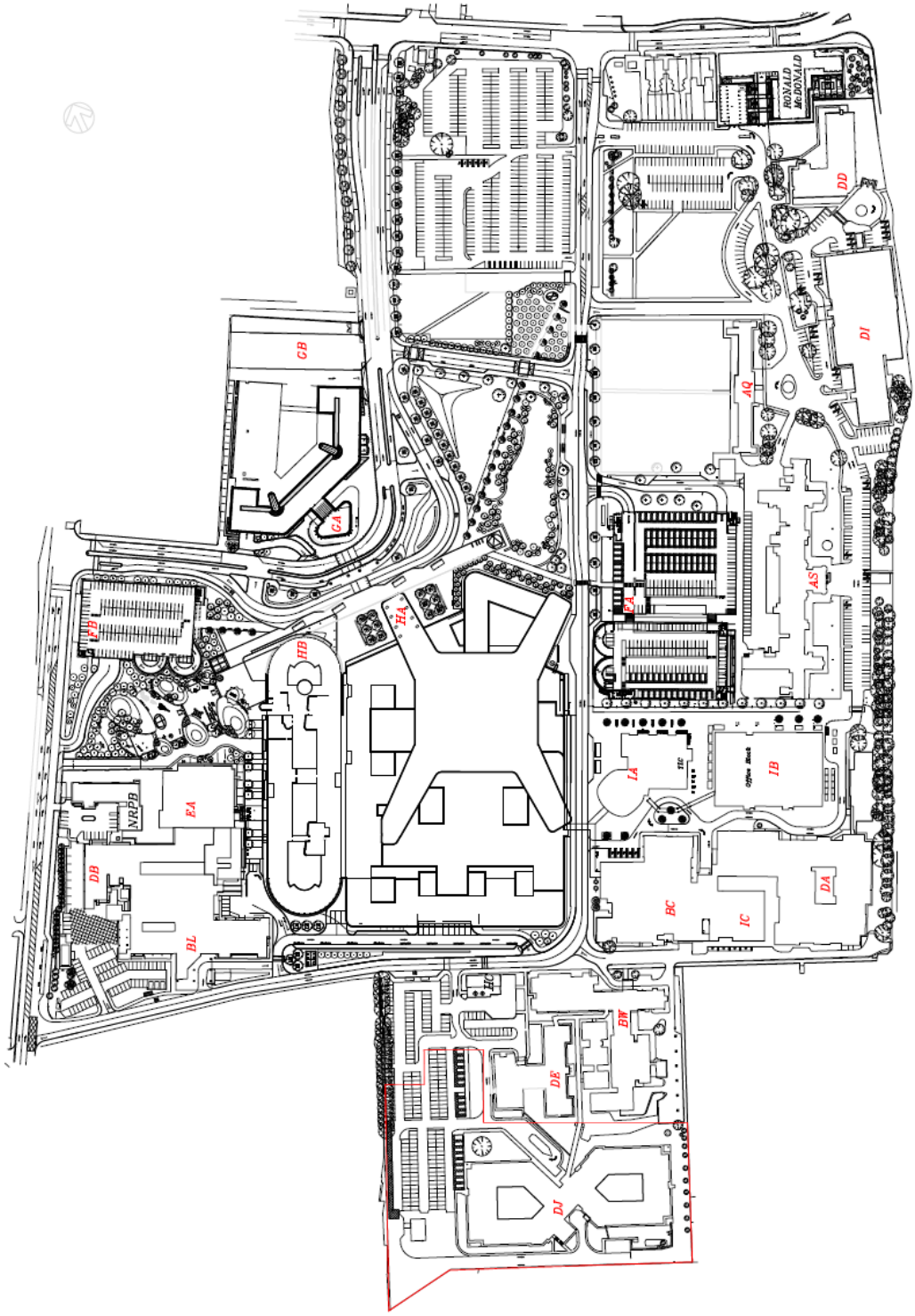
All water outlets are flushed in high-risk environments (adult, paediatric and Neonatal ICUs and associated HDU's), daily, first thing in am for 1 minute at full flow (but not so that splashing goes beyond the basin). This must be recorded. This will be completed as part of the Domestic Services local work schedule for the area .This must be reviewed on a daily basis by the SCN and appropriate action taken when this is identified as not having been completed. Facilities Management should be informed by Domestic Staff if they cannot carry out flushing. This should be reflected on the department flushing records.

Any problems or concerns relating to the safety, maintenance, reduced usage, any changes in use and cleanliness of all water outlets are identified and reported to the ICT and the Estates Department as relevant.

For more information refer to NHS Greater Glasgow and Clyde
'Water Systems Safety Policy Written Scheme and Operational Procedures'

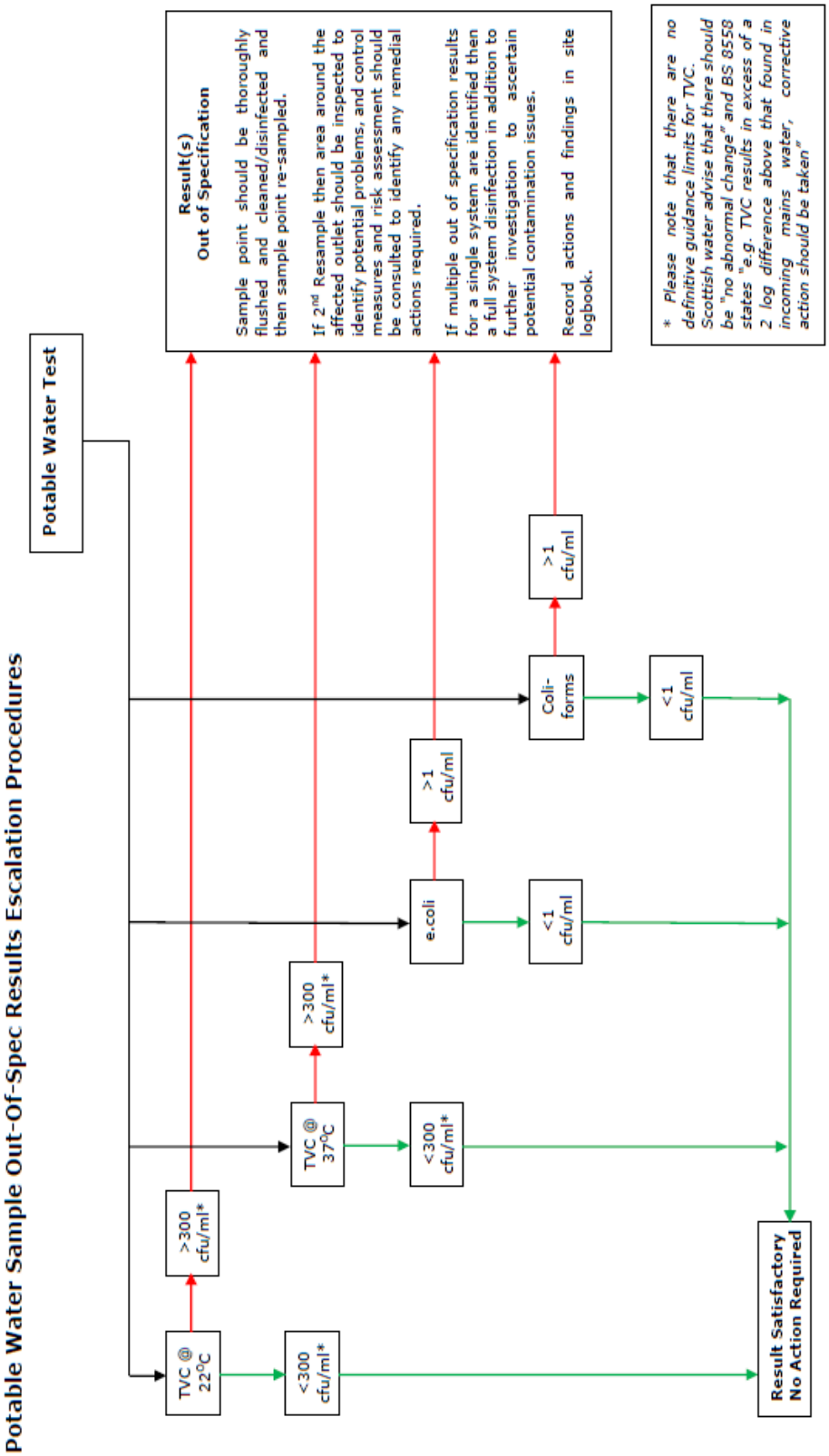
Appendix 1

Site Plan with Block Codes



Appendix 2

Escalation of Sampling Results out-of-spec.



Appendix 3

Risk Assessment Review Guidance

Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Regular check to ensure that legislation and guidance has not changed	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 Management Structure to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of communication lines to ensure still accurate and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of escalation & emergency procedures to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties allocated to site staff and ensure accurate and recorded	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties of sub-contractors and ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered)	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of staff training requirements and update training matrix	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of method statements and risk assessments to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of site documentation to ensure all records up to date and present	L8 HSG 274 Pt 2 SHTM 04-01	
Regular update of "Patient Risk Rating" register for all areas of hospital.	SHTM 04-01 Part B	
Regular review of sentinel outlet locations register.	SHTM 04-01 Part B	
Regular review of primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	HSG 274 Pt 2	
Regular review of plant and equipment maintenance schedules.	Manufacturer's Instructions	
Regular review of BEMS temperature sensor locations to reflect any system alterations	HSG 274 Pt 2	
Regular review of schematic/as-fitted drawings to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 risk assessment with a maximum period of two years between updates. (e.g. if change of use or changes in legislation or any other factor which could affect validity of current assessment)	L8 STHM 04-01	

Appendix 4

HAISCRIBE Risk Assessments

All relevant HAISCRIBE risk assessments produced and approved for Water Systems related tasks are stored on the QEUH Shared Drive within the folder path “

HAI SCRIBE

QEUH Campus Water Systems

WRITTEN SCHEME

Controlling the risks of exposure to Legionella and other harmful bacteria in Water Systems

2023 Rev F

Reviewed by: E. Smith (RP)
K. Clarkson (DRP)
M. MacMillan (Lead AP)
A. Gallacher (Head of Compliance)
M. Feeney (Compliance Manager)

An electronic copy of this document is held on the QEUH Shared Drive at folder path:
S:\SCART Compliance\22 Water\Water Written Schemes\

Table of Contents

1.0 GENERAL OVERVIEW

Note 1: No work will be carried out on the water system without the knowledge and written consent of the Authorised Person (Water).

Note 2: This Written Scheme document is to be read in conjunction with the Operational Procedures for the Written Schemes document and should also be read in conjunction with the Control of Water Records document. For any alterations to the Water System this Written Scheme Document is to be read in conjunction with the Guidance for alterations to water systems document.

1.1 Introduction

This document contains six sections which have been derived from the Risk Assessment to aid the design, installation, maintenance and operational mode of all domestic and process water systems within the premises with respect to the likelihood of the proliferation of waterborne micro-organisms. The assessment also considered the risk of infection presented to building users and the general populous at large, and derived a series of risk ratings and appropriate Remedial Actions and Control Measures, which should be implemented to minimise the presented risks. This Risk Assessment was carried out in a manner consistent with the requirements of *BS8580:2010 Water Quality – Risk Assessments for Legionella Control – Code of Practice*, and is reviewed whenever system alterations or operational considerations may effect a change in the risk.

Section 1 contains an Executive Summary of the recommended control measures and corrective actions together with an overview of the QUEH Site layout and accommodation.

Section 2 contains a record of the logbook inspection, details on the location of records, defects, non-compliance issues, correspondence and archived information.

Section 3 provides information on the management structure associated with the control scheme for the water system and clear definitions of responsibilities held by those named, details of training undertaken and a summary of the designated tasks as detailed in section 4.

This section also provides information on the details of the risk assessment values associated with representative outlets, systems and plant items undertaken since 2013. A generic risk assessment for any positive legionella test results within designated Low Risk locations and a description of the installed plant and equipment with associated schematic layout plans for each of the installed water systems within the site is also contained within this section.

Section 4 of the document details the safe operation of the system and all appropriate Maintenance Procedures (Control Measures) which were derived from the Risk Assessment and recommendations within NHS Greater Glasgow and Clyde Water Systems Safety Policy.

This section of the document contains a task description with associated record (Log) sheet relating to these activities. It should be noted however, that in certain circumstances, specialist contractors are required to implement some Control Measures, and records pertaining to these activities may be held under separate cover. Such activities would typically include those associated with chemical water treatment regimes and drinks vending machines sanitising maintenance.

Refer to Section 2 for the location of records and archived information associated with the maintenance procedures and other control measures.

Section 5 contains supporting information relating to the Control Scheme, and should typically include the recording of system alterations or remedial actions together with utilised materials. Ad hoc maintenance activities should also be recorded in this section, such as system sterilisations which may be required from time to time. This section of the document also contains a glossary of supporting publications, where additional information relating to the risks associated with waterborne micro-organisms, and water quality generally, may be found.

1.2 Executive Summary

The purpose of this Written Scheme document is to assist in the correct and safe operation of the water systems within the QEUH Campus. The document outlines the specific roles, responsibilities, training requirements and regular maintenance procedures to be followed in order to ensure compliance with statutory and mandatory guidance.

Risk Assessments for the water services have been carried out on the instruction of the Board Water Safety Group. DMA Canyon Ltd are presently the appointed Water Systems Risk Assessor and have carried out Risk Assessments within all individual buildings on the campus.

Additionally there are two Hydrotherapy Pools in operation on the campus. These are situated within the New Childrens Hospital, and Spinal Injuries Unit. Separate Risk Assessments have been carried out for both of these facilities by a specialist Swimming Pool Risk Assessment provider.

Risk Assessments require to be reviewed and updated to reflect any changes in-use and / or functions that have taken place since the date of the original Risk Assessment or in the event of control measures becoming ineffective, changes in key personnel or in the event of a case of legionnaires disease / legionellosis associated with the water system. Guidance on the Risk Assessment review procedure is given in Appendix 3.

All documentation and log sheets used to record maintenance activities follow the format contained within guidance document SHTM 04-01 Part G: *Operational Procedures and Exemplar Written Scheme.*

1.3 Overview of Site Accommodation and Premises

The main new-build Adult Hospital building comprises of 12 stories, with the basement housing FM areas and the new-build Childrens Hospital comprising of 4 stories.

On the retained estate there are individual buildings comprising of Neurology, Neurosurgery, Spinal Injuries Unit, PDRU, Maternity, Neo-Natal, Podiatry and Westmarc stand alone with the Teaching and learning and office block new additions.

Full descriptions and information on the individual written schemes are available in the Log book/Risk Assessment folders for each building.

The building codes are as follows:

AC – Minor Injuries Unit
AQ – Acute Medical Block (AMB)
AS – Central Medical Block (CMB)
BC – Neurosurgical Block (INS)
BL – Maternity
BW – Neurology
DA – Spinal Injuries
DB – Maternity Day Surgery
DD – Podiatry
DE – Physically Disabled Rehabilitation Unit (PDRU)
DI – WestMARC
EA – Neo Natal
FA – Multi Storey Car Park 2
FB – Multi Storey Car Park 1
GA – Laboratory Medicine
GB – Energy Centre
HA – Adults Hospital
HB – Childrens Hospital
IA – Teaching & Learning Centre
IB – Office Building
IC – Imaging Centre of Excellence (ICE)

NOTE: ICE building is owned by University of Glasgow (UoG). Facilities management and maintenance is carried out under contract by NHS GG&C on behalf of UoG.

Langland Building is managed via PFI by Serco and MDU is managed via Vanguard.

See Site Map in Appendix 1

2.0 RECORDING

2.1 Written Scheme Inspection Records

Anyone inspecting this written scheme (either as part of the Management Control System or otherwise) is invited to make an entry in this inspection record. **Under no circumstances may this Written Scheme or any part of it be removed from site.**

Date/Time	Comments	Signature	Position
June 2018	Written scheme has been reviewed and re-formatted into this current form (Revision D) by Colin Purdon as part of the water systems review.		Site Manager Operational Estates
Feb 2019	Written scheme has been reviewed and re-formatted into this current form (Revision E) by Colin Purdon as part of the water systems review.		Interim Sector Estates Manager (Deputy Responsible Person)
May 2019 Rev B	Written scheme has been reviewed and re-formatted into this current form (2019 Rev A) by Colin Purdon as part of the water systems review.		Interim Sector Estates Manager (Deputy Responsible Person)
October 2020 Rev C	Written scheme has been reviewed to reflect changes to staff personnel and a review of procedures.		Site Manager Operational Estates
May 2021 Rev D	Written scheme has been reviewed to reflect changes to staff personnel and a review of procedures.		Site Manager Operational Estates
Aug 2022 Rev E	Written scheme has been reviewed to reflect changes to staff personnel and job titles. Additionally modified procedures for WS01 (Page 103)		Site Manager Operational Estates
Jan 2023 Rev F	Minor changes to words regarding daily flushing		Site Manager Operational Estates

Additional entries should be completed on a separate sheet and inserted in Section 2.1 with this sheet.

2.2 Location of Records and Correspondence

Details of any correspondence, including Risk Assessments/Reviews and Ongoing Monitoring Reports, relating to water services should be entered on the sheet below, recording where held and by whom.

Date	Procedure or Record ref	Description	Held by/location
16/07/18	Flushing Outlets 026	Email correspondence in relation to Flushing DCFP kitchen dishwasher and outlets with John Heron and Adam Wright	Colin Purdon email archive. Hard copy in correspondence logbook

Additional entries should be completed on a separate sheet and inserted in Section 2.2 with this sheet.

2.3 Non-Compliance Issues and Fault Detail Log

Record Form 004

All non-compliance and fault details in relation to the individual systems in each building must be recorded on Record Form 004 and brought to the attention of the Water Systems Lead AP as soon as possible. This process ensures that all non-compliance issues are documented, managed effectively and tracked through to completion and close –out of the issue. Copies of Record Form 004 are to be stored within the shared drive. SCART Compliance/22 Water/.

The process for sampling out of specification is documented in WQS – 017 Procedures in the event of out of specification sample for Legionella and other monitored bacteria, moulds etc.

2.4 Archived Information Record Sheet

All records associated with the management or maintenance procedures within this Written Scheme should be kept for a period of five years after they are no longer current. Records should be kept locally within the main Estates Office. The details of any archived information held separately in secure storage should be recorded in the table below.

Date	Procedure or Record Reference	Description	Held By/Location

Additional entries should be completed on a separate sheet and inserted in Section 2.4

2.5 Equipment Calibration Records

All equipment used for the measurement of temperatures should be calibrated at least annually to ensure the accuracy and consistency of the recording procedures.

Calibration certificates for handheld thermometers are held in hard copy within the QEUH Campus Log Book suite in the main estates office. Electronic copies are also held on the QEUH Shared Drive>Water Quality folder.

3.0 MANAGEMENT ARRANGEMENTS

3.1 Roles & Responsibilities

NHS Greater Glasgow & Clyde Chief Executive – (Duty Holder)	The Chief Executive has ultimate responsibility / accountability for water system safety within NHSGG&C. The responsibilities of the Chief Executive include: • Responsibility for implementation of the relevant mandatory and statutory elements contained within the Health & Safety Commissions Approved Code of Practice and Guidance "Legionnaires Disease. The control of Legionella bacteria in water systems" L8 (ACOP L8), SHTM04-01: The control of Legionella, hygiene safe" hot water, cold water and drinking water systems and CEL 08(2013) water sources and potential risk to patients in high risk units – revised guidance. The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring that adequate resources are provided to meet the Water Systems Safety requirements of NHSGG&C estate. Ensuring that the Water Systems Safety Policy is being implemented at all levels. • Reviewing and monitoring the operation of the Water Systems Safety Policy through the Board Corporate Management Team and ensuring that clear guidelines are provided for this tasked with compliance of legislative and statutory standards. • Appointing the Designated person (Pseudomonas) and Designated Person (Water) to assist in the execution of these responsibilities, who for NHSGG&C are the Infection Control Manager (Pseudomonas) and the Director of Facilities (Water).
NHS Greater Glasgow & Clyde Director of Estates and Facilities – (Duty Holder)	The Director of Estates and Facilities is the Designated Person (Water). They shall be responsible for: • Ensuring that Estates and Facilities staff, through the general management structure is fully aware of the current statutory and mandatory requirements and standards for the provision and maintenance of safe water systems. • Ensuring with the Responsible Person (Pseudomonas) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person (Water) at sector level and Deputy Responsible Person(s) (Water) at site level. This shall be the Sector Estates Manager (SEM) and the relevant Site Manager Operational Estates (SMOE)/Site Estates Manager within the Facilities Directorate management structure.

3.1 Roles and Responsibilities (cont)

NHS Greater Glasgow & Clyde Director of Estates and Facilities – (Assistant Duty Holder)	The Assistant Director of Estates and Facilities is the Assistant Designated Person (Water). They shall be responsible for assisting in : • Ensuring that Estates and Facilities staff, through the general management structure is fully aware of the current statutory and mandatory requirements and standards for the provision and maintenance of safe water systems. • Ensuring with the Responsible Person (Pseudomonas) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person (Water) at sector level and Deputy Responsible Person(s) (Water) at site level. This shall be the Sector Estates Manager (SEM) and the relevant Site Manager Operational Estates (SMOE)/Site Estates Manager within the Facilities Directorate management structure.
NHS Greater Glasgow and Clyde Infection Control Manager - Designated Person (Pseudomonas)	The Infection Control Manager supported by the Board Infection Control Doctor is the Responsible Person (Pseudomonas). They shall be responsible for: • Ensuring that Infection Control Teams are fully aware of current guidance on Legionella control matters and the minimisation of the risk of Pseudomonas aeruginosa infection from water. • The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring with the Designated Person (Water) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person(s) (Pseudomonas) at sector level. This shall be the relevant Infection Control Doctor.
Assistant Head of Estates - Responsible Person (Water)	The Assistant Head of Estates will be appointed as the Responsible Person (Water) at Sector level by the Director of Estates and Facilities in writing. The Sector Estates Manager is responsible for: • Ensuring the effective maintenance of engineering controls installed for the purposes of controlling water systems. • Ensuring that written schemes and risk assessments are in place and reviewed regularly. • Devising and maintaining procedures to ensure the quality of water on premises is maintained. • Ensuring operational procedures are carried out and documented. • Ensuring records are kept of all water systems and their purpose, giving locations recording and maintaining within the Boards estates management system. • Liaise closely with other professionals to ensure legislative and statutory compliance is maintained by the Board.

3.1 Roles and Responsibilities (cont)

3.1 Roles and Responsibilities (cont) **Authorising Engineer (AE)**	An Authorising Engineer acts as an independent professional advisor to the healthcare organisation, appointed by the organisation with a brief to provide services in accordance with Scottish Health Technical Memorandum (SHTM) guidance. He will be appointed in writing by the Director of Facilities/General manager (Estates). The Authorising Engineer acts as an assessor, making recommendations for the appointment of Authorised Persons, monitoring the performance of the service and providing an annual audit to the organisation's Designated Person.
Authorised Person (Water)	The Authorised Person (water) has the key operational responsibility for the service, qualified, sufficiently experienced and skilled for the purpose. They will be nominated by the Authorising Engineer and be able to demonstrate • They application through familiarization with the system and attendance at an appropriate professional course; • A level of experience; • Evidence of knowledge and skills. An important element of the Authorised Person (Water) role is the maintenance of records, quality of service and maintenance of system safety (integrity). The Authorised Person (Water) will also be responsible for establishing and maintaining the roles and validation of Competent Persons (Water) who shall be suitable trained employees of the organisation or appointed contractors. Larger sites may require more than one Authorised Person (Water) for a particular service. The Authorised Person (Water) will be appointed by the General Manager – Capital Planning.

3.1 Roles and Responsibilities (cont)

Head of Capital Planning (Water)	The Head of Capital Planning will be appointed as the Deputy Responsible Person (Water) at Board level by the Director of Estates and Facilities in writing. The General Manager for Capital Planning is responsible for: • Ensuring that any new works undertaken or refurbishment within existing premises shall comply with the requirements of this Policy and the Written Scheme and Operational Procedure for managing Water Safety including The control of *Legionella*, hygiene, 'safe' hot water, cold water and drinking Water systems and The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring that all potential interfaces between an operating system and new and refurbishment works shall meet the approval of the Responsible Person (Water) and Authorised Person (water) as to methodology for making that interface. • Ensuring that any work involving the installation of water services or equipment requiring a water supply shall follow the guidance in SHTM 04-01 and HSE document L8 and shall be certified by the design Engineer as to that compliance. • Ensuring that any works which will affect an operational water service will be discussed with the Estates Authorised Person (Water) prior to arranging that work.
Site Estates Manager Deputy Responsible Person (Water)	The Site Manager Operational Estates (SOME) shall be appointed in writing by the Director of Facilities/General Manager (Estates) in writing as the Deputy Responsible Person (Water) and will also act as the Designated Person Water in the absence of the Designated Person (Water). The Site Maintenance Manager/Site Estates Manager is responsible for: • Ensuring all staff conducting water system maintenance are competent to do so. • Ensuring water system maintenance records are maintained and kept up-to-date. • Regularly checking maintenance records. • Ensuring all work is completed in accordance with the NHS GG&C Estates Procedures.

3.1 Roles and Responsibilities (cont)

Acute Services Directors CH(C)P Directors and Corporate Division Directors	As Senior Managers, NHSGG&C Directors play an intrinsic role in ensuring that water safety is embedded within the culture of the organisation. The responsibilities of Directors include: • Supporting the designated person (Water) and (Pseudomonas) in the development of the Board's overall strategy in relation to water safety and for ensuring implementation within their areas of responsibility; • Ensuring that all staff are made aware of their requirement to attend Water Safety training at the appropriate frequency, as per the NHSGG&C Water Safety Policy and Operational Procedures which underpin this by facilitating staff release from duties to attend training; • Supporting action to address staff who put themselves and/or others at risk from a real or potential water safety incident.
Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's	All managers who have a responsibility for the day to day management of facilities, staff or services, and/or premises, have water safety responsibilities that include: • Familiarise themselves with the NHSGG&C Water Safety Policy and local control measures including any water risk assessments for their area(s) of responsibility; • Ensuring that persons in the department, clinic or ward are fully aware of their responsibilities and duties in respect of Water Safety, in particular, the action required of them should the area be defined as High Risk by the local Water Safety Group • Ensure that persons in the department, clinic or ward are fully aware of the Infrequently Used Outlets definitions and Operating Procedure which underpins the NHSGG&C Water Safety Policy
Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's (cont)	• Actively promoting Water Safety within the department or ward by maintaining good housekeeping within the department or ward at all times, ensuring that any flushing or documentation as described in the Water Safety Written Scheme and Operational Procedures documentation is completed on time • Responding appropriately to any water safety concerns that persons in the department, clinic or ward have; • Nominating a responsible person to complete the Monthly Infrequently Used Outlets Audit for each area, forwarding a copy to the Site Maintenance Manager, thereby assisting NHSGG&C to meet its statutory and mandatory requirements; • Ensuring that action is taken on a daily basis to address any access issues identified within the Cleaning Compliance Checklist Sign Off documentation retained in the Facilities Folder. • Liaising with the estates department as required

3.1 Roles and Responsibilities (cont)

Legionella Risk Assessor	The NHS Board appoints in writing a Legionella Risk Assessor with terms of reference to provide services in accordance with BS 8580, SHTM 04-01 and HSE guidance under this Policy. He/she will be appointed in writing by the Director of Facilities/General Manager (Estates)
Competent Person (Water)	The Competent Person (Water) provides skilled installation and/or maintenance of the specialist service. He/she will be appointed, or authorised to work (if a contractor) by the Authorised Person Water). He/she will demonstrate a sound trade background and specific skill in the specialist service, working under the direction of the Authorised Person (Water) in accordance with operating procedures, policies and standards of the service.
Maintenance Tradesperson	A Maintenance Tradesperson is someone who has sufficient technical knowledge and the experience necessary to carry out maintenance and routine testing of the water supply, storage and distribution system.
Installer	The Installer is the person or organisation responsible for the provision of the water storage and distribution system.
Contractor	A Contractor is the person or organisation designated by management to be responsible for the supply, installation, validation and verification of hot and cold water services, and for the conduct of the installation checks and tests in relation to the control of *Legionella*. The NHS Board will expect potential contractors to have suitable qualifications (for example companies/individuals who are members of the *Legionella* Control Association).

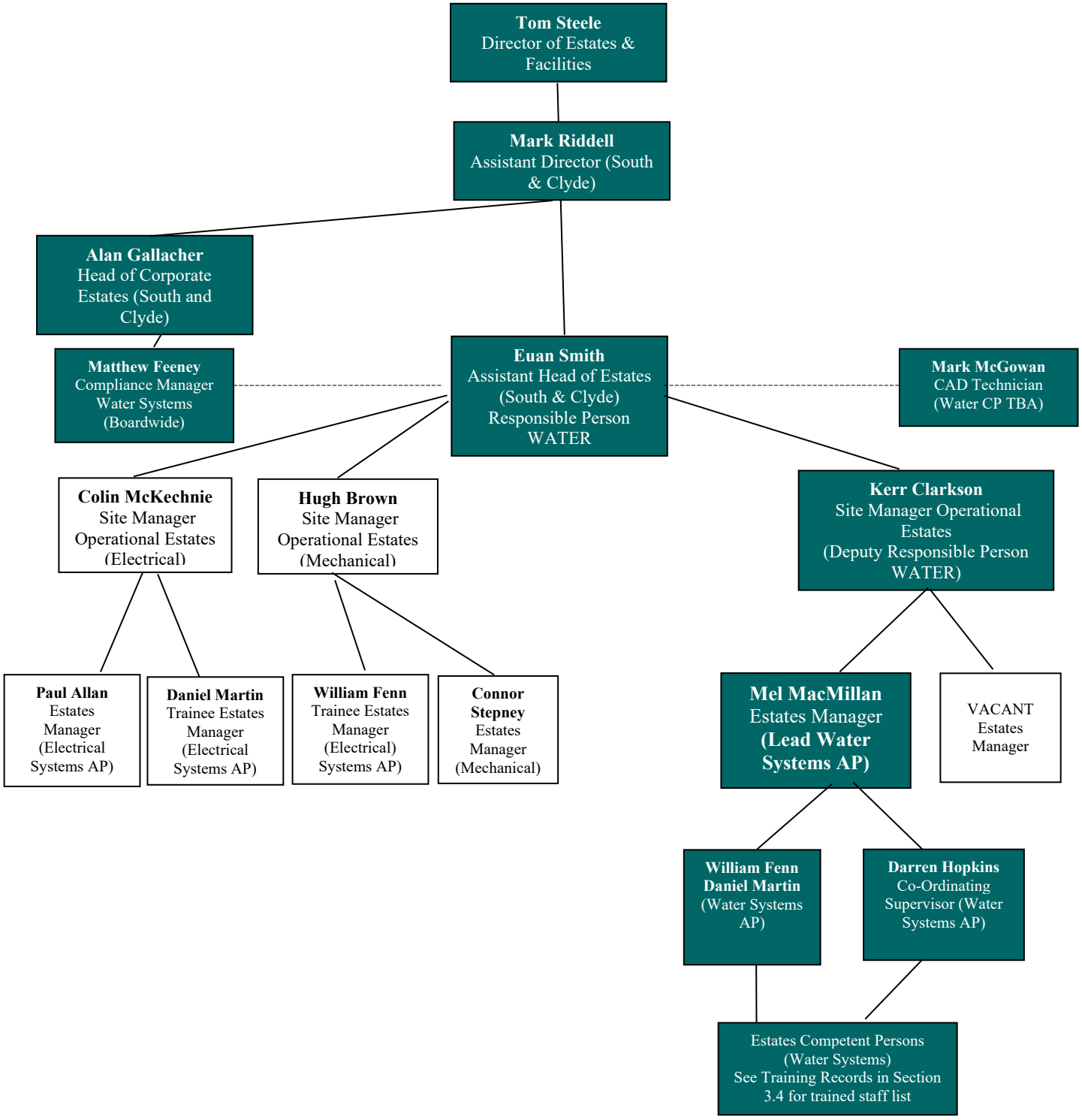
3.1 Roles and Responsibilities (cont)

NHS GG&C South Sector (QEUH) Hierarchy Appointment Table

Designation	Position	Name Tel Number
The Duty Holder	Chief Executive	Jane Grant
Designated Person (Water)	Director of Facilities/General Manager (Estates) Assistant Director (Estates)	Tom Steele Mark Riddell.
Authorising Engineer (Water)	AE	Dennis Kelly [redacted]
Legionella Risk Assessor	DMA Water Services Ltd	David Watson Mike Kinghorn [redacted]
Responsible Person (Water)	Sector Estates Manger (South)	Euan Smith
Deputy Responsible Person (Water)	Site Manager Operational Estates (Building)	Kerr Clarkson
Deputy Responsible Person (Water)	Head of Capital Planning	James Huddleston
Lead Authorised Person	Estates Manager	Mel MacMillan
Authorised Persons	Estates Manager Co-ordinating Supervisor Co-ordinating Supervisor Co-ordinating Supervisor	Darren Hopkins Grant Bennet William Fenn Daniel Martin
Competent Persons	CAD Technician	Mark McGowan
Competent Persons	Plumbers/Engineers	See training records in Section 3.4
Others Involved		
Microbiology	Consultant Microbiologist	Alistair Leonard Linda Bagrade Aleksandra Marek
Infection Control	Director Lead Nurse Lead Nurse	Sandra Devine Gillian Bowskill Lynn Pritchard
Public Health		Dr Iain Kennedy
Laboratory Services		Sandra Higgins

3.2 QEUH Estates Staffing

Management organogram for QEUH Estates Dept as of Oct 2019



3.3 Required Maintenance Tasks

The maintenance and management of the water systems throughout the QEUH Campus is undertaken by a combination of both NHS Staff and external Contractors at the frequencies identified in the following tables.

QEUH Management staff manage and oversee the following tasks:

Procedure Reference	Operation(s)	Record Form Ref	Frequency
P1C1	BMS Temperature Monitoring (**Carried out by NHS Estates**)	**Requires new number**	***Daily***
P1CC1A	Manual Temperature Monitoring for calorifiers (different form used ONLY REQUIRED if no BMS Monitoring	**(005a)**	***Daily***
N/A	Filtration Plant Checks (**Carried out by NHS Estates**)	**028c**	***Twice Daily***
WS01	Daily flushing of all outlets (**Carried out by NHS Facilities**)	**-**	***Daily***
WS01	Deluge shower/Eye wash flushing (**1 off carried out by NHS Estates and 1 off by DMA**)	**(026)**	***Twice Weekly***
WS01	Flushing of little used outlets * frequency based on risk (**Carried out by NHS Clinical**) see page 103	**-**	***Daily or Twice weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
P1C4	DHW Calorifier and Buffer Vessel Checks (**Carried out by NHS Estates**)	**(005)**	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
P1C12	Showerhead/hose replacement/disinfection (*No longer carried out as shower head and hoses replaced quarterly)*	**(005b)**	***Quarterly***
WS01	Review of Rarely Used Water Outlets and Changes In-Use (As required by NHS Estates)		***Quarterly***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
N/A	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates during calorfier checks, Plant Room checks and by DMA during Tank Room checks**)		***Annually***
N/A	Vibration coupling inspection (Carried out as part of checks on booster pumps) (**Carried out by NHS Estates**)		***Annually***
N/A	Carry out review of log books and Written Scheme		***Annually (Sep)***
N/A	Carry out review of drawings and schematics		***Annually (Sep)***

3.3 Required Maintenance Tasks (cont)

In addition to the tasks undertaken by NHS directly employed Competent Persons, there are also tasks undertaken by Contractors on a selection of buildings within the campus.

Appointed Service Providers presently undertake the following tasks:

Procedure Reference	Operation(s)	Record Form Ref	Frequency
WS01	Deluge shower/Eye wash flushing (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
WS01	Flushing Deadlegs and drain valves (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
WS01	Flushing Intermittently used outlets (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
	External Water Mains Valve Operation and Flushing Routines		***Monthly***
PIC4	Temperature and CL02 monitoring of outlets (**Carried out by DMA**)	**DMA Records**	***Monthly***
-	PPM Schedule Monthly Visually inspect chemical delivery system, Check chemical suction and delivery lines for correct operation Chemical level check and refill , Cross check measured ClO2 / Chlorite residual test against analyser & Palintest Kit, Check and Adjust controller settings as required (**Carried out by ScotMas**)	**ScotMas Records**	***Monthly***
	PAL Filters on taps outlets (**Carried out by DMA**)	**DMA Records**	
	'TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)	Carried out 6 monthly	***Quarterly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK) **Carried out 6 monthly**		***Quarterly***
	Shower Head and Flexible Hose Exchange (**Carried out by DMA**)	**DMA Records**	***Quarterly***
WQS 001	HORNE Tap Flow Restrictor Exchange (**Carried out by DMA**)	**DMA Records**	***Quarterly***
	'TMV' Tap Outlet Sanitisation and Operational Checks (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
-	Maintenance of filtration units (**Carried out by Veolia**)	**Veolia Records**	***Six-Monthly***
-	6 Monthly Visit– All above, plus, Check ClO2 gas detector functionality and recording levels, Simulate fault circuitry and alarm on Sentinel Monitor, Change probe electrolyte and cross calibration test, Carry out manual Chlorate & Chlorite validation tests (12 representative outlets), Check water meter operation and report o Electrolyte top up, Probe calibrations (**Carried out by Scotmas**)	**ScotMas Records**	***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***

3.3 Required Maintenance Tasks (cont)

	CWST Inspection **(Carried out by DMA)**	**DMA Records**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks **(NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING)**	**DMA Records**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required **(Carried out by Scotmas)**	**ScotMas Records**	***Annually***
P1C10	Representative Tap Temperature Monitoring Note all tap temperatures are checked through TMT/TMV maintenance **(Carried out by DMA)**	**DMA Records**	***Annually***
	BMS Sensors (**Carried out by Schneider and MCE BMS Providers for respective BMS**)	**Schneider &** **MCE records**	***Annually***

3.4 Training Records

The following NHS personnel are certified to have the required ability, experience, instruction, information and training to carry out the work associated with legionella precautions at QEUH Campus.

NAME	POSITION	NATURE OF TRAINING (QUALIFICATION, TRAINING COURSES ATTENDED)	DATE
Euan Smith	Sector Estates Manager RP	Responsible Person Course ENAP City & Guilds Authorised Person ENWS City & Guilds Managing Water Systems	
Kerr Clarkson Mel MacMillan	Site Manager Operational Estates Manager Lead AP	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	
Daniel Martin William Fenn	Trainee Estates Managers AP	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	
Grant Bennet Darren Hopkins	Co-Ordinating Supervisor AP	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	

Copies of all relevant training records and appointment letters are held electronically on the QEUH Shared Drive within the folder path “Water Quality>Training and Appointments”.

The results achieved by each member of staff during their competency training are held on the central database managed by the Water Systems Compliance Manager.

NAME	POSITION	NATURE OF TRAINING (QUALIFICATION, TRAINING COURSES ATTENDED)	DATE
Martin Inglis	Tech Plumber	Competent Persons	
Andrew Hamilton	Tech Plumber	Competent Persons	
David Fickling	Tech Plumber	Competent Persons	
Mark McInally	Tech Plumber	Competent Persons	
Shawn O'Neill	Tech Plumber	Competent Persons	
Jason Weir	Tech Plumber	Competent Persons	
Adam Gardner	Tech Plumber	TBC	
Robert Grant	Tech Plumber	TBC	
Ryan Ogilvie	Tech Plumber	TBC	
Gavin Goodall	Apprentice	TBC	
Paul Kelly	Apprentice	TBC	
Mark McGowan	CAD Technician	TBC	

Copies of all relevant training records and appointment letters are held electronically on the QEUH Shared Drive within the folder path "Water Quality>Training and Appointments".

The results achieved by each member of staff during their competency training are held on the central database managed by the Water Systems Compliance Manager.

3.5 Training Requirements

A programme of training and procedures to assist in assessing and ensuring the competence of ALL persons responsible for the operation, maintenance, repair and alteration to the water distribution system and associated plant and equipment requires to be progressed, developed and implemented.

QEUH Estates Staff - Interim Training Requirements:

Item	Training Requirement	Applicable to	Target Date for Completion	Date Completed
1	Toolbox talks on Written Scheme Section 4 for staff.	All plumbers		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

NOTE:- This table should be updated on a regular basis as part of the review process described in **Section 3.10.**

3.6 Water Systems Risk Assessment

The duly appointed *Legionella* Risk Assessor for *Legionella* and Water Systems Safety will update the *Legionella* risk assessment database as directed by the board.

Risk assessments for each building have been conducted by DMA Water Ltd and are filed in the main Estates Office at QEUH. Each contains details of individual systems and a summary of the associated risks. The risk assessments each contain unique information in regard to the water distribution systems in the buildings and also guidance on the recommended maintenance procedures for mitigating risk.

Risk Assessment Review-Escalations

During the Risk Assessment, whenever an anomaly is discovered on either the hot or cold water systems, the Risk Assessors e-mail the AP (water) with their findings. These anomalies are actioned by creating a FM job for the onsite CP Plumbing Technician. The findings are held in the Estates office in the folder named (Pre Risk Assessment Jobs completed).

Risk Assessment Process for Removal of Identified Items

Points are actioned that have been identified in the Risk Assessment, all drawings are updated to reflect the changes and the Risk Assessment action point is closed.

Risk Assessment Review Schedule

A review of the Risk Assessments MUST be carried out after or during the following:

A change to the water system or its use

A change to the use of the building/ward/clinic/dept etc.

Changes in legislation or updates in control measures

Changes in immediate management or key personnel

Control measures becoming ineffective

Increased micro-bacterial levels found in the water system or a case of legionnaires disease/legionellosis associated with the water system.

Action plan details for each risk assessment are summarised on the Smartsheet tool.

Electronic copies of the Risk Assessments are also held on the QEUH Shared Drive at the folder path

“Water Quality>Risk Assessments”

Further information on reviewing Risk Assessments is detailed in Appendix 3.

3.7 Plant Description and Schematics

Details of the plant in each building and schematic layouts are contained within the individual log books/risk assessments for each building. The log books/risk assessments are stored in the main Estates Office at QEUH.

These details are also held on the Shared Drive

All plant details and system schematics and as-fitted drawings for the Adult & Childrens Hospitals are contained in the ZUTEC cloud based document management system. All Estates Managers and Supervisors have access to these systems.

Additional access accounts can be set up at the request of the QEUH Site Manager Operational Estates.

Brendan.egan[redacted]

3.8 Water Systems Audits/Review Procedures

A duly appointed Authorising Engineer (Water) will audit the entire Water Safety procedures within *NHS Board* annually.

The appointed Authorising Engineer for Water Safety will produce an annual report for management review. *See Section 3.1 pg 18 for current appointments.*

AE Audit

The Lead Authorised Person (Water) must regularly gather and maintain all the relevant information and records, including relevant Water Safety Risk Assessments and Written Schemes.

Working with the Authorising Engineer (Water) and Responsible Person (Water), the relevant Authorised Person (Water) will review and analyse all records for compliance with *Legionella* and other water safety parameters.

The relevant Authorised Person (Water) will detail on these records any deviations from the *Legionella* and other water safety parameters giving a brief description as to the reason for this deviation.

The Audit Programme will consist of planned audits on the following elements, for example:

Risk Assessments;

All documentation associated with this Written Scheme

training review and records;

schematic drawings;

Water Safety Log Books/Maintenance records;

BMS trend log comparison.

A report will be produced summarising the audit for submission to the Sector Water Safety Group.

The Lead Authorised Person (Water) will file locally, all relevant information and maintain hard copy records in the Water Safety Log Books stored within the main Estates Office. All actions identified should be tracked to ensure completion and closure.

Summary of Internal/External Audit Procedures

Frequency	Task	By Whom
Annually	Carry out Authorising Engineers Audit and produce report for submission to Sector Water Safety Group (Section 3.8 WS)	Lead AP, AE,
Annually/May	Carry out annual review of written scheme and produce report for submission to Sector Water Safety Group (Section 3.9 WS)	RP/DRP, Lead AP, Compliance Mgr
6 monthly	Carry out management review (Section 3.10 WS)	RP/DRP, Lead AP, Compliance Mgr
Monthly	Carry out regular audit of SCART topic and update database (Section 3.11 WS)	Lead AP
Monthly	Conduct contractor meetings/audits to ensure compliance with legislation and training requirements.(Section 3.12 WS)	Lead AP

3.9 Written Scheme Audit Procedure

The Written Scheme will be audited at agreed intervals but should be at least annually.

An audit schedule will be prepared to ensure the entire procedure is audited. This should be done in conjunction with the Lead AP (Water Systems), Compliance manager, and Responsible Person (Water Systems). A report should be produced and submitted to the Sector Water Safety Group.

3.10 Management Review

The Responsible Person (Water) will hold regular review meetings to confirm current compliance with Water Safety System requirements, identification of any deficiencies and actions required to resolve staff training needs.

The management review will be based on following:

- Results of internal audits;
- Results of external audits;
- Staff suggestions;
- Training records;
- Operation of the system and procedures over a reasonable historic period (6 to 12 months)

3.11 Water Systems SCART Report

The Lead Authorised Person (Water) must regularly gather and maintain all the relevant information for import into the Campus SCART system.

All evidence confirming the SCART position and justification for risk rating adjustments should be uploaded to the SCART database in electronic format.

3.12 Contractor Management & Audit Report

Contractor Management Process

Regular review meetings should be set up with any contractors working on the water distribution system. Minutes of the meetings are held on the QEUH Estates Shared Drive at the path: SGH Estates>Water Quality>Contractor Meetings.

Discussions should include:

Ongoing works;
Future task programme;
Recording procedures;
RAMS;

Contractor Competency

Regular checks should be performed to ensure that any contractors working on the water distribution system are deemed competent and all operatives are suitably trained to conduct the delegated tasks. Copies of all Risk Assessments and Method Statements should be refreshed and all training records reviewed by the Water Systems AP. Copies are stored on the QEUH Campus Shared Drive in Water Quality.

Contractor Audit Report

A report should be produced at least annually to record the findings of the audit.

3.13 Permit to Work, Water Systems.

The Permit to Work Water Systems as per this written scheme is solely intended to be used when works on the hot and cold water systems and its ancillary equipment are to be completed within the QEUH and RHC campus. This includes break-ins to existing pipe work, removal of dead legs and any new installation works.

The Permit to Work may only be issued to Competent Persons (L8 approved) by the Authorised Person (AP) for water. This includes in house maintenance staff and approved contractors.

The Permit to Work form will include the following;

- Name of the organisation issuing the permit.
- Permit number.
- Name of Authorising Person (AP), including emergency contact details.
- Reasons for the works on the water system, (Plant Preventive Maintenance, Planned repairs or Emergency works).
- Exact location of the works
- Reference to any as built drawing numbers, (for update purposes).
- Name of Competent Person (CP) undertaking the works.
- Hazards and Risks, (copy of Risk assessment and Method Statements (RAMS) to be submitted for approval before start of works)
- Commissioning and Testing.

The above points on the Permit Work are broken into five categories, namely;

Part 1 Description of work and authorisation/permission to proceed.

Part 2 CP acceptance of work and conditions.

Part 3 Confirmation of work completion and engineering test results.

Part 4 Authorisation to use a system.

Part 5 Acceptance of system status by Nurse Manager.

Procedure to be followed for Permit to Work on water systems within the QEUH and RHC;

Sign into Estates office within the Laboratory building on the QEUH and RHC campus.

Receive induction from Authorised Person water.

Provide L8 Competent Person certification to Authorised Person water.

Provide applicable RAMS for the works to be completed.

3.14 Tool Box Talk, Hot and Cold Water Systems.

Estates Tool Box Talk on Hot and Cold water Systems is located on the shared drive / water quality / Estates Tool Talk. This is carried out in the form of a power point presentation.

4.0 MAINTENANCE PROCEDURES

Procedure Reference	Operation
4.1	SYSTEM INFORMATION
4.2	MAINTENANCE PROCEDURES SUMMARY
4.3	WEEKLY MAINTENANCE TASKS
4.4	MONTHLY MAINTENANCE TASKS
4.5	QUARTERLY MAINTENANCE TASKS
4.6	SIX MONTHLY MAINTENANCE TASKS
4.7	ANNUAL MAINTENANCE TASKS
4.9	BI-ANNUAL MAINTENANCE TASKS

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.1 System Information

4.1.1 Correct and Safe Operation of the System

Measures should be in place to ensure that the water system is operated within the specific parameters as detailed in the following paragraphs:

4.1.2 Hot Water System

The storage of domestic hot water should be arranged to ensure that a water outflow temperature of at least 60ºC is achieved. No two water systems are the same and through periodic monitoring operational system performance, the system outflow temperature should be set to over 60ºC to ensure an outflow of 60ºC is achieved under normal draw-off demand and achieve 55°C at the supply to the furthermost draw-off point in the circulating system. It is important to maintain temperatures at above this figure (Legionellae organisms will survive for only a short period of time above this temperature - approximately two minutes).

Periodic performance monitoring and a system of continuous monitoring and recording of water temperatures via a building management system (BEMS) or data logger is essential to ensure compliant system performance.

The outflow water temperature, under prolonged maximum continuous demand (at least 20 minutes) from calorifiers should not be less than 60ºC.

While it is accepted that occasionally under peak instantaneous or prolonged demand the water outflow temperature will fall, it is not acceptable if this occurs frequently (more than twice in any 24 hour period) and/or for long periods (exceeding 20 minutes).

Under no circumstances should the domestic hot water flow temperature fall below 55ºC.

It is recommended that disinfection by pasteurisation is undertaken if the water temperature of the calorifier falls below 45ºC. A minimum domestic hot water circulation (return) temperature of 55ºC shall be maintained during the hours of occupancy.

4.1.3 Cold Water System

All domestic cold water storage cisterns and tanks shall comply with the requirements of the Scottish Water Byelaws.
Duplicate tanks often create a risk of water becoming stagnant in one of them, leading to risk of Legionella, Pseudomonas Spp or similar contamination. Consideration should be given to taking one of the tanks out of service. See guidance in “Guidance for Alterations to Water Systems”.

All cold water storage tanks are to be examined and the temperature tested on a regular summer / winter six monthly cycles and cleaned on an annual basis as required.

Temperatures in cold water storage tanks and the mains inlet to them should be checked during periods of high ambient temperatures (e.g. summer afternoons between June and August). Water temperatures should be less than 20ºC.
At the same time, the furthest and nearest draw off points in the system should be checked to ensure that the water distribution temperatures are less than 20ºC within 1 minute of running the water (at full flow).
A similar temperature check regime should be undertaken during the winter months to identify the performance of cold water distribution systems and the impact of heat gain from heating systems.

4.1.4 Cold Water System Dump Valves

The cold water system installed in the Adult & Childrens Hospitals has a dump valve arrangement incorporated into the ground floor, 1st floor and 2nd floor layouts. The positions of the dump valves are shown on the Schneider BMS STRUXUREWARE system and connected via the KNX network.
Operating parameters for the dump valves are as follows:
Open at 23°C
Close at 20°C

4.1.5 End of Line Sensors (EOLs)

The hot and cold water system also incorporates End of Line (EOL) sensors which monitor the temperatures at specific sentinel points across all 11 floors of the Adult & Childrens installation. These can also be viewed via the Schneider BMS system.

4.1.6 Sampling

General microbiological and Legionella sampling in hot & cold water systems

Circumstances under which samples are taken:

- prior alterations to an existing water system;
- as part of commissioning process, prior to handover of a new building or introduction of a (altered, refurbished or new) water system into use;
- one week following handover of a new building or new water system;
- as part of the tank cleaning and disinfection process;
- as part of an assessment programme;
- in response to taste, odour or sustained discoloured water complaints.

When such samples are taken, a mains supply sample should be taken as a control to verify whether the supply could be the source of the identified problems. Scottish Water should also be contacted for distribution zone water quality data.

4.1.7 WS01 – Little Used Outlets

Control of Legionella in Water Systems, Intermittently used Water Outlets and Showers, Standard Operating Procedure WS01.

The Estates department is required to ensure that on a quarterly basis the list of ‘intermittent’ or ‘infrequently’ used water outlets or showers is reviewed to ensure it is accurate and up to date. Records of these reviews will be held within the system logbooks held locally.

If after investigation the taps or appliances identified within the reviewed list are deemed not necessary wherever possible the supply should be cut and the appliance removed from the water system. Where this is not possible then pipe work shall be cut back as close to the main circulating line as practicable to ensure that any dead-leg formed is minimised.

Nursing and other staff must be made aware of the issues surrounding legionella contamination and the link to low and underused water outlets and their assistance in formally identifying these possible outlets are sought.

Upon acknowledgement from the clinical staff of any intermittent or infrequently used outlets, the records are held on the Estates shared drive under Water Quality / WS01.

Any request from clinical staff regarding the removal of any intermittent or infrequently used outlets is assessed and surveyed by the AP (Water). If deemed appropriate a job is raised on FM for the Plumbing Technicians to remove, this is documented in the WS01 Records file in the Water Quality file on the shared drive. Subsequent hot and cold water pipe drawings are updated by the CAD Technician CP (water) where and when appropriate.

FILLING IN LOG SHEETS

Good water hygiene depends on maintaining high standards of cleanliness and freshness, together with careful temperature control. This section contains details of checks and recording sheets (marked "Log Sheets") to be filled in when checks and measurements are made to show that the necessary standards are being kept up. Alternatively, where an electronic PPM system is used, Procedure references should be entered.

Follow the instructions within the boxes and make entries as each task is completed. The tasks are all listed at the front of each section e.g. weekly tasks at the front of the weekly section, monthly section, quarterly 6 monthly etc. The summary list of tasks in this section is to remind you of what is required.

The Task and Log Sheets can be copied as required, completed Log Sheets will be filed where indicated in Section 2. **FM First ticket number MUST be included in all logsheets.**

PLANNING

The tasks and forms are organised into weekly, monthly, quarterly and annual sections. Always aim to carry out tasks early in the period when they are due to leave an opportunity to do them later if an emergency delays your plans.

ASK

If you have difficulties with the forms or do not understand the tasks, ask your Supervisor or line manager for clarification or guidance.

CHECKING

Incomplete or incorrect records are unacceptable in that they are misleading and do not do justice to the effort put in to achieve standards. Each log sheet includes a space for comment and tells you to check that all the boxes are complete: do make use of the comment space and double check the form, otherwise the record will have gaps and whoever is responsible for auditing will concentrate on what is missing and may not give you credit for the work that has been done.

LOG INSPECTION

Anyone inspecting this log (either as part of the Management Control System or not) is invited to make an entry in the inspection of Log Book record in front of Section One.

SURVEY

For survey purposes all surveys will be carried out starting left to right, where 2 off access doors are available the left access shall be taken first. Surveys shall be undertaken from top to bottom.

EQUIPMENT FITTINGS AND MATERIALS

Prior to carrying out alterations/ additions to distribution systems, the Water Fittings and Materials Directory published by the Water Regulations Advisory Scheme, should be consulted. This directory lists all materials and fittings approved for use to satisfy the requirements of current Water Byelaws.

Details of all new materials and fittings used in installations should be noted and recorded on the specific work document or project file for future reference.

SYSTEM ADDITIONS AND ALTERATIONS

Any additions, modifications or improvements to the water distribution system are to be noted and recorded and system record's amended to reflect such changes.

HYGIENE PRACTICES

Care should be taken to ensure high levels of personal hygiene, clean hands, clean clothing and PPE or gloves is maintained at all times when working on wholesome water operations. Tools, equipment, instrumentation and material's shall be free from contamination and appropriately disinfected before use.
Items such as pumps and hoses used in contact with water used for domestic purposes must be stored separately, clearly identified (ie colour coded or labelled) and **MUST NOT BE USED FOR ANY OTHER PURPOSE.**

Refer to Section 2.2 for location of maintenance records for the above.

4.2 Maintenance Procedures Summary

This section contains information in relation to the operational and maintenance checks managed by QEUH NHS Staff and appointed contractors to minimise the risk of exposure to *Legionella* and other waterborne micro-organisms within the domestic water systems, and to improve water quality. Procedures are as per the recommendations and exemplar models given in SHTM 04-01 Part G.

Procedure Reference	Operation(s)	Record Form Ref	Frequency
P1C1	BMS Temperature Monitoring (**Carried out by NHS Estates**)	**Requires new number**	***Daily***
P1CC1A	Manual Temperature Monitoring for calorifiers (**different form used ONLY REQUIRED if no BMS Monitoring**)	**(005a)**	***Daily***
N/A	Filtration Plant Checks (**Carried out by NHS Estates**)	**028c**	***Twice Daily***
WS01	Daily flushing of all outlets (**Carried out by NHS Facilities**)	**-**	***Daily***
WS01	Flushing of little used outlets * frequency based on risk (**Carried out by NHS Clinical**) see page 103	**-**	***Daily or Twice weekly***
WS01	Deluge shower/Eye wash flushing (**1 off carried out by NHS Estates and 1 off by DMA**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
P1C4	DHW Calorifier and Buffer Vessel Checks (**Carried out by NHS Estates**)	**(005)**	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
P1C12	Showerhead/hose replacement/disinfection (***No longer carried out as shower head and hoses replaced quarterly***)	**(005b)**	***Quarterly***
WS01	Review of Rarely Used Water Outlets and Changes In-Use (**Carried out by NHS Estates**)		***Quarterly***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
N/A	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates**)		***Annually***
N/A	Vibration coupling inspection (Carried out as part of checks on booster pumps) (**Carried out by NHS Estates**)		***Annually***
N/A	Carry out review of log books and Written Scheme		***Annually (Sep)***
N/A	Carry out review of drawings and schematics		***Annually (Sep)***

4.3 Required Maintenance Tasks (cont)

In addition to the tasks undertaken by NHS directly employed Competent Persons, there are also tasks undertaken by Contractors on a selection of buildings within the campus.

Procedure Reference	Operation(s)	Record Form Ref	*Frequency*
	CWST Inspection **(Carried out by DMA)**	**DMA Records**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks (**NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING**)	**DMA Records**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required **(Carried out by Scotmas)**	**ScotMas Records**	***Annually***
P1C10	Representative Tap Temperature Monitoring **Note:** All tap temperatures are checked through TMT/TMV maintenance **(Carried out by DMA)**	**DMA Records**	***Annually***
P1C1 4.3.1	Daily BMS Temperature Monitoring (**Carried out by Estates**)	**(021)**	***Daily***
P1CC1A 4.3.2	Manual Temperature Monitoring ***(only required in absence of BMS)*** (**Carried out by NHS Estates**)	**(005a)**	***Daily***
4.3.3	Filtration Plant Checks (**Carried out by NHS Estates**)	**(028c)**	***Twice Daily***
-	Flushing all outlets (**Carried out by NHS Facilities**)	-	***Daily***
WS01	Flushing Intermittently used outlets (**Carried out by DMA**)	-	***Twice Weekly***
WS01	Flushing Deadlegs and drain valves (**Carried out by DMA**)	-	***Twice Weekly***
WS01	Deluge shower/Eye wash flushing (**Carried out by DMA and NHS Estates**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
-	Temperature Recording of Sentinel Hot and Cold Water Outlets for CL02 (**Carried out by DMA**)	-	***Monthly***
P1C4	DHW Calorifier and Plate Heat Exchanger Checks (Carried out by NHS Estates)	**(005)**	***Monthly***
-	PPM Schedule Monthly Visually inspect chemical delivery system, Check chemical suction and delivery lines for correct operation Chemical level check and refill , Cross check measured ClO2 / Chlorite residual test against analyser & Palintest Kit, Check and Adjust controller settings as required (**Carried out by ScotMas**)	-	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing. (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
	Replacement of PAL filters (**Carried out by DMA**)		***31 Days or 62 Days***

Procedure Reference	Operation(s)	Record Form Ref	*Frequency*
WQS 001	HORNE Tap Flow Restrictor Exchange (**Carried out by DMA**)		***Quarterly***
	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK)		***Quarterly***
	'TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)		***Six-Monthly***
	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)		***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (Carried out by DMA) (**Carried out by DMA**)	**(003)**	***Six-Monthly***
	TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
-	Maintenance of filtration units (**Carried out by Veolia**)	**Veolia Records**	***Six-Monthly***
-	6 Monthly Visit– As per monthly, plus, Check ClO2 gas detector functionality and recording levels, Simulate fault circuitry and alarm on Sentinel Monitor, Change probe electrolyte and cross calibration test, Carry out manual Chlorate & Chlorite validation tests (12 representative outlets), Check water meter operation and report o Electrolyte top up, Probe calibrations (**Carried out by Scotmas**)	**ScotMas Records**	***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
	CWST Inspection (**Carried out by DMA**)	**-**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks (NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING)	**-**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required (**Carried out by Scotmas**)	**-**	***Annually***
P1C10	Representative Tap Temperature Monitoring Note all tap temperatures are checked through TMT/TMV maintenance (**Carried out by DMA**)	**-**	***Annually***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates**)		***Annually***
P1C10	Representative Tap Temperature Monitoring (**Carried out by DMA as part of TMV checks**)	**(005)**	***Annually***
	Vibration coupling inspection Carried out monthly as part of checks of Booster sets (**Carried out by NHS Estates**)		***Annually***
	BMS Sensors (**Carried out by Schneider and MCE BMS Providers for respective BMS**)		***Annually***

4.3 Daily Maintenance Tasks

Reference	Operation
4.31	BMS Temperature Monitoring
4.32	Manual Temperature Monitoring
4.33	Filtration Plant Checks

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.31 – BMS TEMPERATURE MONITORING

DAILY

FM First Template No 826

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 26 para 3.11

RECORD FORM - (021)

PROCEDURE REF - P1C1

SCHEDULE REF – BMS 01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **DAILY** as a minimum:

Description of Works

- Refer to the BMS Temperature Monitoring Schedule BMS 01.
- Log onto both STRUXUREWARE BMS and DISTECH BMS front ends and check all temperatures from listed locations.
- Complete Schedule BMS 01 to confirm all temperatures have been checked.
- Any temperatures found outside the defined parameters stated on the BMS Temperature Monitoring Schedule should be investigated and resolved immediately. Details must be entered on Record Form (021) and escalated to the Water Systems AP.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Schedule BMS 01 and Incident form **04** if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return forms to the Water Systems AP.

NOTE: Both Struxureware and Distech BMS systems are capable of generating temperature trend logs. These logs will be checked on a regular basis by the Water Systems AP to confirm accuracy of information.

4.32 – MANUAL TEMPERATURE MONITORING (in absence of BMS)

DAILY

FM First Template No 830

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 26 para 3.15

RECORD FORM – (005a) (021a)

PROCEDURE REF - P1CC1A

SCHEDULE REF – MTM 01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **DAILY** as a minimum:

Description of Works

- Refer to the Manual Temperature Monitoring Schedule MTM 01.
- MANUALLY visit each location and obtain and record temperatures from all plant as listed on Schedule MTM 01.
- Any temperatures found outside the defined parameters stated on the MTM 01 Temperature Monitoring Schedule should be investigated and resolved immediately. Details must be entered on Incident Form (004a) and escalated to the Water Systems AP.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (005a) and (004) if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.33 – FILTRATION PLANT CHECKS

TWICE DAILY

FM First Template No 836

IN ACCORDANCE WITH BOARD POLICY

RECORD FORM – (028c)

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE DAILY** as a minimum AM and PM:

Description of Works

- Refer to the Filtration Plant Daily Checks Log sheet (028c).
- Complete all listed checks and ensure plant is running if selected as DUTY, or available to run if selected as STAND-BY.
- Details must be entered on Record Form (028c) and any issues escalated to the Water Systems AP immediately.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (028c) if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.4 Weekly Maintenance Checks

Reference	Operation
4.41	Flushing of Rarely Used Water Outlets (Twice Weekly)
4.42	Flushing of Deadlegs & Drain Valves (Twice Weekly)
4.43	Rotation of Water Services Duty/Stand-By Pumps
4.44	Operation and Checks to Emergency Deluge Shower/Eye Wash (Twice Weekly)

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.41 – FLUSHING OF INTERMITTENTLY USED WATER OUTLETS

FM First Template No 824

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 101 para 6.36

RECORD FORM - (DMA)

PROCEDURE REF - WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE WEEKLY** as a minimum:

Description of Works

- Refer to the locations listed by DMA.
- Estates to arrange for the Schedule to be updated to record on a regular basis.
- Flush water from ALL outlets identified at a minimum frequency of Twice Weekly for a minimum period of 3 minutes per tap outlet taking care not to cause splashing or exposure to water aerosols / droplets.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form ensuring that you date, sign it.
3. DMA to send flushing records to Water Systems AP.

NOTES:

In circumstances where there has been a lapse in the flushing regime, the stagnant and potentially contaminated water from within the shower or tap and associated dead leg should be purged to drain without discharge of aerosols before the appliance is used.

NHSGG&C consider the cleaning of wash hand basins, toilets and showers etc by Domestic Services staff to fulfil the criteria of having been used /flushed.

As part of the ward/departments standard cleaning schedule Domestic Services staff will clean all wash hand basins, showers, baths, WC's and bidets. For the purposes of Legionella and Pseudomonas control the Board deems this to be considered adequate to fulfil guidance on the use of water outlets.

Facilities Management send on flushing records of all taps to Water Systems AP monthly.

Refer to Facilities Procedure - Wash Hand Basin Cleaning (including point of use filter).

4.42 – FLUSHING OF DEADLEGS & DRAIN VALVES

FM First Template No 827

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 101 para 6.36

RECORD FORM - DMA

PROCEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE WEEKLY** as a minimum:

Description of Works

- Refer to the locations listed on Record Form (DMA).
- Estates to arrange for the Schedule to be updated to record on a regular basis.
- Flush water from ALL outlets identified on Record Form on a Weekly basis for a minimum period of 3 minutes per tap outlet taking care not to cause splashing or exposure to water aerosols / droplets. Drain Valves to be purged to ensure the removal of any built up residue in the line.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record ensuring that you date, sign it and Complete FM work request.
3. Return form to the Water Systems AP.

4.43 – ROTATION OF WATER SERVICES DUTY/STAND-BY PUMPS

FM First Template No 820

WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 27 para. 3.24

RECORD FORM - (028a)

PROCEDURE REF - P1C3

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **WEEKLY**:

Description of Works

- Inspect and confirm operation of all listed duty/stand-by pumps by interrogating the programmer to check hours run for each pump motor.
- Check pump rig and associated valves for correct operation, signs of damage, leakage or corrosion.
- Record all details on Record Form (028a)

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (028a) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.44 – OPERATION AND CHECKS TO EMERGENCY DELUGE SHOWERS/EYE WASH

FM First Template No 825

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 57

RECORD FORM - (026c) and DMA record for separate shower.

PRECEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

RISK CONTROL NOTICE - RCN 11/04

The following actions must be undertaken **TWICE WEEKLY**:

Description of Works

- Refer to the locations listed on Record Form (026c) NHS only (DMA complete flushing records).
- Operate shower for a minimum period of 3 minutes taking care not to cause splashing or exposure to water aerosols / droplets. Measure and record temperatures until discharge water drops to the same temperature as the incoming mains water.

  NOTE: For thermostatic showers and taps, the outlet should be flushed on the full cold setting for 2 minutes, then again on the full hot setting for a further 2 minutes, using override setting where available. Cold water should be less than 20ºC, Hot water should be between 55ºC and 60ºC, and Mixed water in the range 41-43°C.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (026c) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.5 Monthly Maintenance Checks

Reference	Operation
4.51	Sentinel Outlet Temperature Recording
4.52	DWS Calorifier – Temperature Checks & Blowdown
4.53	CL02 checks

NOTE:

Completed Log Sheet to be submitted to Site Estates Manager / Authorised Person (Water) for authorisation and copies filed as indicated in Section 2.20.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.51 – SENTINEL OUTLET TEMPERATURE RECORDING

MONTHLY

FM First Template No 828

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 28 para 3.27

RECORD FORM - (005c)

PROCEDURE REF - P1C4

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- Check the temperatures at the sentinel taps as defined in the local plan of the system being checked. NOTE: Where the sentinel is a TMV or TMT the temperature readings should be taken from the pipework or directly from the hot and cold supply.
- Using a calibrated temperature probe, check the temperature of water from the cold water tap does not rise above 20ºC after running the tap for 2 minutes.
- Using a calibrated temperature probe, check the temperature of water from the hot water tap does not drop below 55ºC whilst running the tap for 1 minute.
- Record all temperatures on Record Form (005c).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form **(005c)** ensuring that you date, sign it and enter FM First ticket number. Complete FM Work Request.
3. Return form to the Water Systems AP.

4.52 - DWS CALORIFIER – TEMPERATURE CHECKS & BLOWDOWN

FM First Template No 821

MONTHLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 28 para 3.30

RECORD FORM - (005)

PROCEDURE REF - P1C4

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- MANUALLY CHECK and record the flow and return temperatures on the domestic hot water system as defined on Record Form (005), using the temperature gauges fitted or a suitable surface temperature probe.
- MANUALLY CHECK and record the calorifier storage temperature at top and bottom gauges if fitted.
- The flow temperature to be at least 60ºC and the return temperature shall be no less than 55ºC
- MANUALLY CHECK and record the cold water feed temperature using the temperature gauges fitted or a suitable surface temperature probe.
- Blowdown drain valves (if fitted) on all calorifiers and expansion vessels by opening the drain valve 3 times, each time for a 3 minute period. Where required, the hose from the drain valve connection should be discharged to the nearest drain/gulley. If there is no drain valve make note on Record Form 005.
- Check all local pipework to and from calorifier is in good order and all insulation is intact.
- Operate all isolation valves through their full range of motion.
- Check, confirm and record operation of de-stratification pump.
- Record all information on the Record Form (005).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.

2. Complete Record Form (**005**) ensuring that you date, sign it and enter FM First ticket number.

3. Return form to the Water Systems AP.

4.53 – CL02 PLANT CHECKS

MONTHLY

FM First Template N/A

IN ACCORDANCE WITH SHTM 04-01

RECORD FORM – N/A

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- PPM Schedule Monthly Visually inspect chemical delivery system.
- Check chemical suction and delivery lines for correct operation Chemical level check and refill.
- Cross check measured ClO2 / Chlorite residual test against analyser & Palintest kit.
- Check and Adjust controller settings as required.

CHECK

1. Record all details of any fault or discrepancies and report to Water Lead AP who will complete Incident Form (04).

4.6 Quarterly & Other Maintenance Checks

Reference	Operation
4.61	Shower Head and Flexible Hoses Disinfection/Replacement
4.62	DHWS Calorifier and Expansion Vessel - Flush
4.63	HORNE Tap Flow Restrictor Exchange
4.64	Review of Rarely Used Water Outlets and Changes In-Use
4.65	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK)
4.66	PAL filter replacement

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.61 SHOWER HEAD AND HOSE REPLACEMENT

FM First Template No 869
Schedules: 1997 to 2724

QUARTERLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 32 para 3.51

RECORD FORM -See DMA records
PROCEDURE REF - P1C12 CURRENTLY CONTRACTED TO DMA CANYON WATER

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

NOTE: If PALL filter is fitted it must be left in place and recorded as such on DMA records)

Description of Work

- Exchange shower head and hose assembly inc sealing washers with new disposable unit. Place old shower head and hose assembly into re-sealable plastic bag.
- Check that the new head and hose package is intact;
- Open replacement new shower head and hose assembly sealed packaging, remove and fit following the manufacturer's instructions;
- Run water and flush for 3 minutes in accordance with Legionella Risk Assessment in such a way as to avoid the creation of aerosols;
- Check final temperature for compliance and working order and return shower appliance to use.
- Return redundant sealed bag with shower head and hose assembly to collection point for recycling in accordance with Waste Procedures;
- Record all actions on the Record Form (005b).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (005b) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

NOTE: This procedure replaces the previous Clean & Disinfect method from 1st April 2019

4.62 - DWS CALORIFIER AND EXPANSION VESSEL - FLUSH

FM First Template No 821

QUARTERLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 29 para 3.34

RECORD FORM - (006) and (023)

PROCEDURE REF - P1C6

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Flush each Domestic Hot Water Calorifier and Buffer Vessel through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. Where required, the hose from the drain valve connection should be discharged to the nearest drain/gulley.
- Record all actions on the top section of Record Form(006).
- Where the domestic hot water system has a stratification pump(s) fitted to circulate the hot water from the top to the base of the calorifier or the storage/buffer vessel, and the history data shows no sludge deposits during flushing, then this procedure should be risk assessed to determine if the maintenance frequency can be changed. This assessment should be recorded on Record Form (023).

NOTE: this flushing process can air lock the hot water system, so only carry it out when there is no hot water demand and the calorifier is valved off from the system.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (006) and/or (023) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.63 – HORNE TAP FLOW RESTRICTOR EXCHANGE

FM First Template No N/A

QUARTERLY

IN ACCORDANCE WITH IC GUIDANCE

RECORD FORM – (See DMA Records)

PROCEDURE REF – WQS 001

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

PPE:- Surgical gloves should be worn when carrying out this task. Cross contamination of the replacement flow restrictor should be considered and avoided at all times.

Restrictor should only be replaced at outlets without PALL filters. If PALL filter is fitted it should be left in place and noted on Record Form.

- Assemble all tools and materials required to complete task.
- Check with ward staff to ensure access can be granted to each area without Infection Control restriction.
- Remove existing restrictor using the appropriate tool and dispose of the restrictor in general waste.
- Use disinfectant wipes to sanitise tap outlet and tools used before re-fitting new restrictor.
- Change gloves to avoid cross contamination of new components and tools.
- Unpack new restrictor components and insert into tap as per the manufacturer's instructions.
- Test on completion and fill out log sheet to record all relevant information.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (DMA WATER) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.64 - REVIEW OF INTERMITTENTLY USED WATER OUTLETS/CHANGE IN-USE

IN ACCORDANCE WITH BOARD POLICY

QUARTERLY

RECORD FORM – (001) (026)

PROCEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Liaise with Site Facilities Manager and Heads of Department to review existing accommodation occupancy and usage on a 3 monthly basis.
- Issue Quarterly circular email to all HoDs requesting to identify little used outlets and to confirm that they have a flushing regime implemented.
- Identify any water services outlets that are not used OR changes to the occupancy.
- Schedule to be updated to record all areas which change in-use, become unoccupied or otherwise out of use.

CHECK

1. Record all details of any dept closures or little used outlets on Record Form (001) and add outlets to flushing register.
2. Ensure outlets are brought to the attention of the maintenance person carrying out the flushing activity and details added to Record Form (026) or arrange with DMA to add to flushing requirements if required. Wards should be carrying out flushing as per requirements and provide evidence on WS01 form.
3. All completed Record Forms to be stored in the building specific Log Book.

4.65 – TMV/TMT & THERMOSTATIC SHOWER DISINFECTION AND FUNCTION TEST (HIGH RISK)

QUARTERLY

FM First Template No

IN ACCORDANCE BOARD POLICY

RECORD FORM - REQUIRES CONFIRMATION IF THIS SHOULD BE CARRIED OUT THREE MONTHLY

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Examine all thermostatic taps for scale build-up or other deposits. De-scale any which are not clean.
- Check and remove any installed plastic flow straighteners from tap outlet
- Inspect and Clean and Disinfect filters / strainers by removing and immersing in a solution of 1000ppm free residual chlorine (50cc CLO2 in 5 litres of water) in water for 5 minutes.
- All HORNE Optitherm taps MUST have the flow straightener replaced during three monthly service tasks.
- Pasteurise outlets by over-riding thermostatic controls drawing water through each thermostatic tap until a temperature of 60°C is achieved. Run the tap at this temperature for five minutes. If this is not possible disassemble tap assembly and spray all accessible components with 'Shower Head plus' mixed to a 1:3 solution, (one part chemical, 3 parts water) or equal and approved and let stand for 5 minutes.
- Reassemble and verify fail safe operation by isolating hot and cold water supplies separately.
- Ensure thermostatic controls are re-adjusted to permit blending.
- Should controls not be able to be over-ridden, verify the temperatures at the inlet connections to the thermostatic valve utilising a contact type probe and electronic thermometer.
- Run and test tap and record hot and cold water inlet temperatures and mixed water outlet temperature.
- Log all actions.

4.66 – PAL FILTER REPLACEMENT

FM First Template No

31& 62 Day

IN ACCORDANCE WITH AGREED FILTER LOCATIONS

RECORD FORM - DMA RECORDS

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **31 Days or 62 Days based on filter types and locations**:

Description of Work

- Replace filters prior to end date on tap and shower filters as per programme.
- Process for replacement as per DMA Procedures.
- Log all replacements as per DMA Procedures and record in DMA Records.
- Any issues should be reported to Water Lead AP.

4.7 Six Monthly Checks

Reference	Operation
4.71	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK)
4.72	CWST Inspection and Temperature Monitoring
4.73	Maintenance of filtration units
4.74	CL02 checks

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.71 – TMV/TMT & THERMOSTATIC SHOWER DISINFECTION AND FUNCTION TEST (NON HIGH RISK)

SIX MONTHLY

IN ACCORDANCE WITH BOARD POLICY

RECORD FORM -

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- Examine all thermostatic taps for scale build-up or other deposits. De-scale any which are not clean.
- Check and remove any installed plastic flow straighteners from tap outlet
- Inspect and Clean and Disinfect filters / strainers by removing and immersing in a solution of 1000ppm free residual chlorine (50cc CLO2 in 5 litres of water) in water for 5 minutes.
- All HORNE Optitherm taps MUST have the flow straightener replaced during three monthly service tasks.
- Pasteurise outlets by over-riding thermostatic controls drawing water through each thermostatic tap until a temperature of 60°C is achieved. Run the tap at this temperature for five minutes. If this is not possible disassemble tap assembly and spray all accessible components with 'Shower Head plus' mixed to a 1:3 solution, (one part chemical, 3 parts water) or equal and approved and let stand for 5 minutes.
- Reassemble and verify fail safe operation by isolating hot and cold water supplies separately.
- Ensure thermostatic controls are re-adjusted to permit blending.
- Should controls not be able to be over-ridden, verify the temperatures at the inlet connections to the thermostatic valve utilising a contact type probe and electronic thermometer.
- Run and test tap and record hot and cold water inlet temperatures and mixed water outlet temperature.
- Log all actions.

4.72 – CWST INSPECTION AND TEMPERATURE MONITORING:

FM First Template No 819

SIX MONTHLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 29 para 3.37

RECORD FORM – Carried out by DMA – refer to records

PROCEDURE REF – P1C7

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **SIX MONTHS** seasonally during Summer and Winter:

Description of Work

- Inspect the tank and associated pipework including insulation, valves etc for damage or corrosion and sediment.
- Operate all isolation valves through their full range of motion.
- Check the operation of the ball-valve by pressing down on it and lifting the float to confirm that water flows and stops.
- Inspect the tank overflows if visible. Confirm that there is no blockage or other foreign material and that the mesh screen is not damaged.
- Measure and record the temperature of the water in the tanks, by dipping the thermometer into the top as far from the ball-valve as possible.
- Check and record ambient outside air temp and tank room temp.
- Check the flow and record the temperature of water feeding the tanks. There should be a steady rapid flow when the ball float is down.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Records and send information to Water Systems AP.

4.73 – MAINTENANCE OF WATER FILTRATION UNITS:

FM First Template N/A

SIX MONTHLY

N/A

RECORD FORM – Carried out by Veolia– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- Check on feedwater quality
- Check on treated water quality & flows
- The condition of valves & diaphragms
- Operational cycle simulation
- General plant condition & safety
- The condition of system pumps
- The condition of the pre-filters
- Level control function

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.74 – MAINTENANCE OF CL02 PLANT:

FM First Template N/A

SIX MONTHLY

N/A

RECORD FORM – Carried out by Scotmas– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- As per monthly plus :-
- Check ClO2 gas detector functionality and recording levels.
- Simulate fault circuitry and alarm on Sentinel Monitor.
- Change probe electrolyte and cross calibration test.
- Carry out manual Chlorate & Chlorite validation tests (12 representative outlets).
- Check water meter operation and report on Electrolyte top up, Probe calibrations

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.8 Annual Maintenance Checks

Reference	Operation
4.81	DWS Calorifier / Expansion Vessel Inspection
4.82	Water Services Pipework and Distribution System Checks
4.83	Representative Tap Temperature Monitoring
4.84	Vibration coupling inspection
4.85	BMS Temperature Sensor Test and Calibration

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.81 - DWS CALORIFIER/EXPANSION VESSEL INSPECTION

FM First Template No 821

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 31 para 3.44

RECORD FORM - (006)

PROCEDURE REF - P1C9

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**

Description of Work

Follow the manufacturers' maintenance instructions from O&M manuals. Record all actions where applicable on Record Form (006) for each system.

- Isolate domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel service valves;
- Heat any domestic hot water calorifier or hot water storage/buffer vessel up until the contents has reached 60ºC and hold at this temperature for a period of at least 1 hour;
- Drain domestic hot water calorifier and expansion vessel and remove inspection hatch;
- Hose out the domestic hot water calorifier or hot and expansion vessel to remove any debris, scale or other deposit. Care should be taken to keep aerosols to a minimum.
- If the domestic hot water calorifier or expansion vessel does not have an inspection hatch, the pipework at the top of the vessel should be disconnected to allow the insertion of a water hose to allow debris to be washed down off internal surfaces;
- Examine the internal and external condition of the domestic hot water calorifier and expansion vessel and pipework, any defects should be reported in writing to the relevant Authorised Person (Water). The safety valve should be checked, overhauled and reset as necessary. The temperature and pressure gauges to be checked for operation.
- On completion of examination and any repairs, the domestic hot water calorifier and expansion vessel should be re-assembled and the following sequence must be undertaken:
- Refill with cold water;
- Drain the domestic hot water calorifier and expansion vessel;
- Refill with cold water, leave cold feed valve open;
- Run domestic hot water calorifier or hot water storage/buffer vessel at a temperature of 60ºC for at least 1 hour. Test the operation of high limit cut-out system if fitted. Check the temperature of the calorifier/vessel top and bottom with a surface thermometer;

- Adjust any controls as necessary.
- Take bacteriological samples from the base of the calorifier and submit to GRI Water Lab for analysis. (THIS TASK TO BE CARRIED OUT BY DMA CANYON WATER)

NOTE: this flushing process can air lock the hot water system, so only carry it out when there is no hot water demand and the calorifier is valved off from the system.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (006) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.82 - PIPEWORK AND DISTRIBUTION SYSTEM CHECKS

FM First Template No 829

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 31 para 3.

RECORD FORM - (0)

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Estates Manager or Water Systems AP will define areas to be checked in each building.

Description of Work

- Check all accessible pipework for damage, or corrosion.
- Check for missing or damaged pipework insulation
- This is carried within the Tank Room by DMA during sampling and tank inspections monthly.
- This is carried out by NHS Estates within Plantrooms during plantroom inspections monthly
- This is carried out as per above procedures and noted on FM First PPM's..

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms as per above procedures ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.83 – REPRESENTATIVE TAP TEMPERATURE MONITORING

FM First Template No 917

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 32 para 3.39

RECORD FORM - (005d)

PROCEDURE REF – P1C10

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken at regular intervals throughout the year to ensure 20% of the requirement is completed **ANNUALLY**:

Description of Work

- OBJECTIVE: Carry out water temperature monitoring to ensure consistency and performance of the system as per design. 20% of all outlets to be assessed annually to ensure entire system is completed within a 5 year period (*ref: SCART2 Question 54)*
- Check the temperatures at a representative number of hot and cold outlets on a rotational basis as defined in the local plan of the system being checked. Lead AP (Water) to define areas to be checked each month.
- Using a temperature probe check the temperature of the cold water tap does not go above 20ºC after running the tap for 2 minutes;
- Using a temperature probe check the temperature of the hot water tap does not go below 55ºC within running the tap for 1 minute;
- If the outlet being tested is protected by a TMV/TMT then temperatures should be taken directly from the supply pipework or by bypassing the thermostatic device by use of an appropriate purging kit.
- Record all temperatures and locations tested on the Record Form (005d) or if carried out by DMA to reflect in records.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (005d) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.84 - VIBRATION COUPLING INSPECTION

FM First Template No 831

ANNUALLY

IN ACCORDANCE WITH HSG 274 Part 2 *(2014)* Page 19 para 2.35

RECORD FORM - (008)

PROCEDURE REF – WQMS 001

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Refer to list of vibration coupling locations to be assessed.
- Visually check the condition of the coupling for any signs of leakage, deterioration or corrosion.
- Ensure flexible portion of coupling is intact and free from damage or deterioration.
- Carried out on Cold Water Booster sets as part of the inspection.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.85 – BMS TEMPERATURE SENSOR CALIBRATION

ANNUALLY

FM First Template No

IN ACCORDANCE WITH

RECORD FORM -

PROCEDURE REF –

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- This task should be included in the BMS Service Contract Specification.
- All temperature sensors related to domestic hot and cold water services to be checked and calibrated annually.
- All calorifiers, storage tanks, flow and return monitoring devices.
- Include all End of Line (EOL) sensors and cold water flushing devices.
- Records should be kept and made available to the estates dept on request.

4.86 – MAINTENANCE OF WATER FILTRATION UNITS:

FM First Template N/A

ANNUALLY

N/A

RECORD FORM – Carried out by Veolia– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken **ANNUALLY**:

Description of Work

- As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement.
- Dosing Pump diaphragm valve replacements.
- Replace ClO2 gas detector cartridge if required

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.9 Bi-Annual Maintenance Checks

Reference	Operation
4.91	Flexible Hose/Connection Inspection and Exchange
4.92	CWST Drop Test

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.91 – FLEXIBLE HOSE/CONNECTION INSPECTION AND EXCHANGE

FM First Template No **BI-ANNUALLY**

IN ACCORDANCE WITH QEUH RISK ASSESSMENT RECOMMENDATIONS 2017

RECORD FORM - (009)

PROCEDURE REF – WQMS 002

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Refer to list of flexible connection locations to be assessed as per WQMS 002.
- Visually check the condition of the coupling for any signs of leakage, deterioration or corrosion.
- Safely isolate the water services and exchange the flexible connection with a BRAND NEW UNUSED replacement.
- Apply tag/label to indicate the intended date of future replacement (todays date + 24 months)
- Record all details on the Record Form (009).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (009) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.92 – CWST DROP TESTS

BI-ANNUALLY

FM First Template No 819

IN ACCORDANCE WITH

RECORD FORM -

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Shut off mains cold water supply to tank.
- Record the start time and allow tank to drain naturally through usage. DO NOT OPEN THE DRAIN.
- Periodically monitor the tank until usage has reduced tank to exactly half of its starting capacity.
- Record the stop time and estimate the number of hours of storage of water in the tank.
- Record all inspection details on the Record Form (010).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (010) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

5.0 INCIDENT AND EMERGENCY PROCEDURES

Procedure Reference	Operation
5.10	FAILURE OF CONTROL MEASURES
5.20	HIGH COLD WATER SUPPLY TEMPERATURE TO OUTLET
5.30	LOW HOT WATER SUPPLY TEMPERATURE TO OUTLET
5.40	CALORIFIER OR HEAT EXCHANGER TEMPERATURE FAULT
5.50	POSITIVE LEGIONELLA TEST RESULT
5.60	IDENTIFICATION OF LITTLE USED WATER OUTLET
5.70	EMERGENCY REPAIRS
5.80	DISINFECTION OF WATER SYSTEM
5.90	PSEUDOMONAS

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

THE FOLLOWING PAGES DESCRIBE REMEDIAL ACTIONS TO BE TAKEN IN THE EVENT OF AN INCIDENT, EMERGENCY, OUT-OF-SPECIFICATION TEST RESULT AND / OR WHERE *LEGIONELLA* HAS BEEN IDENTIFIED AND/OR BACTERIA COUNTS BEING INEXCESS OF THE RECOMMENDED LIMITS IN THE WATER SYSTEM ARE IDENTIFIED.

The Health and Safety at Work Act places a duty on employers to ensure, so far as is reasonably practicable, the maintenance of safe working conditions without risks to health, not only to employees, but also to the general public.

The risk to personnel associated with the presence of *Legionella* depends on a number of variables and may be quite low. However, since the actions to eradicate it are straightforward and reasonably practicable, it would be wise to put them in hand without delay if *Legionella* has been identified.

When analysis confirms that the levels of bacteriological contamination are in excess of acceptable limits, and/or the presence of Coliforms or *E.coli* is identified, the procedures recommended in this section should be applied.

5.1 Failure of Control Measures:

Where any reported test result, non-compliance issue or defect is made known which affects the integrity of the water system and indicates the failure of Control Measures and / or increased risk of Legionella the following procedures shall be followed and duly recorded within Section 2.3 of this document and brought to the attention of the relevant Infection Control Team and Water Management Group.

IN ALL CASES THE INCIDENT RECORD FORM (004) SHOULD BE COMPLETED AND INSERTED IN THE BUILDING SPECIFIC WATER SAFETY LOG BOOK.

5.2 High Cold Water Supply Temperature

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the QEUH campus served by the same mains lines) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as "out-of-specification" mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:

    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);
    - any water sampling results;
    - system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
    - recent maintenance history; recent alterations, changes or additions to the water system;
    - any other changes made by Duty Holders or users of the water system; On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Water Safety log book.

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment

Stage 3 - Water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.

Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;

  - thereafter the tank/local area being disinfected shall be brought back into service;
  - finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible.

5.3 Low Hot Water Supply Temperature

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the Southern General Hospital served by the same mains lines8) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as “out-of-specification” mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:

    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);

- any water sampling results;
- system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
- recent maintenance history; recent alterations, changes or additions to the water system;
- any other changes made by Duty Holders or users of the water system;

On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Logbook via Incident form (04).

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment.

-

Stage 3 - water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.

Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;

- thereafter the tank/local area being disinfected shall be brought back into service;
- finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible. Record on Incident form (04).

Hot Water Services

When hot water storage or distribution temperatures fall below those required (60°C storage, 55°C at outlets and returning to calorifier) these will almost inevitably be caused a mechanical fault. Appropriate maintenance procedures, including the Mercury Fault Finding guidance documents, should be created and referenced to assist in timely rectification.

This escalation procedure (taken from SHTM 04-01 Part G (Draft)) should be employed if the Calorifier/Plate Heat Exchangers outflow temperature falls below 45ºC.

The table below should be used to decide on the actions necessary in the event of a plant breakdown such as power failure or gas supply failure.

Breakdown leading to temperature <45ºC, lasting for:	Risk Category	Action
<12 hrs	High	Verify
	Significant	Verify
	Moderate	Verify
>12 hrs	High	Thermally pasteurise
	Significant	Verify
	Moderate	Verify
>24 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Verify
>72 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Thermally pasteurise

In the event of a reduction in domestic hot water temperature the **Authorised Person (Water)** should be notified in writing as soon as possible. The reason for failure must be identified and rectified as soon as possible.
The **Authorised Person (Water)** shall notify the **Duty Holder** and users on the failed system that they must not draw off any hot water from the affected services until further notice.
The relevant **Duty Holder** shall ensure that their staff are aware of the situation, and that they in turn shall prevent patients from using affected services.

Where thermal pasteurisation is to be carried out, the temperature of the calorifier or plate heat exchanger shall be raised to 70ºC, and the water shall be circulated throughout the affected distribution system for at least one 1 hour. Each tap or appliance should be run in sequence until full temperature is achieved (this should be measured). To be effective the temperature in the calorifier or plate heat exchanger should be high enough to ensure that all distribution outlets receive water at a temperature of greater than 60ºC. Ensure the return flow to the calorifier or plate heat exchanger is no less than **55ºC**.

The **Authorised Person (Water)** shall inform users that the system is back in operation.
Bacteriological samples should be taken in consultation with the Infection Prevention and Control team.
The **Authorised Person (Water)** shall complete an Incident Report Record and ensure the **Responsible Person (Water)** is notified in writing as soon as possible. Maintain hard copy records in the Water Safety Log.

5.4 Positive Legionella Test Result

Microbiological Sampling (Legionella)

Sampling requirements and frequency are to be formulated by NHS GG&C and written scheme should be updated as appropriate.

Legionella testing may be required:

- In systems where the temperature control regimes are not consistently achieved, frequent testing e.g. weekly should be carried out to provide early warning of loss of control. Once the system is brought back under control as demonstrated by monitoring, the frequency of testing should be reviewed
- Weekly checks are recommended until the system is brought under control;
- When an outbreak is suspected or has been identified;
- In wards with at-risk patients – for example those who are immuno-compromised ("high risk patient" areas still to be confirmed to DMA).

As a minimum, samples should be taken as follows:

- From the cold water storage and the furthermost outlet from the tank, on every loop;
- From the calorifier flow, or the closest tap to the calorifier, and the furthermost tap on the hot water service circulating system (these should be identified on sentinel outlet register);
- Additional samples should be taken from the base of the calorifier via drain valves;
- From areas where the target control parameters are not met (i.e. where temperatures are below 55°c for hot water systems or ≥20°c for cold water systems);
- From areas subject to low usage, stagnation, excess storage capacity, dead legs, excessive heat loss, crossflow from the water system or other anomaly.
- High Risk Patient Areas
- Additional random samples may also be considered appropriate where systems are known to be susceptible to colonisation.

The temperature control regime is the preferred strategy for reducing the risk from *Legionella* and other waterborne organisms in water systems. This will require monitoring on a regular basis. The recommended test frequencies for various outlets are set out in Table 2 in Section 7.

HSG 274 Part 2 Table 2.3 Actions to be taken following legionella sampling in hot and cold water systems in healthcare premises with susceptible patients

Legionella bacteria (cfu/Litre)	Action required
More than 100 but less than 1,000	Low risk area Estates action only If only one or two samples are positive, system should be re-sampled. If a similar count is found again, a review should be carried out to identify any remedial actions a) If the majority of samples are positive, the system may be colonised, albeit at low level, with Legionella. Disinfection of the system should be considered but an immediate review of control measures and risk assessment should be carried out to identify any other remedial actions required. If remedial action is ineffective further measures will be discussed and approved by the Board Water Safety Group
More than 100 but less than 1,000	High Risk areas Impact on patient care Discuss results with ICD and agree actions and any closure of area.
More than 1,000	Low Risk Estates action only The system should be re-sampled and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection of the system. If remedial action is ineffective further measures will be discussed and approved by the Board Water Safety Group
More than 1,000	High Risk areas Discuss results with ICD and agree actions and any closure of area.

Communication pathway for Legionella results from water samples:

Water samples are sent to; UKASS-accredited laboratories which provide this service for NHS and other organisations that manage buildings. Reports will come back initially to the estates department.

Negative water samples are recorded as part of the documentation of Legionella control. If they are related to investigation of an "incident" such as a clinical case or a previous positive sample then these results are communicated to those managing that incident.

The information on the report which needs to be communicated is:

- Date of sampling
- Location and type of water outlet
- Identification of the organism, (Legionella pneumophila with serogroup, or Legionella species other than L pneumophila.)
- Count of organisms per Litre.

Estates will

- Inspect the system and take further action in accordance with HSE guidance and locally agreed procedures
- Inform Charge Nurse and or Clinical Nurse Manager of the Clinical Area concerned if appropriate of any control measures being taken/required
- Inform GM for the Sector if appropriate.

The results of this initial risk assessment must be communicated to all those noted above and also to the Facilities General Manager for the site involved.

The Infection Control Manager for Infection Prevention and Control will inform NHS GG&C

If there is impact on patient care then an Incident Management Team (IMT) may be convened to assess the risk and further actions.

Refer to WQS – 017 for out of spec procedure

See table in Appendix 2

5.5 Intermittent or Infrequently Used Water Outlets

If after investigation the taps or appliances identified within the reviewed list, to be updated on a quarterly basis, is deemed not necessary wherever possible the supply pipe work shall be cut back as close to the main circulating line as practicable to ensure that any dead leg formed is minimised and the appliance is removed from the water system.

In circumstances where there has been a lapse in the flushing regime, the stagnant and potentially contaminated water from within the shower or tap and associated dead leg should be purged to drain without discharge of aerosols before the appliance is used.

Where a ward or department is closed or taken out-of-use for an extended period of time e.g.: pending refurbishment, change in-use or other reason, arrangements shall be put in place to ensure the regular flushing and recording of water outlets within such areas. If such closures are considered to be long term or permanent consideration should be given to the disconnection of all water services to the affected areas.

5.6 Emergency Repairs

Emergency repairs may be required at any time and should be undertaken by trained and competent personnel. Such repairs can vary from a simple repair to a section of pipework, replacement of a component or major burst or loss of service. In all such cases the integrity and safety of the water distribution system must be maintained at all times.

5.7 Disinfection of Water System and Components

There are a number of different chemical and thermal disinfection methods available ALL of which shall be undertaken by trained and competent personnel in strict accordance with all Statutory Requirements, Safety Precautions and Manufacturers Instructions.

Disinfection – is the process of destroying or inactivating Pathogenic organisms and is generally applied to the water supply.

Sterilisation – is the process of destroying or inactivating all Organic Life Forms and is generally applied to all systems of transmission and storage materials.

In ALL instances no matter what disinfection method is employed, due regard shall be taken of patient groups, specialist equipment and processes which may be sensitive to the disinfection process being used – eg Renal Dialysis patients **must not** be exposed to Silver Hydrogen Peroxide chemicals as such the RO Water Treatment Plant and Dialysis Machines must be disconnected from the water system until the disinfection process is completed.

Silver Hydrogen Peroxide should NOT be used for a period of 90 days or longer, as required by the Drinking Water Inspectorate.

The disinfection process may be required for the following situations:

REPAIRS -	Repair fittings and exposed pipe ends should be clean and disinfected before use. Such items should be sprayed with a suitable disinfection solution such as a Sodium Hypochlorite @ a strength of 1000 mg/l (1000ppm) with a minimum contact time of 5 minutes or equal and approved.
MINOR ALTERATIONS -	Pipework should be cleaned internally by spraying with a suitable disinfection solution such as a Sodium Hypochlorite @ a strength of 1000 mg/l (1000ppm) or where pipes are long and internal surfaces cannot be reached with sprays then a swab soaked in a solution of 50mg/l (50ppm) with a contact time of one hour or equal and approved.
NEW SUPPLY PIPEWORK -	Pipes are filled with a solution such as a Sodium Hypochlorite @ a strength of 20 mg/l (20ppm) with a contact time of 24 hours. Or Sodium Hypochlorite and water at a strength of 50mg/l (50ppm) for a contact period of one hour. Minimum free chlorine after one hour – 30mg/l (30ppm) or equal and approved
SYSTEM DISINFECTION -	This will include water storage tanks and possibly the water distribution system. The advice and use of Legionella Control Association (LCA) approved contractors will be used for this purpose

NOTE:

Appropriate Method Statements and Risk Assessments will be compiled and obtained prior to any disinfection process commencing. Water Disinfection Risk Based Assessment Form (024) should be completed prior to any disinfection process being carried out. *(SHTM 04-01 Part G (V1 July 2015) Page 38 para 5.9)*

An alternative to chemical disinfection is to pasteurise the system. This involves increasing the temperature to greater than 60°C by increasing the thermostat setting at the calorifier or boiler and recirculation as necessary to maintain this temperature throughout for at least one hour. This should effectively sterilise the calorifier, and kill any *Legionella* organisms present.

The water should be flushed through the system more than once. It is important that all taps are run for at least 5 minutes (preferably longer) at full temperature to ensure that the complete system is pasteurised and that the hot water has reached all parts of the system.

5.8 Pseudomonas SOP

Standard Operating Procedure for minimising the risk of Pseudomonas

This SOP provides direction and guidance for ward based staff to meet their responsibilities as stated in *HPS(2013) Guidance for neonatal units (NNUs) (levels 1,2&3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water.* This document refers to critical control points 2 – 4 (inclusive) only. (Critical points 1, 5 and 6 are considered in the NHSGGC Water Safety Policy 2013.

*High Dependency Units (HDUs) which are adjoining/ integrated with an ICU should be included in this guidance.

Responsibilities:

Senior Charge Nurses (SCNs) must:

- Follow this SOP.
- Ensure that they are aware of access issues to wash hand basins. Where access is an issue they must arrange for flushing to occur and document this.
- Keep records of daily flushing for at least one month within the Facilities Folder.
- Inform a member of the local Estates Team if this SOP cannot be followed in relation to flushing water outlets.
- Inform a member of the local Estates Team of infrequently used outlets which could be removed.
- Allow members of the local Estates Team access to complete maintenance as appropriate.

Estates must:

- Undertake actions deemed the responsibility of the local Estates Department as per the Water Safety Policy.
- Keep a record of outlets reported that are deemed to be infrequently used and actions taken by them to remove this risk.
- Provide a report of maintenance actions and issues/ anomalies to the Sector Water Safety Group.
- Support staff locally to undertake their responsibilities in terms of reducing risk associated with pseudomonas.

Domestic Services must:

- Ensure that water outlets are flushed at full flow for 1 minute (not causing splashing) as part of the cleaning process and to ensure for Mixer taps that this ensures and equal mix of cold and hot. If full flow cannot be achieved taps should be flushed for a longer period following assessment.
- Ensure this is the first task completed of the day.
- Record this in the Domestic services Compliance Checklist "Water Outlets"
- Ensure the Checklist is retained within the facilities Folder at ward level for one month.
- Send a copy of flushing records to Water AP and to ensure any rooms/areas which were not flushed are identified.
- Domestic Services Supervisors and Managers must also notify Estates LAP, if they identify any unused areas or outlets as per SHTM04-01 Part G Section 8.3.

Managers must:

- Make this SOP available to their staff.
- Support SCNs in following this SOP.

Water Systems Group must:

- Keep this SOP up-to-date.
- Audit compliance with this SOP.
- Provide guidance via the Water Systems Policy.

5.9 Flushing Water Outlets

Flushing of water outlets is necessary to control the build-up of biofilm in water systems to reduce the risk of transmission of pathogens via the environment and equipment to patients.

The Senior Charge Nurse (SCN) in each unit has responsibility (under current guidance) to ensure that the following recommendations are complied with in their area. The SCN should ensure that:

All little used outlets outlets that are not used at least twice weekly in general areas and daily on high risk area identified on WS01a form. These must be flushed at full flow (but not so that splashing goes beyond the basin. However if taps cannot be flushed on full flow they should be flushed for longer based on specific assessment. The manager responsible for the ward or department must put systems in place for the outlet to be flushed to waste for 3 minutes as per SHTM04-01 Part G Page 111.

Where the outlet may be used by high-risk patients, more frequent flushing may be needed and the frequency should be determined following a risk assessment.

Additionally high high-risk environments (adult, paediatric and Neonatal ICUs and associated HDU's), flushed daily, first thing in am for 1 minute at full flow (but not so that splashing goes beyond the basin). However if taps cannot be flushed on full flow they should be flushed for longer based on specific assessment.

Additionally Facilities (Domestic Services) to ensure that all water outlets are flushed daily where access is available and all outlets flushed for 1 minute at full flow (but not so that splashing goes beyond the basin). However if taps cannot be flushed on full flow they should be flushed for longer based on specific assessment. Records must reflect where access is not available or outlets not able to flush e.g. rooms/areas under Estates, Minor Works, Capital or no access at the weekend.

Domestic Services Supervisors and Managers will also notify Estates if they identify any unused areas or outlets or outlets not able to flush as per requirements of *SHTM04-01 Part G Section 8.3*.

These should be reflected on the department flushing records.

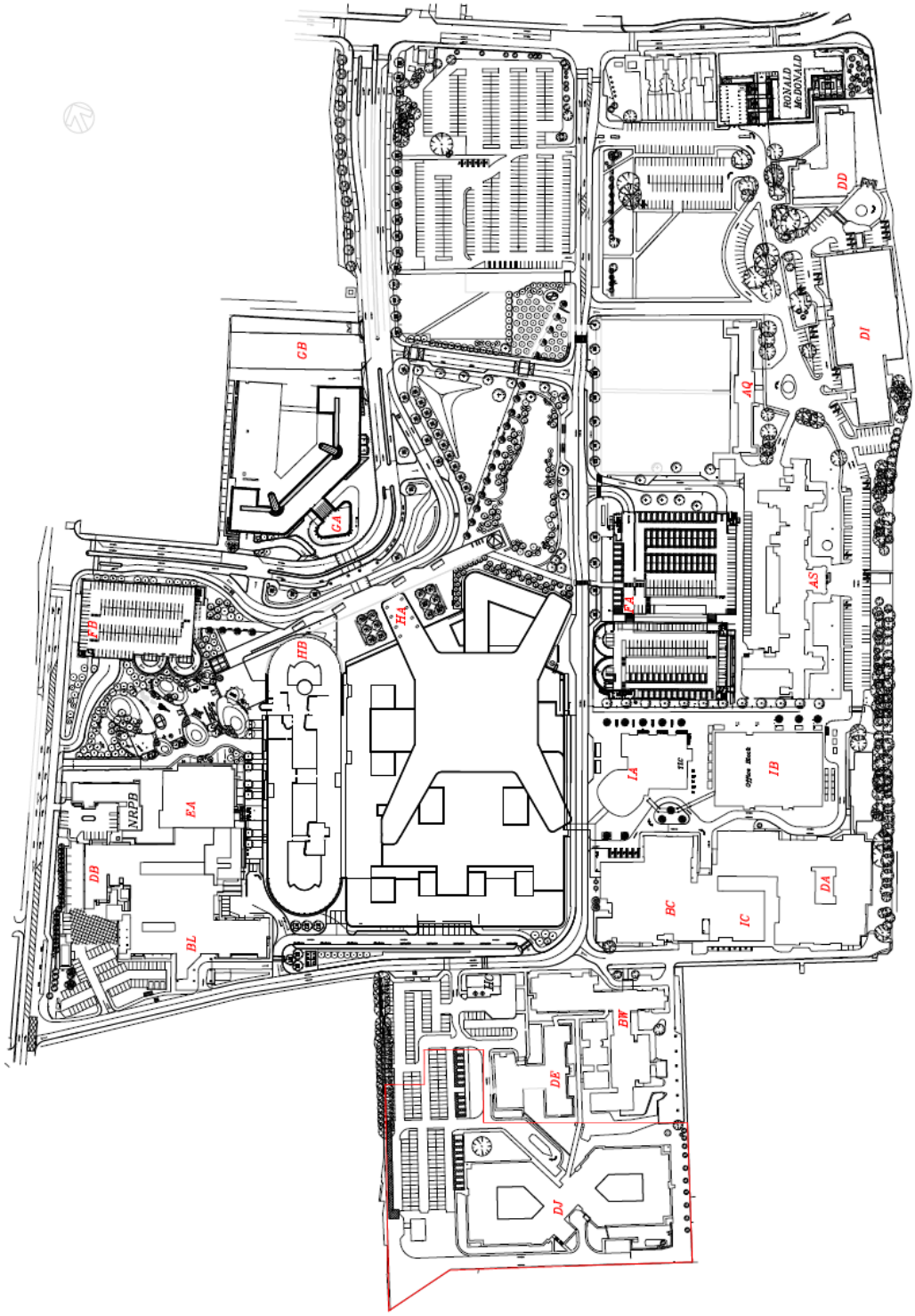
These must be reviewed on a daily basis by the SCN and appropriate action taken when this is identified as not having been completed.

Any problems or concerns relating to the safety, maintenance, reduced usage, any changes in use and cleanliness of all water outlets are identified and reported to the ICT, Facilities and Estates Department as relevant.

For more information refer to NHS Greater Glasgow and Clyde
'Water Systems Safety Policy Written Scheme and Operational Procedures'

Appendix 1

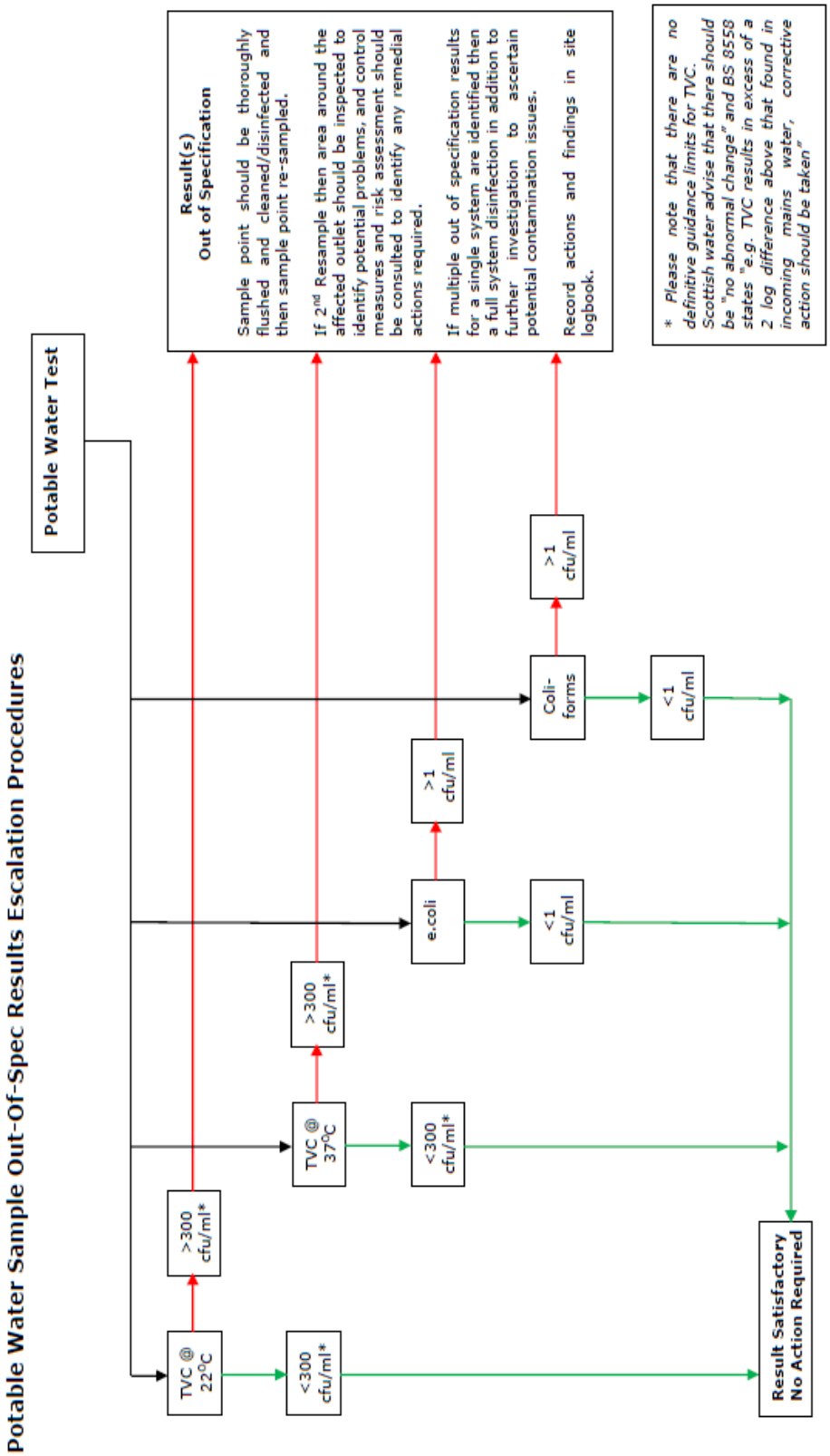
Site Plan with Block Codes



Queen Elizabeth University Hospital

Appendix 2

Escalation of Sampling Results out-of-spec.



Appendix 3

Risk Assessment Review Guidance

Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Regular check to ensure that legislation and guidance has not changed	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 Management Structure to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of communication lines to ensure still accurate and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of escalation & emergency procedures to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties allocated to site staff and ensure accurate and recorded	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties of sub-contractors and ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered)	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of staff training requirements and update training matrix	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of method statements and risk assessments to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of site documentation to ensure all records up to date and present	L8 HSG 274 Pt 2 SHTM 04-01	
Regular update of "Patient Risk Rating" register for all areas of hospital.	SHTM 04-01 Part B	
Regular review of sentinel outlet locations register.	SHTM 04-01 Part B	
Regular review of primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	HSG 274 Pt 2	
Regular review of plant and equipment maintenance schedules.	Manufacturer's Instructions	
Regular review of BEMS temperature sensor locations to reflect any system alterations	HSG 274 Pt 2	
Regular review of schematic/as-fitted drawings to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 risk assessment with a maximum period of two years between updates. (e.g. if change of use or changes in legislation or any other factor which could affect validity of current assessment)	L8 STHM 04-01	

Appendix 4

HAISCRIBE Risk Assessments

All relevant HAISCRIBE risk assessments produced and approved for Water Systems related tasks are stored on the QEUH Shared Drive within the folder path “

HAI SCRIBE

QEUH Campus Water Systems

WRITTEN SCHEME

Controlling the risks of exposure to Legionella and other harmful bacteria in Water Systems

2023 Rev G

Reviewed by: E. Smith (RP)
K. Clarkson (DRP)
M. MacMillan (Lead AP)
A. Gallacher (Head of Compliance)
M. Feeney (Compliance Manager)

An electronic copy of this document is held on the QEUH Shared Drive at folder path:
S:\SCART Compliance\22 Water\Water Written Schemes\

Table of Contents

1.0 GENERAL OVERVIEW

Note 1: No work will be carried out on the water system without the knowledge and written consent of the Authorised Person (Water).

Note 2: This Written Scheme document is to be read in conjunction with the Operational Procedures for the Written Schemes document and should also be read in conjunction with the Control of Water Records document. For any alterations to the Water System this Written Scheme Document is to be read in conjunction with the Guidance for alterations to water systems document.

1.1 Introduction

This document contains six sections which have been derived from the Risk Assessment to aid the design, installation, maintenance and operational mode of all domestic and process water systems within the premises with respect to the likelihood of the proliferation of waterborne micro-organisms. The assessment also considered the risk of infection presented to building users and the general populous at large, and derived a series of risk ratings and appropriate Remedial Actions and Control Measures, which should be implemented to minimise the presented risks. This Risk Assessment was carried out in a manner consistent with the requirements of *BS8580:2010 Water Quality – Risk Assessments for Legionella Control – Code of Practice*, and is reviewed whenever system alterations or operational considerations may effect a change in the risk.

Section 1 contains an Executive Summary of the recommended control measures and corrective actions together with an overview of the QUEH Site layout and accommodation.

Section 2 contains a record of the logbook inspection, details on the location of records, defects, non-compliance issues, correspondence and archived information.

Section 3 provides information on the management structure associated with the control scheme for the water system and clear definitions of responsibilities held by those named, details of training undertaken and a summary of the designated tasks as detailed in section 4.

This section also provides information on the details of the risk assessment values associated with representative outlets, systems and plant items undertaken since 2013. A generic risk assessment for any positive legionella test results within designated Low Risk locations and a description of the installed plant and equipment with associated schematic layout plans for each of the installed water systems within the site is also contained within this section.

Section 4 of the document details the safe operation of the system and all appropriate Maintenance Procedures (Control Measures) which were derived from the Risk Assessment and recommendations within NHS Greater Glasgow and Clyde Water Systems Safety Policy.

This section of the document contains a task description with associated record (Log) sheet relating to these activities. It should be noted however, that in certain circumstances, specialist contractors are required to implement some Control Measures, and records pertaining to these activities may be held under separate cover. Such activities would typically include those associated with chemical water treatment regimes and drinks vending machines sanitising maintenance.

Refer to Section 2 for the location of records and archived information associated with the maintenance procedures and other control measures.

Section 5 contains supporting information relating to the Control Scheme, and should typically include the recording of system alterations or remedial actions together with utilised materials. Ad hoc maintenance activities should also be recorded in this section, such as system sterilisations which may be required from time to time. This section of the document also contains a glossary of supporting publications, where additional information relating to the risks associated with waterborne micro-organisms, and water quality generally, may be found.

1.2 Executive Summary

The purpose of this Written Scheme document is to assist in the correct and safe operation of the water systems within the QEUH Campus. The document outlines the specific roles, responsibilities, training requirements and regular maintenance procedures to be followed in order to ensure compliance with statutory and mandatory guidance.

Risk Assessments for the water services have been carried out on the instruction of the Board Water Safety Group. DMA Canyon Ltd are presently the appointed Water Systems Risk Assessor and have carried out Risk Assessments within all individual buildings on the campus.

Additionally there are two Hydrotherapy Pools in operation on the campus. These are situated within the New Childrens Hospital, and Spinal Injuries Unit. Separate Risk Assessments have been carried out for both of these facilities by a specialist Swimming Pool Risk Assessment provider.

Risk Assessments require to be reviewed and updated to reflect any changes in-use and / or functions that have taken place since the date of the original Risk Assessment or in the event of control measures becoming ineffective, changes in key personnel or in the event of a case of legionnaires disease / legionellosis associated with the water system. Guidance on the Risk Assessment review procedure is given in Appendix 3.

All documentation and log sheets used to record maintenance activities follow the format contained within guidance document SHTM 04-01 Part G: *Operational Procedures and Exemplar Written Scheme.*

1.3 Overview of Site Accommodation and Premises

The main new-build Adult Hospital building comprises of 12 stories, with the basement housing FM areas and the new-build Childrens Hospital comprising of 4 stories.

On the retained estate there are individual buildings comprising of Neurology, Neurosurgery, Spinal Injuries Unit, PDRU, Maternity, Neo-Natal, Podiatry and Westmarc stand alone with the Teaching and learning and office block new additions.

Full descriptions and information on the individual written schemes are available in the Log book/Risk Assessment folders for each building.

The building codes are as follows:

AC – Minor Injuries Unit
AQ – Acute Medical Block (AMB)
AS – Central Medical Block (CMB)
BC – Neurosurgical Block (INS)
BL – Maternity
BW – Neurology
DA – Spinal Injuries
DB – Maternity Day Surgery
DD – Podiatry
DE – Physically Disabled Rehabilitation Unit (PDRU)
DI – WestMARC
EA – Neo Natal
FA – Multi Storey Car Park 2
FB – Multi Storey Car Park 1
GA – Laboratory Medicine
GB – Energy Centre
HA – Adults Hospital
HB – Childrens Hospital
IA – Teaching & Learning Centre
IB – Office Building
IC – Imaging Centre of Excellence (ICE)

NOTE: ICE building is owned by University of Glasgow (UoG). Facilities management and maintenance is carried out under contract by NHS GG&C on behalf of UoG.

Langland Building is managed via PFI by Serco and MDU is managed via Vanguard.

See Site Map in Appendix 1

2.0 RECORDING

2.1 Written Scheme Inspection Records

Anyone inspecting this written scheme (either as part of the Management Control System or otherwise) is invited to make an entry in this inspection record. **Under no circumstances may this Written Scheme or any part of it be removed from site.**

Date/Time	Comments	Signature	Position
June 2018	Written scheme has been reviewed and re-formatted into this current form (Revision D) by Colin Purdon as part of the water systems review.		Site Manager Operational Estates
Feb 2019	Written scheme has been reviewed and re-formatted into this current form (Revision E) by Colin Purdon as part of the water systems review.		Interim Sector Estates Manager (Deputy Responsible Person)
May 2019 Rev B	Written scheme has been reviewed and re-formatted into this current form (2019 Rev A) by Colin Purdon as part of the water systems review.		Interim Sector Estates Manager (Deputy Responsible Person)
October 2020 Rev C	Written scheme has been reviewed to reflect changes to staff personnel and a review of procedures.		Site Manager Operational Estates
May 2021 Rev D	Written scheme has been reviewed to reflect changes to staff personnel and a review of procedures.		Site Manager Operational Estates
Aug 2022 Rev E	Written scheme has been reviewed to reflect changes to staff personnel and job titles. Additionally modified procedures for WS01 (Page 103)		Site Manager Operational Estates
Jan 2023 Rev F	Minor changes to words regarding daily flushing		Site Manager Operational Estates
Aug 2023 Rev G	Index section 2 missing now added back in. Some additional record form references added and some wording changes to Facilities flushing		Site Manager Operational Estates

Additional entries should be completed on a separate sheet and inserted in Section 2.1 with this sheet.

2.2 Location of Records and Correspondence

Details of any correspondence, including Risk Assessments/Reviews and Ongoing Monitoring Reports, relating to water services should be entered on the sheet below, recording where held and by whom.

Date	Procedure or Record ref	Description	Held by/location
16/07/18	Flushing Outlets 026	Email correspondence in relation to Flushing DCFP kitchen dishwasher and outlets with John Heron and Adam Wright	Colin Purdon email archive. Hard copy in correspondence logbook

Additional entries should be completed on a separate sheet and inserted in Section 2.2 with this sheet.

2.3 Non-Compliance Issues and Fault Detail Log

Record Form 004

All non-compliance and fault details in relation to the individual systems in each building must be recorded on Record Form 004 and brought to the attention of the Water Systems Lead AP as soon as possible. This process ensures that all non-compliance issues are documented, managed effectively and tracked through to completion and close –out of the issue. Copies of Record Form 004 are to be stored within the shared drive. SCART Compliance/22 Water/.

The process for sampling out of specification is documented in WQS – 017 Procedures in the event of out of specification sample for Legionella and other monitored bacteria, moulds etc.

2.4 Archived Information Record Sheet

All records associated with the management or maintenance procedures within this Written Scheme should be kept for a period of five years after they are no longer current. Records should be kept locally within the main Estates Office. The details of any archived information held separately in secure storage should be recorded in the table below.

Date	Procedure or Record Reference	Description	Held By/Location

Additional entries should be completed on a separate sheet and inserted in Section 2.4

2.5 Equipment Calibration Records

All equipment used for the measurement of temperatures should be calibrated at least annually to ensure the accuracy and consistency of the recording procedures.

Calibration certificates for handheld thermometers are held in hard copy within the QEUH Campus Log Book suite in the main estates office. Electronic copies are also held on the QEUH Shared Drive>Water Quality folder.

3.0 MANAGEMENT ARRANGEMENTS

3.1 Roles & Responsibilities

NHS Greater Glasgow & Clyde Chief Executive – (Duty Holder)	The Chief Executive has ultimate responsibility / accountability for water system safety within NHSGG&C. The responsibilities of the Chief Executive include: • Responsibility for implementation of the relevant mandatory and statutory elements contained within the Health & Safety Commissions Approved Code of Practice and Guidance "Legionnaires Disease. The control of Legionella bacteria in water systems" L8 (ACOP L8), SHTM04-01: The control of Legionella, hygiene safe" hot water, cold water and drinking water systems and CEL 08(2013) water sources and potential risk to patients in high risk units – revised guidance. The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring that adequate resources are provided to meet the Water Systems Safety requirements of NHSGG&C estate. Ensuring that the Water Systems Safety Policy is being implemented at all levels. • Reviewing and monitoring the operation of the Water Systems Safety Policy through the Board Corporate Management Team and ensuring that clear guidelines are provided for this tasked with compliance of legislative and statutory standards. • Appointing the Designated person (Pseudomonas) and Designated Person (Water) to assist in the execution of these responsibilities, who for NHSGG&C are the Infection Control Manager (Pseudomonas) and the Director of Facilities (Water).
NHS Greater Glasgow & Clyde Director of Estates and Facilities – (Duty Holder)	The Director of Estates and Facilities is the Designated Person (Water). They shall be responsible for: • Ensuring that Estates and Facilities staff, through the general management structure is fully aware of the current statutory and mandatory requirements and standards for the provision and maintenance of safe water systems. • Ensuring with the Responsible Person (Pseudomonas) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person (Water) at sector level and Deputy Responsible Person(s) (Water) at site level. This shall be the Sector Estates Manager (SEM) and the relevant Site Manager Operational Estates (SMOE)/Site Estates Manager within the Facilities Directorate management structure.

3.1 Roles and Responsibilities (cont)

NHS Greater Glasgow & Clyde Director of Estates and Facilities – (Assistant Duty Holder)	The Assistant Director of Estates and Facilities is the Assistant Designated Person (Water). They shall be responsible for assisting in : • Ensuring that Estates and Facilities staff, through the general management structure is fully aware of the current statutory and mandatory requirements and standards for the provision and maintenance of safe water systems. • Ensuring with the Responsible Person (Pseudomonas) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person (Water) at sector level and Deputy Responsible Person(s) (Water) at site level. This shall be the Sector Estates Manager (SEM) and the relevant Site Manager Operational Estates (SMOE)/Site Estates Manager within the Facilities Directorate management structure.
NHS Greater Glasgow and Clyde Infection Control Manager - Designated Person (Pseudomonas)	The Infection Control Manager supported by the Board Infection Control Doctor is the Responsible Person (Pseudomonas). They shall be responsible for: • Ensuring that Infection Control Teams are fully aware of current guidance on Legionella control matters and the minimisation of the risk of Pseudomonas aeruginosa infection from water. • The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring with the Designated Person (Water) that the Water System Safety Policy is regularly reviewed and updated. • Co-Chair the NHSGG&C Water Systems Safety Group. • Appointing in writing the Responsible Person(s) (Pseudomonas) at sector level. This shall be the relevant Infection Control Doctor.
Assistant Head of Estates - Responsible Person (Water)	The Assistant Head of Estates will be appointed as the Responsible Person (Water) at Sector level by the Director of Estates and Facilities in writing. The Sector Estates Manager is responsible for: • Ensuring the effective maintenance of engineering controls installed for the purposes of controlling water systems. • Ensuring that written schemes and risk assessments are in place and reviewed regularly. • Devising and maintaining procedures to ensure the quality of water on premises is maintained. • Ensuring operational procedures are carried out and documented. • Ensuring records are kept of all water systems and their purpose, giving locations recording and maintaining within the Boards estates management system. • Liaise closely with other professionals to ensure legislative and statutory compliance is maintained by the Board.

3.1 Roles and Responsibilities (cont)

3.1 Roles and Responsibilities (cont) **Authorising Engineer (AE)**	An Authorising Engineer acts as an independent professional advisor to the healthcare organisation, appointed by the organisation with a brief to provide services in accordance with Scottish Health Technical Memorandum (SHTM) guidance. He will be appointed in writing by the Director of Facilities/General manager (Estates). The Authorising Engineer acts as an assessor, making recommendations for the appointment of Authorised Persons, monitoring the performance of the service and providing an annual audit to the organisation's Designated Person.
Authorised Person (Water)	The Authorised Person (water) has the key operational responsibility for the service, qualified, sufficiently experienced and skilled for the purpose. They will be nominated by the Authorising Engineer and be able to demonstrate • They application through familiarization with the system and attendance at an appropriate professional course; • A level of experience; • Evidence of knowledge and skills. An important element of the Authorised Person (Water) role is the maintenance of records, quality of service and maintenance of system safety (integrity). The Authorised Person (Water) will also be responsible for establishing and maintaining the roles and validation of Competent Persons (Water) who shall be suitable trained employees of the organisation or appointed contractors. Larger sites may require more than one Authorised Person (Water) for a particular service. The Authorised Person (Water) will be appointed by the General Manager – Capital Planning.

3.1 Roles and Responsibilities (cont)

Head of Capital Planning (Water)	The Head of Capital Planning will be appointed as the Deputy Responsible Person (Water) at Board level by the Director of Estates and Facilities in writing. The General Manager for Capital Planning is responsible for: • Ensuring that any new works undertaken or refurbishment within existing premises shall comply with the requirements of this Policy and the Written Scheme and Operational Procedure for managing Water Safety including The control of *Legionella*, hygiene, 'safe' hot water, cold water and drinking Water systems and The implementation of Guidance for neonatal units (NNU's) (levels 1, 2 & 3) adult and paediatric intensive care units ICU's in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water. • Ensuring that all potential interfaces between an operating system and new and refurbishment works shall meet the approval of the Responsible Person (Water) and Authorised Person (water) as to methodology for making that interface. • Ensuring that any work involving the installation of water services or equipment requiring a water supply shall follow the guidance in SHTM 04-01 and HSE document L8 and shall be certified by the design Engineer as to that compliance. • Ensuring that any works which will affect an operational water service will be discussed with the Estates Authorised Person (Water) prior to arranging that work.
Site Estates Manager Deputy Responsible Person (Water)	The Site Manager Operational Estates (SOME) shall be appointed in writing by the Director of Facilities/General Manager (Estates) in writing as the Deputy Responsible Person (Water) and will also act as the Designated Person Water in the absence of the Designated Person (Water). The Site Maintenance Manager/Site Estates Manager is responsible for: • Ensuring all staff conducting water system maintenance are competent to do so. • Ensuring water system maintenance records are maintained and kept up-to-date. • Regularly checking maintenance records. • Ensuring all work is completed in accordance with the NHS GG&C Estates Procedures.

3.1 Roles and Responsibilities (cont)

Acute Services Directors CH(C)P Directors and Corporate Division Directors	As Senior Managers, NHSGG&C Directors play an intrinsic role in ensuring that water safety is embedded within the culture of the organisation. The responsibilities of Directors include: • Supporting the designated person (Water) and (Pseudomonas) in the development of the Board's overall strategy in relation to water safety and for ensuring implementation within their areas of responsibility; • Ensuring that all staff are made aware of their requirement to attend Water Safety training at the appropriate frequency, as per the NHSGG&C Water Safety Policy and Operational Procedures which underpin this by facilitating staff release from duties to attend training; • Supporting action to address staff who put themselves and/or others at risk from a real or potential water safety incident.
Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's	All managers who have a responsibility for the day to day management of facilities, staff or services, and/or premises, have water safety responsibilities that include: • Familiarise themselves with the NHSGG&C Water Safety Policy and local control measures including any water risk assessments for their area(s) of responsibility; • Ensuring that persons in the department, clinic or ward are fully aware of their responsibilities and duties in respect of Water Safety, in particular, the action required of them should the area be defined as High Risk by the local Water Safety Group • Ensure that persons in the department, clinic or ward are fully aware of the Infrequently Used Outlets definitions and Operating Procedure which underpins the NHSGG&C Water Safety Policy
Heads of Service, Departmental Managers, Clinical Managers, Senior Charge Nurse's (cont)	• Actively promoting Water Safety within the department or ward by maintaining good housekeeping within the department or ward at all times, ensuring that any flushing or documentation as described in the Water Safety Written Scheme and Operational Procedures documentation is completed on time • Responding appropriately to any water safety concerns that persons in the department, clinic or ward have; • Nominating a responsible person to complete the Monthly Infrequently Used Outlets Audit for each area, forwarding a copy to the Site Maintenance Manager, thereby assisting NHSGG&C to meet its statutory and mandatory requirements; • Ensuring that action is taken on a daily basis to address any access issues identified within the Cleaning Compliance Checklist Sign Off documentation retained in the Facilities Folder. • Liaising with the estates department as required

3.1 Roles and Responsibilities (cont)

Legionella Risk Assessor	The NHS Board appoints in writing a Legionella Risk Assessor with terms of reference to provide services in accordance with BS 8580, SHTM 04-01 and HSE guidance under this Policy. He/she will be appointed in writing by the Director of Facilities/General Manager (Estates)
Competent Person (Water)	The Competent Person (Water) provides skilled installation and/or maintenance of the specialist service. He/she will be appointed, or authorised to work (if a contractor) by the Authorised Person Water). He/she will demonstrate a sound trade background and specific skill in the specialist service, working under the direction of the Authorised Person (Water) in accordance with operating procedures, policies and standards of the service.
Maintenance Tradesperson	A Maintenance Tradesperson is someone who has sufficient technical knowledge and the experience necessary to carry out maintenance and routine testing of the water supply, storage and distribution system.
Installer	The Installer is the person or organisation responsible for the provision of the water storage and distribution system.
Contractor	A Contractor is the person or organisation designated by management to be responsible for the supply, installation, validation and verification of hot and cold water services, and for the conduct of the installation checks and tests in relation to the control of *Legionella*. The NHS Board will expect potential contractors to have suitable qualifications (for example companies/individuals who are members of the *Legionella* Control Association).

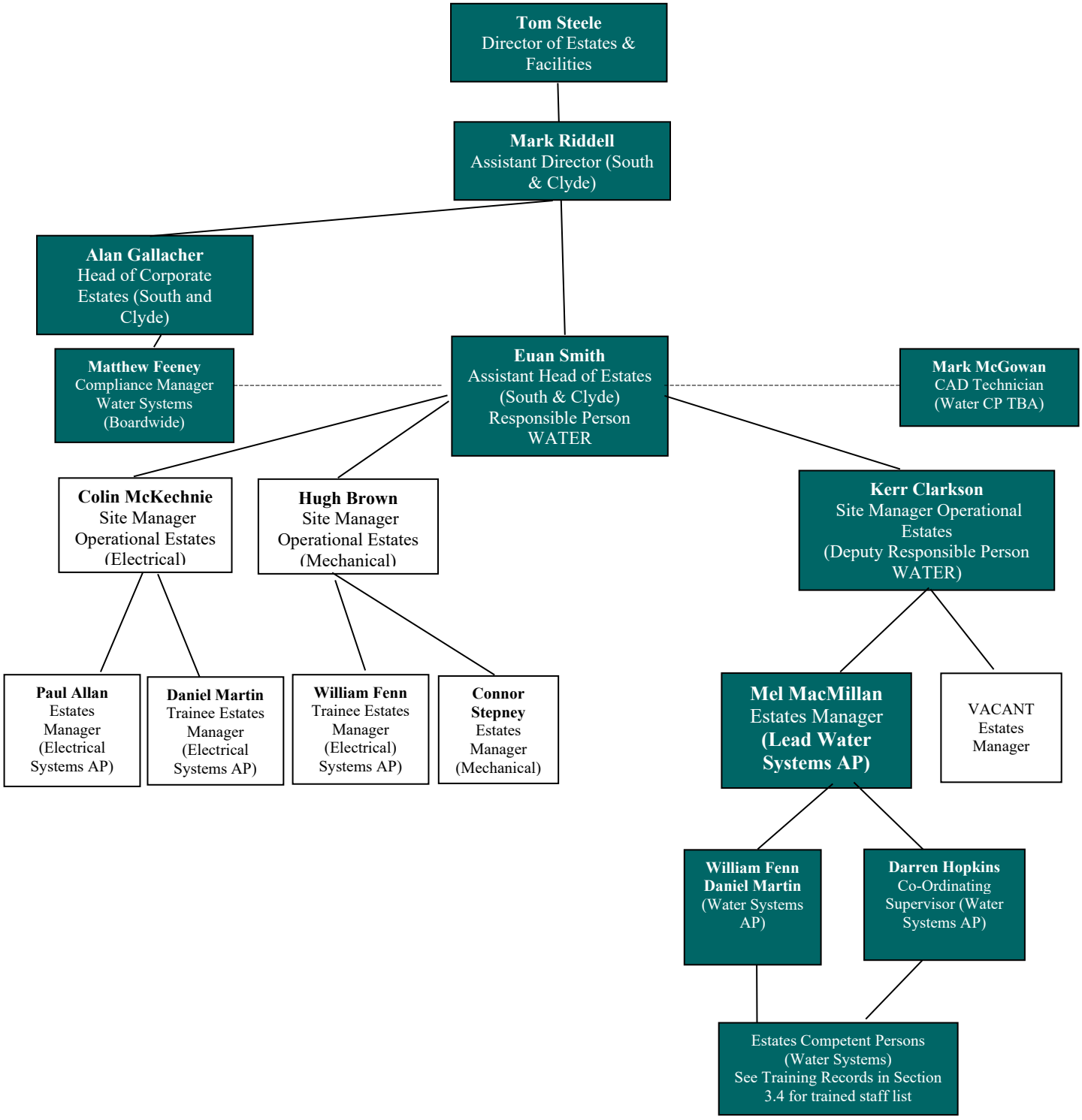
3.1 Roles and Responsibilities (cont)

NHS GG&C South Sector (QEUH) Hierarchy Appointment Table

Designation	Position	Name Tel Number
The Duty Holder	Chief Executive	Jane Grant
Designated Person (Water)	Director of Facilities/General Manager (Estates) Assistant Director (Estates)	Tom Steele Mark Riddell.
Authorising Engineer (Water)	AE	Dennis Kelly [redacted]
Legionella Risk Assessor	DMA Water Services Ltd	David Watson Mike Kinghorn [redacted]
Responsible Person (Water)	Sector Estates Manger (South)	Euan Smith
Deputy Responsible Person (Water)	Site Manager Operational Estates (Building)	Kerr Clarkson
Deputy Responsible Person (Water)	Head of Capital Planning	James Huddleston
Lead Authorised Person	Estates Manager	Mel MacMillan
Authorised Persons	Estates Manager Co-ordinating Supervisor Co-ordinating Supervisor Co-ordinating Supervisor	Darren Hopkins Grant Bennet William Fenn Daniel Martin
Competent Persons	CAD Technician	Mark McGowan
Competent Persons	Plumbers/Engineers	See training records in Section 3.4
Others Involved		
Microbiology	Consultant Microbiologist	Alistair Leonard Linda Bagrade Aleksandra Marek
Infection Control	Director Lead Nurse Lead Nurse	Sandra Devine Gillian Bowskill Lynn Pritchard
Public Health		Dr Iain Kennedy
Laboratory Services		Sandra Higgins

3.2 QEUH Estates Staffing

Management organogram for QEUH Estates Dept as of Oct 2019



3.3 Required Maintenance Tasks

The maintenance and management of the water systems throughout the QEUH Campus is undertaken by a combination of both NHS Staff and external Contractors at the frequencies identified in the following tables.

QEUH Management staff manage and oversee the following tasks:

Procedure Reference	Operation(s)	Record Form Ref	Frequency
P1C1	BMS Temperature Monitoring (**Carried out by NHS Estates**)	**Requires new number**	***Daily***
P1CC1A	Manual Temperature Monitoring for calorifiers (different form used ONLY REQUIRED if no BMS Monitoring	**(005a)**	***Daily***
N/A	Filtration Plant Checks (**Carried out by NHS Estates**)	**028c**	***Twice Daily***
WS01	Daily flushing of agreed outlets (**Carried out by NHS Facilities**)	**QEUH Water Flushing form**	***Daily***
WS01	Deluge shower/Eye wash flushing (**1 off carried out by NHS Estates and 1 off by DMA**)	**(026)**	***Twice Weekly***
WS01	Flushing of little used outlets * frequency based on risk (**Carried out by NHS Clinical**) see page 103	**On line or physical records WS01**	***Daily or Twice weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
P1C4	DHW Calorifier and Buffer Vessel Checks (**Carried out by NHS Estates**)	**(005)**	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
P1C12	Showerhead/hose replacement/disinfection (*No longer carried out as shower head and hoses replaced quarterly)*	**(005b)**	***Quarterly***
WS01	Review of Rarely Used Water Outlets and Changes In-Use (As required by NHS Estates)		***Quarterly***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
N/A	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates during calorfier checks, Plant Room checks and by DMA during Tank Room checks**)		***Annually***
N/A	Vibration coupling inspection (Carried out as part of checks on booster pumps) (**Carried out by NHS Estates**)		***Annually***
N/A	Carry out review of log books and Written Scheme		***Annually (Sep)***
N/A	Carry out review of drawings and schematics		***Annually (Sep)***

3.3 Required Maintenance Tasks (cont)

In addition to the tasks undertaken by NHS directly employed Competent Persons, there are also tasks undertaken by Contractors on a selection of buildings within the campus.

Appointed Service Providers presently undertake the following tasks:

Procedure Reference	Operation(s)	Record Form Ref	Frequency
WS01	Deluge shower/Eye wash flushing (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
WS01	Flushing Deadlegs and drain valves (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
WS01	Flushing Intermittently used outlets (**Carried out by DMA**)	**DMA Records**	***Twice Weekly***
	External Water Mains Valve Operation and Flushing Routines		***Monthly***
PIC4	Temperature and CL02 monitoring of outlets (**Carried out by DMA**)	**DMA Records**	***Monthly***
-	PPM Schedule Monthly Visually inspect chemical delivery system, Check chemical suction and delivery lines for correct operation Chemical level check and refill , Cross check measured ClO2 / Chlorite residual test against analyser & Palintest Kit, Check and Adjust controller settings as required (**Carried out by ScotMas**)	**ScotMas Records**	***Monthly***
	PAL Filters on taps outlets (**Carried out by DMA**)	**DMA Records**	
	'TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)	Carried out 6 monthly	***Quarterly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK) **Carried out 6 monthly**		***Quarterly***
	Shower Head and Flexible Hose Exchange (**Carried out by DMA**)	**DMA Records**	***Quarterly***
WQS 001	HORNE Tap Flow Restrictor Exchange (**Carried out by DMA**)	**DMA Records**	***Quarterly***
	'TMV' Tap Outlet Sanitisation and Operational Checks (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
-	Maintenance of filtration units (**Carried out by Veolia**)	**Veolia Records**	***Six-Monthly***
-	6 Monthly Visit– All above, plus, Check ClO2 gas detector functionality and recording levels, Simulate fault circuitry and alarm on Sentinel Monitor, Change probe electrolyte and cross calibration test, Carry out manual Chlorate & Chlorite validation tests (12 representative outlets), Check water meter operation and report o Electrolyte top up, Probe calibrations (**Carried out by Scotmas**)	**ScotMas Records**	***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***

3.3 Required Maintenance Tasks (cont)

	CWST Inspection **(Carried out by DMA)**	**DMA Records**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks **(NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING)**	**DMA Records**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required **(Carried out by Scotmas)**	**ScotMas Records**	***Annually***
P1C10	Representative Tap Temperature Monitoring Note all tap temperatures are checked through TMT/TMV maintenance **(Carried out by DMA)**	**DMA Records**	***Annually***
	BMS Sensors (**Carried out by Schneider and MCE BMS Providers for respective BMS**)	**Schneider & MCE records**	***Annually***

3.4 Training Records

The following NHS personnel are certified to have the required ability, experience, instruction, information and training to carry out the work associated with legionella precautions at QEUH Campus.

NAME	POSITION	NATURE OF TRAINING (QUALIFICATION, TRAINING COURSES ATTENDED)	DATE
Euan Smith	Sector Estates Manager RP	Responsible Person Course ENAP City & Guilds Authorised Person ENWS City & Guilds Managing Water Systems	
Kerr Clarkson	Site Manager Operational	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	
Mel MacMillan	Estates Manager Lead AP		
Daniel Martin William Fenn	Trainee Estates Managers AP	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	
Grant Bennet Darren Hopkins	Co-Ordinating Supervisor AP	WHH01 – Legionella Management for Water Systems SHTM-04 01 WH003 - Legionella Control Within Hot and Cold Water Systems	

Copies of all relevant training records and appointment letters are held electronically on the QEUH Shared Drive within the folder path “Water Quality>Training and Appointments”.

The results achieved by each member of staff during their competency training are held on the central database managed by the Water Systems Compliance Manager.

NAME	POSITION	NATURE OF TRAINING (QUALIFICATION, TRAINING COURSES ATTENDED)	DATE
Martin Inglis	Tech Plumber	Competent Persons	
Andrew Hamilton	Tech Plumber	Competent Persons	
David Fickling	Tech Plumber	Competent Persons	
Mark McInally	Tech Plumber	Competent Persons	
Shawn O'Neill	Tech Plumber	Competent Persons	
Jason Weir	Tech Plumber	Competent Persons	
Adam Gardner	Tech Plumber	TBC	
Robert Grant	Tech Plumber	TBC	
Ryan Ogilvie	Tech Plumber	TBC	
Gavin Goodall	Apprentice	TBC	
Paul Kelly	Apprentice	TBC	
Mark McGowan	CAD Technician	TBC	

Copies of all relevant training records and appointment letters are held electronically on the QEUH Shared Drive within the folder path "Water Quality>Training and Appointments".

The results achieved by each member of staff during their competency training are held on the central database managed by the Water Systems Compliance Manager.

3.5 Training Requirements

A programme of training and procedures to assist in assessing and ensuring the competence of ALL persons responsible for the operation, maintenance, repair and alteration to the water distribution system and associated plant and equipment requires to be progressed, developed and implemented.

QEUH Estates Staff - Interim Training Requirements:

Item	Training Requirement	Applicable to	Target Date for Completion	Date Completed
1	Toolbox talks on Written Scheme Section 4 for staff.	All plumbers		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

NOTE:- This table should be updated on a regular basis as part of the review process described in **Section 3.10.**

3.6 Water Systems Risk Assessment

The duly appointed *Legionella* Risk Assessor for *Legionella* and Water Systems Safety will update the *Legionella* risk assessment database as directed by the board.

Risk assessments for each building have been conducted by DMA Water Ltd and are filed in the main Estates Office at QEUH. Each contains details of individual systems and a summary of the associated risks. The risk assessments each contain unique information in regard to the water distribution systems in the buildings and also guidance on the recommended maintenance procedures for mitigating risk.

Risk Assessment Review-Escalations

During the Risk Assessment, whenever an anomaly is discovered on either the hot or cold water systems, the Risk Assessors e-mail the AP (water) with their findings. These anomalies are actioned by creating a FM job for the onsite CP Plumbing Technician. The findings are held in the Estates office in the folder named (Pre Risk Assessment Jobs completed).

Risk Assessment Process for Removal of Identified Items

Points are actioned that have been identified in the Risk Assessment, all drawings are updated to reflect the changes and the Risk Assessment action point is closed.

Risk Assessment Review Schedule

A review of the Risk Assessments MUST be carried out after or during the following:

A change to the water system or its use

A change to the use of the building/ward/clinic/dept etc.

Changes in legislation or updates in control measures

Changes in immediate management or key personnel

Control measures becoming ineffective

Increased micro-bacterial levels found in the water system or a case of legionnaires disease/legionellosis associated with the water system.

Action plan details for each risk assessment are summarised on the Smartsheet tool.

Electronic copies of the Risk Assessments are also held on the QEUH Shared Drive at the folder path

“Water Quality>Risk Assessments”

Further information on reviewing Risk Assessments is detailed in Appendix 3.

3.7 Plant Description and Schematics

Details of the plant in each building and schematic layouts are contained within the individual log books/risk assessments for each building. The log books/risk assessments are stored in the main Estates Office at QEUH.

These details are also held on the Shared Drive

All plant details and system schematics and as-fitted drawings for the Adult & Childrens Hospitals are contained in the ZUTEC cloud based document management system. All Estates Managers and Supervisors have access to these systems.

Additional access accounts can be set up at the request of the QEUH Site Manager Operational Estates.

Brendan.egan[redacted]

3.8 Water Systems Audits/Review Procedures

A duly appointed Authorising Engineer (Water) will audit the entire Water Safety procedures within *NHS Board* annually.

The appointed Authorising Engineer for Water Safety will produce an annual report for management review. *See Section 3.1 pg 18 for current appointments.*

AE Audit

The Lead Authorised Person (Water) must regularly gather and maintain all the relevant information and records, including relevant Water Safety Risk Assessments and Written Schemes.

Working with the Authorising Engineer (Water) and Responsible Person (Water), the relevant Authorised Person (Water) will review and analyse all records for compliance with *Legionella* and other water safety parameters.

The relevant Authorised Person (Water) will detail on these records any deviations from the *Legionella* and other water safety parameters giving a brief description as to the reason for this deviation.

The Audit Programme will consist of planned audits on the following elements, for example:

Risk Assessments;

All documentation associated with this Written Scheme

training review and records;

schematic drawings;

Water Safety Log Books/Maintenance records;

BMS trend log comparison.

A report will be produced summarising the audit for submission to the Sector Water Safety Group.

The Lead Authorised Person (Water) will file locally, all relevant information and maintain hard copy records in the Water Safety Log Books stored within the main Estates Office. All actions identified should be tracked to ensure completion and closure.

Summary of Internal/External Audit Procedures

Frequency	Task	By Whom
Annually	Carry out Authorising Engineers Audit and produce report for submission to Sector Water Safety Group (Section 3.8 WS)	Lead AP, AE,
Annually/May	Carry out annual review of written scheme and produce report for submission to Sector Water Safety Group (Section 3.9 WS)	RP/DRP, Lead AP, Compliance Mgr
6 monthly	Carry out management review (Section 3.10 WS)	RP/DRP, Lead AP, Compliance Mgr
Monthly	Carry out regular audit of SCART topic and update database (Section 3.11 WS)	Lead AP
Monthly	Conduct contractor meetings/audits to ensure compliance with legislation and training requirements.(Section 3.12 WS)	Lead AP

3.9 Written Scheme Audit Procedure

The Written Scheme will be audited at agreed intervals but should be at least annually.

An audit schedule will be prepared to ensure the entire procedure is audited. This should be done in conjunction with the Lead AP (Water Systems), Compliance manager, and Responsible Person (Water Systems). A report should be produced and submitted to the Sector Water Safety Group.

3.10 Management Review

The Responsible Person (Water) will hold regular review meetings to confirm current compliance with Water Safety System requirements, identification of any deficiencies and actions required to resolve staff training needs.

The management review will be based on following:

- Results of internal audits;
- Results of external audits;
- Staff suggestions;
- Training records;
- Operation of the system and procedures over a reasonable historic period (6 to 12 months)

3.11 Water Systems SCART Report

The Lead Authorised Person (Water) must regularly gather and maintain all the relevant information for import into the Campus SCART system.

All evidence confirming the SCART position and justification for risk rating adjustments should be uploaded to the SCART database in electronic format.

3.12 Contractor Management & Audit Report

Contractor Management Process

Regular review meetings should be set up with any contractors working on the water distribution system. Minutes of the meetings are held on the QEUH Estates Shared Drive at the path: SGH Estates>Water Quality>Contractor Meetings.

Discussions should include:

Ongoing works;
Future task programme;
Recording procedures;
RAMS;

Contractor Competency

Regular checks should be performed to ensure that any contractors working on the water distribution system are deemed competent and all operatives are suitably trained to conduct the delegated tasks. Copies of all Risk Assessments and Method Statements should be refreshed and all training records reviewed by the Water Systems AP. Copies are stored on the QEUH Campus Shared Drive in Water Quality.

Contractor Audit Report

A report should be produced at least annually to record the findings of the audit.

3.13 Permit to Work, Water Systems.

The Permit to Work Water Systems as per this written scheme is solely intended to be used when works on the hot and cold water systems and its ancillary equipment are to be completed within the QEUH and RHC campus. This includes break-ins to existing pipe work, removal of dead legs and any new installation works.

The Permit to Work may only be issued to Competent Persons (L8 approved) by the Authorised Person (AP) for water. This includes in house maintenance staff and approved contractors.

The Permit to Work form will include the following;

- Name of the organisation issuing the permit.
- Permit number.
- Name of Authorising Person (AP), including emergency contact details.
- Reasons for the works on the water system, (Plant Preventive Maintenance, Planned repairs or Emergency works).
- Exact location of the works
- Reference to any as built drawing numbers, (for update purposes).
- Name of Competent Person (CP) undertaking the works.
- Hazards and Risks, (copy of Risk assessment and Method Statements (RAMS) to be submitted for approval before start of works)
- Commissioning and Testing.

The above points on the Permit Work are broken into five categories, namely;

Part 1 Description of work and authorisation/permission to proceed.

Part 2 CP acceptance of work and conditions.

Part 3 Confirmation of work completion and engineering test results.

Part 4 Authorisation to use a system.

Part 5 Acceptance of system status by Nurse Manager.

Procedure to be followed for Permit to Work on water systems within the QEUH and RHC;

Sign into Estates office within the Laboratory building on the QEUH and RHC campus.

Receive induction from Authorised Person water.

Provide L8 Competent Person certification to Authorised Person water.

Provide applicable RAMS for the works to be completed.

3.14 Tool Box Talk, Hot and Cold Water Systems.

Estates Tool Box Talk on Hot and Cold water Systems is located on the shared drive / water quality / Estates Tool Talk. This is carried out in the form of a power point presentation.

4.0 MAINTENANCE PROCEDURES

Procedure Reference	Operation
4.1	SYSTEM INFORMATION
4.2	MAINTENANCE PROCEDURES SUMMARY
4.3	WEEKLY MAINTENANCE TASKS
4.4	MONTHLY MAINTENANCE TASKS
4.5	QUARTERLY MAINTENANCE TASKS
4.6	SIX MONTHLY MAINTENANCE TASKS
4.7	ANNUAL MAINTENANCE TASKS
4.9	BI-ANNUAL MAINTENANCE TASKS

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.1 System Information

4.1.1 Correct and Safe Operation of the System

Measures should be in place to ensure that the water system is operated within the specific parameters as detailed in the following paragraphs:

4.1.2 Hot Water System

The storage of domestic hot water should be arranged to ensure that a water outflow temperature of at least 60ºC is achieved. No two water systems are the same and through periodic monitoring operational system performance, the system outflow temperature should be set to over 60ºC to ensure an outflow of 60ºC is achieved under normal draw-off demand and achieve 55°C at the supply to the furthermost draw-off point in the circulating system. It is important to maintain temperatures at above this figure (Legionellae organisms will survive for only a short period of time above this temperature - approximately two minutes).

Periodic performance monitoring and a system of continuous monitoring and recording of water temperatures via a building management system (BEMS) or data logger is essential to ensure compliant system performance.

The outflow water temperature, under prolonged maximum continuous demand (at least 20 minutes) from calorifiers should not be less than 60ºC.

While it is accepted that occasionally under peak instantaneous or prolonged demand the water outflow temperature will fall, it is not acceptable if this occurs frequently (more than twice in any 24 hour period) and/or for long periods (exceeding 20 minutes).

Under no circumstances should the domestic hot water flow temperature fall below 55ºC.

It is recommended that disinfection by pasteurisation is undertaken if the water temperature of the calorifier falls below 45ºC. A minimum domestic hot water circulation (return) temperature of 55ºC shall be maintained during the hours of occupancy.

4.1.3 Cold Water System

All domestic cold water storage cisterns and tanks shall comply with the requirements of the Scottish Water Byelaws.
Duplicate tanks often create a risk of water becoming stagnant in one of them, leading to risk of Legionella, Pseudomonas Spp or similar contamination. Consideration should be given to taking one of the tanks out of service. See guidance in “Guidance for Alterations to Water Systems”.

All cold water storage tanks are to be examined and the temperature tested on a regular summer / winter six monthly cycles and cleaned on an annual basis as required.

Temperatures in cold water storage tanks and the mains inlet to them should be checked during periods of high ambient temperatures (e.g. summer afternoons between June and August). Water temperatures should be less than 20ºC.
At the same time, the furthest and nearest draw off points in the system should be checked to ensure that the water distribution temperatures are less than 20ºC within 1 minute of running the water (at full flow).
A similar temperature check regime should be undertaken during the winter months to identify the performance of cold water distribution systems and the impact of heat gain from heating systems.

4.1.4 Cold Water System Dump Valves

The cold water system installed in the Adult & Childrens Hospitals has a dump valve arrangement incorporated into the ground floor, 1st floor and 2nd floor layouts. The positions of the dump valves are shown on the Schneider BMS STRUXUREWARE system and connected via the KNX network.
Operating parameters for the dump valves are as follows:
Open at 23°C
Close at 20°C

4.1.5 End of Line Sensors (EOLs)

The hot and cold water system also incorporates End of Line (EOL) sensors which monitor the temperatures at specific sentinel points across all 11 floors of the Adult & Childrens installation. These can also be viewed via the Schneider BMS system.

4.1.6 Sampling

General microbiological and Legionella sampling in hot & cold water systems

Circumstances under which samples are taken:

- prior alterations to an existing water system;
- as part of commissioning process, prior to handover of a new building or introduction of a (altered, refurbished or new) water system into use;
- one week following handover of a new building or new water system;
- as part of the tank cleaning and disinfection process;
- as part of an assessment programme;
- in response to taste, odour or sustained discoloured water complaints.

When such samples are taken, a mains supply sample should be taken as a control to verify whether the supply could be the source of the identified problems. Scottish Water should also be contacted for distribution zone water quality data.

4.1.7 WS01 – Little Used Outlets

Control of Legionella in Water Systems, Intermittently used Water Outlets and Showers, Standard Operating Procedure WS01.

The Estates department is required to ensure that on a quarterly basis the list of ‘intermittent’ or ‘infrequently’ used water outlets or showers is reviewed to ensure it is accurate and up to date. Records of these reviews will be held within the system logbooks held locally.

If after investigation the taps or appliances identified within the reviewed list are deemed not necessary wherever possible the supply should be cut and the appliance removed from the water system. Where this is not possible then pipe work shall be cut back as close to the main circulating line as practicable to ensure that any dead-leg formed is minimised.

Nursing and other staff must be made aware of the issues surrounding legionella contamination and the link to low and underused water outlets and their assistance in formally identifying these possible outlets are sought.

Upon acknowledgement from the clinical staff of any intermittent or infrequently used outlets, the records are held on the Estates shared drive under Water Quality / WS01.

Any request from clinical staff regarding the removal of any intermittent or infrequently used outlets is assessed and surveyed by the AP (Water). If deemed appropriate a job is raised on FM for the Plumbing Technicians to remove, this is documented in the WS01 Records file in the Water Quality file on the shared drive. Subsequent hot and cold water pipe drawings are updated by the CAD Technician CP (water) where and when appropriate.

FILLING IN LOG SHEETS

Good water hygiene depends on maintaining high standards of cleanliness and freshness, together with careful temperature control. This section contains details of checks and recording sheets (marked "Log Sheets") to be filled in when checks and measurements are made to show that the necessary standards are being kept up. Alternatively, where an electronic PPM system is used, Procedure references should be entered.

Follow the instructions within the boxes and make entries as each task is completed. The tasks are all listed at the front of each section e.g. weekly tasks at the front of the weekly section, monthly section, quarterly 6 monthly etc. The summary list of tasks in this section is to remind you of what is required.

The Task and Log Sheets can be copied as required, completed Log Sheets will be filed where indicated in Section 2. **FM First ticket number MUST be included in all logsheets.**

PLANNING

The tasks and forms are organised into weekly, monthly, quarterly and annual sections. Always aim to carry out tasks early in the period when they are due to leave an opportunity to do them later if an emergency delays your plans.

ASK

If you have difficulties with the forms or do not understand the tasks, ask your Supervisor or line manager for clarification or guidance.

CHECKING

Incomplete or incorrect records are unacceptable in that they are misleading and do not do justice to the effort put in to achieve standards. Each log sheet includes a space for comment and tells you to check that all the boxes are complete: do make use of the comment space and double check the form, otherwise the record will have gaps and whoever is responsible for auditing will concentrate on what is missing and may not give you credit for the work that has been done.

LOG INSPECTION

Anyone inspecting this log (either as part of the Management Control System or not) is invited to make an entry in the inspection of Log Book record in front of Section One.

SURVEY

For survey purposes all surveys will be carried out starting left to right, where 2 off access doors are available the left access shall be taken first. Surveys shall be undertaken from top to bottom.

EQUIPMENT FITTINGS AND MATERIALS

Prior to carrying out alterations/ additions to distribution systems, the Water Fittings and Materials Directory published by the Water Regulations Advisory Scheme, should be consulted. This directory lists all materials and fittings approved for use to satisfy the requirements of current Water Byelaws.

Details of all new materials and fittings used in installations should be noted and recorded on the specific work document or project file for future reference.

SYSTEM ADDITIONS AND ALTERATIONS

Any additions, modifications or improvements to the water distribution system are to be noted and recorded and system record's amended to reflect such changes.

HYGIENE PRACTICES

Care should be taken to ensure high levels of personal hygiene, clean hands, clean clothing and PPE or gloves is maintained at all times when working on wholesome water operations. Tools, equipment, instrumentation and material's shall be free from contamination and appropriately disinfected before use.
Items such as pumps and hoses used in contact with water used for domestic purposes must be stored separately, clearly identified (ie colour coded or labelled) and **MUST NOT BE USED FOR ANY OTHER PURPOSE.**

Refer to Section 2.2 for location of maintenance records for the above.

4.2 Maintenance Procedures Summary

This section contains information in relation to the operational and maintenance checks managed by QEUH NHS Staff and appointed contractors to minimise the risk of exposure to *Legionella* and other waterborne micro-organisms within the domestic water systems, and to improve water quality. Procedures are as per the recommendations and exemplar models given in SHTM 04-01 Part G.

Procedure Reference	Operation(s)	Record Form Ref	Frequency
P1C1	BMS Temperature Monitoring (**Carried out by NHS Estates**)	**Requires new number**	***Daily***
P1CC1A	Manual Temperature Monitoring for calorifiers (**different form used ONLY REQUIRED if no BMS Monitoring**)	**(005a)**	***Daily***
N/A	Filtration Plant Checks (**Carried out by NHS Estates**)	**028c**	***Twice Daily***
WS01	Daily flushing of all outlets (**Carried out by NHS Facilities**)	**-**	***Daily***
WS01	Flushing of little used outlets * frequency based on risk (**Carried out by NHS Clinical**) see page 103	**-**	***Daily or Twice weekly***
WS01	Deluge shower/Eye wash flushing (**1 off carried out by NHS Estates and 1 off by DMA**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
P1C4	DHW Calorifier and Buffer Vessel Checks (**Carried out by NHS Estates**)	**(005)**	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
P1C12	Showerhead/hose replacement/disinfection (***No longer carried out as shower head and hoses replaced quarterly***)	**(005b)**	***Quarterly***
WS01	Review of Rarely Used Water Outlets and Changes In-Use (**Carried out by NHS Estates**)		***Quarterly***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
N/A	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates**)		***Annually***
N/A	Vibration coupling inspection (Carried out as part of checks on booster pumps) (**Carried out by NHS Estates**)		***Annually***
N/A	Carry out review of log books and Written Scheme		***Annually (Sep)***
N/A	Carry out review of drawings and schematics		***Annually (Sep)***

4.3 Required Maintenance Tasks (cont)

In addition to the tasks undertaken by NHS directly employed Competent Persons, there are also tasks undertaken by Contractors on a selection of buildings within the campus.

Procedure Reference	Operation(s)	Record Form Ref	*Frequency*
	CWST Inspection **(Carried out by DMA)**	**DMA Records**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks (**NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING**)	**DMA Records**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required **(Carried out by Scotmas)**	**ScotMas Records**	***Annually***
P1C10	Representative Tap Temperature Monitoring **Note:** All tap temperatures are checked through TMT/TMV maintenance **(Carried out by DMA)**	**DMA Records**	***Annually***
P1C1 4.3.1	Daily BMS Temperature Monitoring (**Carried out by Estates**)	**(021)**	***Daily***
P1CC1A 4.3.2	Manual Temperature Monitoring ***(only required in absence of BMS)*** (**Carried out by NHS Estates**)	**(005a)**	***Daily***
4.3.3	Filtration Plant Checks (**Carried out by NHS Estates**)	**(028c)**	***Twice Daily***
-	Flushing all outlets (**Carried out by NHS Facilities**)	-	***Daily***
WS01	Flushing Intermittently used outlets (**Carried out by DMA**)	-	***Twice Weekly***
WS01	Flushing Deadlegs and drain valves (**Carried out by DMA**)	-	***Twice Weekly***
WS01	Deluge shower/Eye wash flushing (**Carried out by DMA and NHS Estates**)	**(026)**	***Twice Weekly***
P1C3	Pump operation/duty rotation (**Carried out by NHS Estates**)	**(028a)**	***Weekly***
P1C4	Temperature Recording of Sentinel Hot and Cold Water Outlets. (**Carried out by NHS Estates**)	**(005c)**	***Monthly***
-	Temperature Recording of Sentinel Hot and Cold Water Outlets for CL02 (**Carried out by DMA**)	-	***Monthly***
P1C4	DHW Calorifier and Plate Heat Exchanger Checks (Carried out by NHS Estates)	**(005)**	***Monthly***
-	PPM Schedule Monthly Visually inspect chemical delivery system, Check chemical suction and delivery lines for correct operation Chemical level check and refill , Cross check measured ClO2 / Chlorite residual test against analyser & Palintest Kit, Check and Adjust controller settings as required (**Carried out by ScotMas**)	-	***Monthly***
P1C6	DWS Calorifier, Expansion Vessel Flushing. (**Carried out by NHS Estates**)	**(006) (023)**	***Monthly***
	Replacement of PAL filters (**Carried out by DMA**)		***31 Days or 62 Days***

Procedure Reference	Operation(s)	Record Form Ref	*Frequency*
WQS 001	HORNE Tap Flow Restrictor Exchange (**Carried out by DMA**)		***Quarterly***
	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK)		***Quarterly***
	'TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)		***Six-Monthly***
	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)		***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (Carried out by DMA) (**Carried out by DMA**)	**(003)**	***Six-Monthly***
	TMV' and Mixing Valve Sanitation and Maintenance Checks (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
N/A	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK) (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
-	Maintenance of filtration units (**Carried out by Veolia**)	**Veolia Records**	***Six-Monthly***
-	6 Monthly Visit– As per monthly, plus, Check ClO2 gas detector functionality and recording levels, Simulate fault circuitry and alarm on Sentinel Monitor, Change probe electrolyte and cross calibration test, Carry out manual Chlorate & Chlorite validation tests (12 representative outlets), Check water meter operation and report o Electrolyte top up, Probe calibrations (**Carried out by Scotmas**)	**ScotMas Records**	***Six-Monthly***
P1C7	CWST Inspection and Temperature Monitoring (**Carried out by DMA**)	**DMA Records**	***Six-Monthly***
	CWST Inspection (**Carried out by DMA**)	**-**	***Annually***
	Hot and Cold Tap Outlet Sanitisation and Operational Checks (NOT CARRIED OUT UNLESS ISSUE IDENTIFIED THROUGH SAMPLING)	**-**	***Annually***
-	As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement, Dosing Pump diaphragm valve replacements, Replace ClO2 gas detector cartridge if required (**Carried out by Scotmas**)	**-**	***Annually***
P1C10	Representative Tap Temperature Monitoring Note all tap temperatures are checked through TMT/TMV maintenance (**Carried out by DMA**)	**-**	***Annually***
P1C9	DWS Calorifier / Expansion Vessel Inspection (**Carried out by NHS Estates**)	**(006)**	***Annually***
	Water Services Pipework and Distribution System Checks (**Carried out by NHS Estates**)		***Annually***
P1C10	Representative Tap Temperature Monitoring (**Carried out by DMA as part of TMV checks**)	**(005)**	***Annually***
	Vibration coupling inspection Carried out monthly as part of checks of Booster sets (**Carried out by NHS Estates**)		***Annually***
	BMS Sensors (**Carried out by Schneider and MCE BMS Providers for respective BMS**)		***Annually***

4.3 Daily Maintenance Tasks

Reference	Operation
4.31	BMS Temperature Monitoring
4.32	Manual Temperature Monitoring
4.33	Filtration Plant Checks

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.31 – BMS TEMPERATURE MONITORING

DAILY

FM First Template No 826

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 26 para 3.11

RECORD FORM - (021)

PROCEDURE REF - P1C1

SCHEDULE REF – BMS 01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **DAILY** as a minimum:

Description of Works

- Refer to the BMS Temperature Monitoring Schedule BMS 01.
- Log onto both STRUXUREWARE BMS and DISTECH BMS front ends and check all temperatures from listed locations.
- Complete Schedule BMS 01 to confirm all temperatures have been checked.
- Any temperatures found outside the defined parameters stated on the BMS Temperature Monitoring Schedule should be investigated and resolved immediately. Details must be entered on Record Form (021) and escalated to the Water Systems AP.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Schedule BMS 01 and Incident form **04** if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return forms to the Water Systems AP.

NOTE: Both Struxureware and Distech BMS systems are capable of generating temperature trend logs. These logs will be checked on a regular basis by the Water Systems AP to confirm accuracy of information.

4.32 – MANUAL TEMPERATURE MONITORING (in absence of BMS)

DAILY

FM First Template No 830

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 26 para 3.15

RECORD FORM – (005a) (021a)

PROCEDURE REF - P1CC1A

SCHEDULE REF – MTM 01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **DAILY** as a minimum:

Description of Works

- Refer to the Manual Temperature Monitoring Schedule MTM 01.
- MANUALLY visit each location and obtain and record temperatures from all plant as listed on Schedule MTM 01.
- Any temperatures found outside the defined parameters stated on the MTM 01 Temperature Monitoring Schedule should be investigated and resolved immediately. Details must be entered on Incident Form (004a) and escalated to the Water Systems AP.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (005a) and (004) if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.33 – FILTRATION PLANT CHECKS

TWICE DAILY

FM First Template No 836

IN ACCORDANCE WITH BOARD POLICY

RECORD FORM – (028c)

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE DAILY** as a minimum AM and PM:

Description of Works

- Refer to the Filtration Plant Daily Checks Log sheet (028c).
- Complete all listed checks and ensure plant is running if selected as DUTY, or available to run if selected as STAND-BY.
- Details must be entered on Record Form (028c) and any issues escalated to the Water Systems AP immediately.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (028c) if required, ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.4 Weekly Maintenance Checks

Reference	Operation
4.41	Flushing of Rarely Used Water Outlets (Twice Weekly)
4.42	Flushing of Deadlegs & Drain Valves (Twice Weekly)
4.43	Rotation of Water Services Duty/Stand-By Pumps
4.44	Operation and Checks to Emergency Deluge Shower/Eye Wash (Twice Weekly)

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.41 – FLUSHING OF INTERMITTENTLY USED WATER OUTLETS

FM First Template No 824

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 101 para 6.36

RECORD FORM - (DMA)

PROCEDURE REF - WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE WEEKLY** as a minimum:

Description of Works

- Refer to the locations listed by DMA.
- Estates to arrange for the Schedule to be updated to record on a regular basis.
- Flush water from ALL outlets identified at a minimum frequency of Twice Weekly for a minimum period of 3 minutes per tap outlet taking care not to cause splashing or exposure to water aerosols / droplets.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form ensuring that you date, sign it.
3. DMA to send flushing records to Water Systems AP.

NOTES:

In circumstances where there has been a lapse in the flushing regime, the stagnant and potentially contaminated water from within the shower or tap and associated dead leg should be purged to drain without discharge of aerosols before the appliance is used.

NHSGG&C consider the cleaning of wash hand basins, toilets and showers etc by Domestic Services staff to fulfil the criteria of having been used /flushed.

As part of the ward/departments standard cleaning schedule Domestic Services staff will clean all wash hand basins, showers, baths, WC's and bidets. For the purposes of Legionella and Pseudomonas control the Board deems this to be considered adequate to fulfil guidance on the use of water outlets.

Facilities Management send on flushing records of all taps to Water Systems AP monthly.

Refer to Facilities Procedure - Wash Hand Basin Cleaning (including point of use filter).

4.42 – FLUSHING OF DEADLEGS & DRAIN VALVES

FM First Template No 827

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 101 para 6.36

RECORD FORM - DMA

PROCEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **TWICE WEEKLY** as a minimum:

Description of Works

- Refer to the locations listed on Record Form (DMA).
- Estates to arrange for the Schedule to be updated to record on a regular basis.
- Flush water from ALL outlets identified on Record Form on a Weekly basis for a minimum period of 3 minutes per tap outlet taking care not to cause splashing or exposure to water aerosols / droplets. Drain Valves to be purged to ensure the removal of any built up residue in the line.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record ensuring that you date, sign it and Complete FM work request.
3. Return form to the Water Systems AP.

4.43 – ROTATION OF WATER SERVICES DUTY/STAND-BY PUMPS

FM First Template No 820

WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 27 para. 3.24

RECORD FORM - (028a)

PROCEDURE REF - P1C3

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **WEEKLY**:

Description of Works

- Inspect and confirm operation of all listed duty/stand-by pumps by interrogating the programmer to check hours run for each pump motor.
- Check pump rig and associated valves for correct operation, signs of damage, leakage or corrosion.
- Record all details on Record Form (028a)

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (028a) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.44 – OPERATION AND CHECKS TO EMERGENCY DELUGE SHOWERS/EYE WASH

FM First Template No 825

TWICE WEEKLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 57

RECORD FORM - (026c) and DMA record for separate shower.

PRECEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

RISK CONTROL NOTICE - RCN 11/04

The following actions must be undertaken **TWICE WEEKLY**:

Description of Works

- Refer to the locations listed on Record Form (026c) NHS only (DMA complete flushing records).
- Operate shower for a minimum period of 3 minutes taking care not to cause splashing or exposure to water aerosols / droplets. Measure and record temperatures until discharge water drops to the same temperature as the incoming mains water.

  NOTE: For thermostatic showers and taps, the outlet should be flushed on the full cold setting for 2 minutes, then again on the full hot setting for a further 2 minutes, using override setting where available. Cold water should be less than 20^{o}C, Hot water should be between 55^{o}C and 60^{o}C, and Mixed water in the range 41-43°C.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (026c) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.5 Monthly Maintenance Checks

Reference	Operation
4.51	Sentinel Outlet Temperature Recording
4.52	DWS Calorifier – Temperature Checks & Blowdown
4.53	CL02 checks

NOTE:

Completed Log Sheet to be submitted to Site Estates Manager / Authorised Person (Water) for authorisation and copies filed as indicated in Section 2.20.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.51 – SENTINEL OUTLET TEMPERATURE RECORDING

MONTHLY

FM First Template No 828

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 28 para 3.27

RECORD FORM - (005c)

PROCEDURE REF - P1C4

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- Check the temperatures at the sentinel taps as defined in the local plan of the system being checked. NOTE: Where the sentinel is a TMV or TMT the temperature readings should be taken from the pipework or directly from the hot and cold supply.
- Using a calibrated temperature probe, check the temperature of water from the cold water tap does not rise above 20ºC after running the tap for 2 minutes.
- Using a calibrated temperature probe, check the temperature of water from the hot water tap does not drop below 55ºC whilst running the tap for 1 minute.
- Record all temperatures on Record Form (005c).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form **(005c)** ensuring that you date, sign it and enter FM First ticket number. Complete FM Work Request.
3. Return form to the Water Systems AP.

4.52 - DWS CALORIFIER – TEMPERATURE CHECKS & BLOWDOWN

FM First Template No 821

MONTHLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 28 para 3.30

RECORD FORM - (005)

PROCEDURE REF - P1C4

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- MANUALLY CHECK and record the flow and return temperatures on the domestic hot water system as defined on Record Form (005), using the temperature gauges fitted or a suitable surface temperature probe.
- MANUALLY CHECK and record the calorifier storage temperature at top and bottom gauges if fitted.
- The flow temperature to be at least 60ºC and the return temperature shall be no less than 55ºC
- MANUALLY CHECK and record the cold water feed temperature using the temperature gauges fitted or a suitable surface temperature probe.
- Blowdown drain valves (if fitted) on all calorifiers and expansion vessels by opening the drain valve 3 times, each time for a 3 minute period. Where required, the hose from the drain valve connection should be discharged to the nearest drain/gulley. If there is no drain valve make note on Record Form 005.
- Check all local pipework to and from calorifier is in good order and all insulation is intact.
- Operate all isolation valves through their full range of motion.
- Check, confirm and record operation of de-stratification pump.
- Record all information on the Record Form (005).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.

2. Complete Record Form (**005**) ensuring that you date, sign it and enter FM First ticket number.

3. Return form to the Water Systems AP.

4.53 – CL02 PLANT CHECKS

MONTHLY

FM First Template N/A

IN ACCORDANCE WITH SHTM 04-01

RECORD FORM – N/A

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **MONTHLY**:

Description of Work

- PPM Schedule Monthly Visually inspect chemical delivery system.
- Check chemical suction and delivery lines for correct operation Chemical level check and refill.
- Cross check measured ClO2 / Chlorite residual test against analyser & Palintest kit.
- Check and Adjust controller settings as required.

CHECK

1. Record all details of any fault or discrepancies and report to Water Lead AP who will complete Incident Form (04).

4.6 Quarterly & Other Maintenance Checks

Reference	Operation
4.61	Shower Head and Flexible Hoses Disinfection/Replacement
4.62	DHWS Calorifier and Expansion Vessel - Flush
4.63	HORNE Tap Flow Restrictor Exchange
4.64	Review of Rarely Used Water Outlets and Changes In-Use
4.65	TMV/TMT & Thermostatic Shower Disinfection and Function Test (HIGH RISK)
4.66	PAL filter replacement

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.61 SHOWER HEAD AND HOSE REPLACEMENT

FM First Template No 869
Schedules: 1997 to 2724

QUARTERLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 32 para 3.51

RECORD FORM -See DMA records
PROCEDURE REF - P1C12 CURRENTLY CONTRACTED TO DMA CANYON WATER

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

NOTE: If PALL filter is fitted it must be left in place and recorded as such on DMA records)

Description of Work

- Exchange shower head and hose assembly inc sealing washers with new disposable unit. Place old shower head and hose assembly into re-sealable plastic bag.
- Check that the new head and hose package is intact;
- Open replacement new shower head and hose assembly sealed packaging, remove and fit following the manufacturer's instructions;
- Run water and flush for 3 minutes in accordance with Legionella Risk Assessment in such a way as to avoid the creation of aerosols;
- Check final temperature for compliance and working order and return shower appliance to use.
- Return redundant sealed bag with shower head and hose assembly to collection point for recycling in accordance with Waste Procedures;
- Record all actions on the Record Form (005b).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (005b) ensuring that you date, sign it and enter FM First ticket number.
3. Return form to the Water Systems AP.

NOTE: This procedure replaces the previous Clean & Disinfect method from 1st April 2019

4.62 - DWS CALORIFIER AND EXPANSION VESSEL - FLUSH

FM First Template No 821

QUARTERLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 29 para 3.34

RECORD FORM - (006) and (023)

PROCEDURE REF - P1C6

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Flush each Domestic Hot Water Calorifier and Buffer Vessel through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. Where required, the hose from the drain valve connection should be discharged to the nearest drain/gulley.
- Record all actions on the top section of Record Form(006).
- Where the domestic hot water system has a stratification pump(s) fitted to circulate the hot water from the top to the base of the calorifier or the storage/buffer vessel, and the history data shows no sludge deposits during flushing, then this procedure should be risk assessed to determine if the maintenance frequency can be changed. This assessment should be recorded on Record Form (023).

NOTE: this flushing process can air lock the hot water system, so only carry it out when there is no hot water demand and the calorifier is valved off from the system.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (006) and/or (023) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.63 – HORNE TAP FLOW RESTRICTOR EXCHANGE

FM First Template No N/A

QUARTERLY

IN ACCORDANCE WITH IC GUIDANCE

RECORD FORM – (See DMA Records)

PROCEDURE REF – WQS 001

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

PPE:- Surgical gloves should be worn when carrying out this task. Cross contamination of the replacement flow restrictor should be considered and avoided at all times.

Restrictor should only be replaced at outlets without PALL filters. If PALL filter is fitted it should be left in place and noted on Record Form.

- Assemble all tools and materials required to complete task.
- Check with ward staff to ensure access can be granted to each area without Infection Control restriction.
- Remove existing restrictor using the appropriate tool and dispose of the restrictor in general waste.
- Use disinfectant wipes to sanitise tap outlet and tools used before re-fitting new restrictor.
- Change gloves to avoid cross contamination of new components and tools.
- Unpack new restrictor components and insert into tap as per the manufacturer's instructions.
- Test on completion and fill out log sheet to record all relevant information.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Form (DMA WATER) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.64 - REVIEW OF INTERMITTENTLY USED WATER OUTLETS/CHANGE IN-USE

IN ACCORDANCE WITH BOARD POLICY

QUARTERLY

RECORD FORM – (001) (026)

PROCEDURE REF – WS01

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Liaise with Site Facilities Manager and Heads of Department to review existing accommodation occupancy and usage on a 3 monthly basis.
- Issue Quarterly circular email to all HoDs requesting to identify little used outlets and to confirm that they have a flushing regime implemented.
- Identify any water services outlets that are not used OR changes to the occupancy.
- Schedule to be updated to record all areas which change in-use, become unoccupied or otherwise out of use.

CHECK

1. Record all details of any dept closures or little used outlets on Record Form (001) and add outlets to flushing register.
2. Ensure outlets are brought to the attention of the maintenance person carrying out the flushing activity and details added to Record Form (026) or arrange with DMA to add to flushing requirements if required. Wards should be carrying out flushing as per requirements and provide evidence on WS01 form.
3. All completed Record Forms to be stored in the building specific Log Book.

4.65 – TMV/TMT & THERMOSTATIC SHOWER DISINFECTION AND FUNCTION TEST (HIGH RISK)

QUARTERLY

FM First Template No

IN ACCORDANCE BOARD POLICY

RECORD FORM - REQUIRES CONFIRMATION IF THIS SHOULD BE CARRIED OUT THREE MONTHLY

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **THREE MONTHS**:

Description of Work

- Examine all thermostatic taps for scale build-up or other deposits. De-scale any which are not clean.
- Check and remove any installed plastic flow straighteners from tap outlet
- Inspect and Clean and Disinfect filters / strainers by removing and immersing in a solution of 1000ppm free residual chlorine (50cc CLO2 in 5 litres of water) in water for 5 minutes.
- All HORNE Optitherm taps MUST have the flow straightener replaced during three monthly service tasks.
- Pasteurise outlets by over-riding thermostatic controls drawing water through each thermostatic tap until a temperature of 60°C is achieved. Run the tap at this temperature for five minutes. If this is not possible disassemble tap assembly and spray all accessible components with 'Shower Head plus' mixed to a 1:3 solution, (one part chemical, 3 parts water) or equal and approved and let stand for 5 minutes.
- Reassemble and verify fail safe operation by isolating hot and cold water supplies separately.
- Ensure thermostatic controls are re-adjusted to permit blending.
- Should controls not be able to be over-ridden, verify the temperatures at the inlet connections to the thermostatic valve utilising a contact type probe and electronic thermometer.
- Run and test tap and record hot and cold water inlet temperatures and mixed water outlet temperature.
- Log all actions.

4.66 – PAL FILTER REPLACEMENT

FM First Template No

31& 62 Day

IN ACCORDANCE WITH AGREED FILTER LOCATIONS

RECORD FORM - DMA RECORDS

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **31 Days or 62 Days based on filter types and locations**:

Description of Work

- Replace filters prior to end date on tap and shower filters as per programme.
- Process for replacement as per DMA Procedures.
- Log all replacements as per DMA Procedures and record in DMA Records.
- Any issues should be reported to Water Lead AP.

4.7 Six Monthly Checks

Reference	Operation
4.71	TMV/TMT & Thermostatic Shower Disinfection and Function Test (Non-HIGH RISK)
4.72	CWST Inspection and Temperature Monitoring
4.73	Maintenance of filtration units
4.74	CL02 checks

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.71 – TMV/TMT & THERMOSTATIC SHOWER DISINFECTION AND FUNCTION TEST (NON HIGH RISK)

IN ACCORDANCE WITH BOARD POLICY

SIX MONTHLY

RECORD FORM -

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- Examine all thermostatic taps for scale build-up or other deposits. De-scale any which are not clean.
- Check and remove any installed plastic flow straighteners from tap outlet
- Inspect and Clean and Disinfect filters / strainers by removing and immersing in a solution of 1000ppm free residual chlorine (50cc CLO2 in 5 litres of water) in water for 5 minutes.
- All HORNE Optitherm taps MUST have the flow straightener replaced during three monthly service tasks.
- Pasteurise outlets by over-riding thermostatic controls drawing water through each thermostatic tap until a temperature of 60°C is achieved. Run the tap at this temperature for five minutes. If this is not possible disassemble tap assembly and spray all accessible components with 'Shower Head plus' mixed to a 1:3 solution, (one part chemical, 3 parts water) or equal and approved and let stand for 5 minutes.
- Reassemble and verify fail safe operation by isolating hot and cold water supplies separately.
- Ensure thermostatic controls are re-adjusted to permit blending.
- Should controls not be able to be over-ridden, verify the temperatures at the inlet connections to the thermostatic valve utilising a contact type probe and electronic thermometer.
- Run and test tap and record hot and cold water inlet temperatures and mixed water outlet temperature.
- Log all actions.

4.72 – CWST INSPECTION AND TEMPERATURE MONITORING:

FM First Template No 819

SIX MONTHLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 29 para 3.37

RECORD FORM – Carried out by DMA – refer to records

PROCEDURE REF – P1C7

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken every **SIX MONTHS** seasonally during Summer and Winter:

Description of Work

- Inspect the tank and associated pipework including insulation, valves etc for damage or corrosion and sediment.
- Operate all isolation valves through their full range of motion.
- Check the operation of the ball-valve by pressing down on it and lifting the float to confirm that water flows and stops.
- Inspect the tank overflows if visible. Confirm that there is no blockage or other foreign material and that the mesh screen is not damaged.
- Measure and record the temperature of the water in the tanks, by dipping the thermometer into the top as far from the ball-valve as possible.
- Check and record ambient outside air temp and tank room temp.
- Check the flow and record the temperature of water feeding the tanks. There should be a steady rapid flow when the ball float is down.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Records and send information to Water Systems AP.

4.73 – MAINTENANCE OF WATER FILTRATION UNITS:

FM First Template N/A

SIX MONTHLY

N/A

RECORD FORM – Carried out by Veolia– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- Check on feedwater quality
- Check on treated water quality & flows
- The condition of valves & diaphragms
- Operational cycle simulation
- General plant condition & safety
- The condition of system pumps
- The condition of the pre-filters
- Level control function

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.74 – MAINTENANCE OF CL02 PLANT:

FM First Template N/A

SIX MONTHLY

N/A

RECORD FORM – Carried out by Scotmas– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken every **SIX MONTHS**:

Description of Work

- As per monthly plus :-
- Check ClO2 gas detector functionality and recording levels.
- Simulate fault circuitry and alarm on Sentinel Monitor.
- Change probe electrolyte and cross calibration test.
- Carry out manual Chlorate & Chlorite validation tests (12 representative outlets).
- Check water meter operation and report on Electrolyte top up, Probe calibrations

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.8 Annual Maintenance Checks

Reference	Operation
4.81	DWS Calorifier / Expansion Vessel Inspection
4.82	Water Services Pipework and Distribution System Checks
4.83	Representative Tap Temperature Monitoring
4.84	Vibration coupling inspection
4.85	BMS Temperature Sensor Test and Calibration

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.81 - DWS CALORIFIER/EXPANSION VESSEL INSPECTION

FM First Template No 821

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 31 para 3.44

RECORD FORM - (006)

PROCEDURE REF - P1C9

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**

Description of Work

Follow the manufacturers' maintenance instructions from O&M manuals. Record all actions where applicable on Record Form (006) for each system.

- Isolate domestic hot water calorifier or hot, cold or chilled water storage/buffer vessel service valves;
- Heat any domestic hot water calorifier or hot water storage/buffer vessel up until the contents has reached 60ºC and hold at this temperature for a period of at least 1 hour;
- Drain domestic hot water calorifier and expansion vessel and remove inspection hatch;
- Hose out the domestic hot water calorifier or hot and expansion vessel to remove any debris, scale or other deposit. Care should be taken to keep aerosols to a minimum.
- If the domestic hot water calorifier or expansion vessel does not have an inspection hatch, the pipework at the top of the vessel should be disconnected to allow the insertion of a water hose to allow debris to be washed down off internal surfaces;
- Examine the internal and external condition of the domestic hot water calorifier and expansion vessel and pipework, any defects should be reported in writing to the relevant Authorised Person (Water). The safety valve should be checked, overhauled and reset as necessary. The temperature and pressure gauges to be checked for operation.
- On completion of examination and any repairs, the domestic hot water calorifier and expansion vessel should be re-assembled and the following sequence must be undertaken:
- Refill with cold water;
- Drain the domestic hot water calorifier and expansion vessel;
- Refill with cold water, leave cold feed valve open;
- Run domestic hot water calorifier or hot water storage/buffer vessel at a temperature of 60ºC for at least 1 hour. Test the operation of high limit cut-out system if fitted. Check the temperature of the calorifier/vessel top and bottom with a surface thermometer;

- Adjust any controls as necessary.
- Take bacteriological samples from the base of the calorifier and submit to GRI Water Lab for analysis. (THIS TASK TO BE CARRIED OUT BY DMA CANYON WATER)

NOTE: this flushing process can air lock the hot water system, so only carry it out when there is no hot water demand and the calorifier is valved off from the system.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (006) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.82 - PIPEWORK AND DISTRIBUTION SYSTEM CHECKS

FM First Template No 829

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 31 para 3.

RECORD FORM - (0)

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Estates Manager or Water Systems AP will define areas to be checked in each building.

Description of Work

- Check all accessible pipework for damage, or corrosion.
- Check for missing or damaged pipework insulation
- This is carried within the Tank Room by DMA during sampling and tank inspections monthly.
- This is carried out by NHS Estates within Plantrooms during plantroom inspections monthly
- This is carried out as per above procedures and noted on FM First PPM's..

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms as per above procedures ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.83 – REPRESENTATIVE TAP TEMPERATURE MONITORING

FM First Template No 917

ANNUALLY

IN ACCORDANCE WITH SHTM 04-01 Part G (*V1 July 2015*) Page 32 para 3.39

RECORD FORM - (005d)

PROCEDURE REF – P1C10

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken at regular intervals throughout the year to ensure 20% of the requirement is completed **ANNUALLY**:

Description of Work

- OBJECTIVE: Carry out water temperature monitoring to ensure consistency and performance of the system as per design. 20% of all outlets to be assessed annually to ensure entire system is completed within a 5 year period (*ref: SCART2 Question 54)*
- Check the temperatures at a representative number of hot and cold outlets on a rotational basis as defined in the local plan of the system being checked. Lead AP (Water) to define areas to be checked each month.
- Using a temperature probe check the temperature of the cold water tap does not go above 20ºC after running the tap for 2 minutes;
- Using a temperature probe check the temperature of the hot water tap does not go below 55ºC within running the tap for 1 minute;
- If the outlet being tested is protected by a TMV/TMT then temperatures should be taken directly from the supply pipework or by bypassing the thermostatic device by use of an appropriate purging kit.
- Record all temperatures and locations tested on the Record Form (005d) or if carried out by DMA to reflect in records.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (005d) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.84 - VIBRATION COUPLING INSPECTION

FM First Template No 831

ANNUALLY

IN ACCORDANCE WITH HSG 274 Part 2 *(2014)* Page 19 para 2.35

RECORD FORM - (008)

PROCEDURE REF – WQMS 001

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Refer to list of vibration coupling locations to be assessed.
- Visually check the condition of the coupling for any signs of leakage, deterioration or corrosion.
- Ensure flexible portion of coupling is intact and free from damage or deterioration.
- Carried out on Cold Water Booster sets as part of the inspection.

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.85 – BMS TEMPERATURE SENSOR CALIBRATION

ANNUALLY

FM First Template No

IN ACCORDANCE WITH

RECORD FORM -

PROCEDURE REF –

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- This task should be included in the BMS Service Contract Specification.
- All temperature sensors related to domestic hot and cold water services to be checked and calibrated annually.
- All calorifiers, storage tanks, flow and return monitoring devices.
- Include all End of Line (EOL) sensors and cold water flushing devices.
- Records should be kept and made available to the estates dept on request.

4.86 – MAINTENANCE OF WATER FILTRATION UNITS:

FM First Template N/A

ANNUALLY

N/A

RECORD FORM – Carried out by Veolia– refer to records

PROCEDURE REF – N/A

HAISCRIBE/Risk Assessment Ref – N/A

The following actions must be undertaken **ANNUALLY**:

Description of Work

- As per 6 monthly and ClO2 & Chlorite Probe membrane cap replacement.
- Dosing Pump diaphragm valve replacements.
- Replace ClO2 gas detector cartridge if required

CHECK

1. Record all details of any fault or discrepancy and pass to Water Lead AP to record on the FAULT LOG and complete Incident Form (04).

4.9 Bi-Annual Maintenance Checks

Reference	Operation
4.91	Flexible Hose/Connection Inspection and Exchange
4.92	CWST Drop Test

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

4.91 – FLEXIBLE HOSE/CONNECTION INSPECTION AND EXCHANGE

FM First Template No

BI-ANNUALLY

IN ACCORDANCE WITH QEUH RISK ASSESSMENT RECOMMENDATIONS 2017

RECORD FORM - (009)

PROCEDURE REF – WQMS 002

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Refer to list of flexible connection locations to be assessed as per WQMS 002.
- Visually check the condition of the coupling for any signs of leakage, deterioration or corrosion.
- Safely isolate the water services and exchange the flexible connection with a BRAND NEW UNUSED replacement.
- Apply tag/label to indicate the intended date of future replacement (todays date + 24 months)
- Record all details on the Record Form (009).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (009) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

4.92 – CWST DROP TESTS

BI-ANNUALLY

FM First Template No 819

IN ACCORDANCE WITH

RECORD FORM -

PROCEDURE REF -

HAISCRIBE/Risk Assessment Ref – N/A See Appendix 4

The following actions must be undertaken **ANNUALLY**:

Description of Work

- Shut off mains cold water supply to tank.
- Record the start time and allow tank to drain naturally through usage. DO NOT OPEN THE DRAIN.
- Periodically monitor the tank until usage has reduced tank to exactly half of its starting capacity.
- Record the stop time and estimate the number of hours of storage of water in the tank.
- Record all inspection details on the Record Form (010).

CHECK

1. Record all details of any fault or discrepancy on the FAULT LOG and complete Incident Form (04) and report to Manager.
2. Complete Record Forms (010) ensuring that you date, sign them and enter FM First ticket number.
3. Return form to the Water Systems AP.

5.0 INCIDENT AND EMERGENCY PROCEDURES

Procedure Reference	Operation
5.10	FAILURE OF CONTROL MEASURES
5.20	HIGH COLD WATER SUPPLY TEMPERATURE TO OUTLET
5.30	LOW HOT WATER SUPPLY TEMPERATURE TO OUTLET
5.40	CALORIFIER OR HEAT EXCHANGER TEMPERATURE FAULT
5.50	POSITIVE LEGIONELLA TEST RESULT
5.60	IDENTIFICATION OF LITTLE USED WATER OUTLET
5.70	EMERGENCY REPAIRS
5.80	DISINFECTION OF WATER SYSTEM
5.90	PSEUDOMONAS

NOTE:

Completed Log Sheet to be submitted to either the Authorised Person (Water Systems) or Site Manager Operational Estates for authorisation and copies filed as indicated in Section 2.2.

Due to the volume of information required for the recording of test results for each of the assets being maintained, the Log Sheets provided within this document are for indicative purposes only.

Detailed information on the assets and test records for same will be retained within the specific 'Log Book' for the location being maintained.

THE FOLLOWING PAGES DESCRIBE REMEDIAL ACTIONS TO BE TAKEN IN THE EVENT OF AN INCIDENT, EMERGENCY, OUT-OF-SPECIFICATION TEST RESULT AND / OR WHERE *LEGIONELLA* HAS BEEN IDENTIFIED AND/OR BACTERIA COUNTS BEING INEXCESS OF THE RECOMMENDED LIMITS IN THE WATER SYSTEM ARE IDENTIFIED.

The Health and Safety at Work Act places a duty on employers to ensure, so far as is reasonably practicable, the maintenance of safe working conditions without risks to health, not only to employees, but also to the general public.

The risk to personnel associated with the presence of *Legionella* depends on a number of variables and may be quite low. However, since the actions to eradicate it are straightforward and reasonably practicable, it would be wise to put them in hand without delay if *Legionella* has been identified.

When analysis confirms that the levels of bacteriological contamination are in excess of acceptable limits, and/or the presence of Coliforms or *E.coli* is identified, the procedures recommended in this section should be applied.

5.1 Failure of Control Measures:

Where any reported test result, non-compliance issue or defect is made known which affects the integrity of the water system and indicates the failure of Control Measures and / or increased risk of Legionella the following procedures shall be followed and duly recorded within Section 2.3 of this document and brought to the attention of the relevant Infection Control Team and Water Management Group.

IN ALL CASES THE INCIDENT RECORD FORM (004) SHOULD BE COMPLETED AND INSERTED IN THE BUILDING SPECIFIC WATER SAFETY LOG BOOK.

5.2 High Cold Water Supply Temperature

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the QEUH campus served by the same mains lines) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as “out-of-specification” mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:

    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);
    - any water sampling results;
    - system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
    - recent maintenance history; recent alterations, changes or additions to the water system;
    - any other changes made by Duty Holders or users of the water system; On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Water Safety log book.

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment

Stage 3 - Water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.

Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;

  - thereafter the tank/local area being disinfected shall be brought back into service;
  - finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible.

5.3 Low Hot Water Supply Temperature

Incident Plan

In the event of plant failure suppliers and installers guidance should be consulted. The location of all relevant literature should be recorded in the site logbook (e.g. Mercury fault finding guidance).

Mains and Stored Water

Currently there is no legal maximum water supply temperature from the Licensed Provider. In practice the water supply temperature to boundary point will be subject to seasonal variation. In winter this would normally be expected to be in the 5°C – 10°C range and in summer up to 20°C.

The following staged risk assessment escalation procedure should be employed where the water temperature in Cold Water Storage Tanks is 20°C or higher.

Stage 1 - Verification

- Where tepid cold water occurrence (i.e. ≥20°C) is reported from any numbers of cold water outlets, from maintenance/ppm, flushing procedures, from BEMS monitoring, or from the manual monitoring of storage tanks, the person identifying, or making a report must notify the relevant Authorised Person (Water) as soon as the problem is identified and confirm this in writing within 24 hours;

- The Authorised Person (Water) should liaise with the person identifying the problem and verify the problem by independently re-checking by means of taking the water temperature of the appropriate cold water storage tank, the temperature of each incoming mains supplies at the site boundary point (and building entry points of other buildings within the Southern General Hospital served by the same mains lines8) and the outflow distribution temperature;

- If the cold water storage temperature is confirmed as being 20°C or higher at any of the above noted points, then the Authorised Person (Water) should record this in writing as well as conducting continuous monitoring of the incoming cold water mains, the cold water storage and the outflow temperatures to establish the temperature profiles and in more detail over at least a one week period to determine the level of risk;

- If only one of the incoming mains lines is ≥20°C the consideration should be given to switching to the other mains supply until such times as “out-of-specification” mains line has returned to compliant parameters. Ensure if either mains line is non-operational it is included in a daily flushing regime and treated as per escalation procedures to follow.

- The Authorised Person (Water) should also review the Water Safety Log Book and take into account the recent water system history specifically to include:

    - the primary water treatment levels (for mains cold water supplied with Chlorine or Chloramination treatment);

- any water sampling results;
- system monitoring data including temperature monitoring and water quality chlorine or chloramination checks;
- recent maintenance history; recent alterations, changes or additions to the water system;
- any other changes made by Duty Holders or users of the water system;

On reviewing continuous monitoring temperature profiles action as Stage 2, 3 or 4 as appropriate of this escalation procedure should be undertaken. The Authorised Person (Water) will ensure that the Responsible Person (Water) is notified immediately in writing at each stage and also recorded in the Logbook via Incident form (04).

Stage 2 - Initial Action – High Incoming Mains Cold Water Temperature

- Where the incoming mains cold water is 18°C or higher for more than a 48 hour period the Responsible Person (Water) should contact Business Stream (the Licensed Provider) who will work with Scottish Water to establish the reasons and determine a resolution. Continuous monitoring should continue and recorded in the risk assessment.

-

Stage 3 - water temperatures fluctuating above and below 20°C (but not higher than 25°C)

- Where water temperatures are fluctuating above and below 20°C in a regular cyclical manner over 72 hour periods in response to regular user water demand (but not higher than 25°C) and are more than 2°C higher than the incoming cold water mains supply temperature at the building entry point, then continuous monitoring should be continued by the Authorised Person (Water). The reason(s) for failure(s) should be identified and rectified as soon as possible. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there may be increased risk and appropriate actions may be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained).

- considerations for failures include:
  - accuracy of temperature sensors (requiring recalibration);
  - temperature sensors being located in water (requiring reposition where tank storage levels been reduced and sensor no longer sensing stored water);
  - inappropriate standby tank configuration;
  - temperature sensor in standby system;
  - temperature sensor measuring stagnation (requires reposition);
  - inappropriate siting (not in a cool location);
  - heat gain to the tank and pipework (due to lack of appropriate insulation or located close to heat gain from other heat sources);
  - storage capacity not minimised to match daily use (12 hours storage is recommended);
  - ingress of hot water through cross connection or mixing valve failure (i.e. from DHW system or MTHW systems);

Stage 4 - water temperatures fluctuating above and below 25°C (and rarely below 20°C)

- In this situation continuous monitoring should be continued by the Authorised Person (Water), the reason(s) for failure(s) (as Stage 3) identified and rectified on an urgent basis. This should be recorded by updated risk assessment (specifically in relation to the patient risk rating – where there will be an increased risk and appropriate actions will be required to mitigate exposure. An up to date register of all areas and their subsequent patient risk ratings should be maintained);

- In this situation a permanent solution, such as ventilation for the plant room, or changing the water storage arrangements, or forming a circulating distribution system (with or without chilling depending on the circumstances) would require to be implemented;

- The Authorised Person (Water) should, unless instructed in writing to the contrary by Responsible Person (Water) implement the following:
  - arrange to drain the tank contents and clean if necessary *(and/or carry out local disinfections where appropriate)*;
  - inform the users of the failed system that they must not draw off any water from the affected system until further notice;
  - suitable disinfection of the tank and/or distribution system shall be carried out.

Please Note: *Due to the system design and installation complete disinfection of all downservices fed from the Raw and Bulk water storage tanks may not be practical as "high risk" system such as renal dialysis is fed from these tanks. Alternative protocols/method statements for local disinfections should be prepared and maintained*;

- thereafter the tank/local area being disinfected shall be brought back into service;
- finally the users shall be informed that the system is back in operation.

The Authorised Person (Water) shall complete an Incident Report Record Form. An entry should also be made in the Water Safety Log Book and the Responsible Person (Water) should be notified in writing as soon as possible. Record on Incident form (04).

Hot Water Services

When hot water storage or distribution temperatures fall below those required (60°C storage, 55°C at outlets and returning to calorifier) these will almost inevitably be caused a mechanical fault. Appropriate maintenance procedures, including the Mercury Fault Finding guidance documents, should be created and referenced to assist in timely rectification.

This escalation procedure (taken from SHTM 04-01 Part G (Draft)) should be employed if the Calorifier/Plate Heat Exchangers outflow temperature falls below 45ºC.

The table below should be used to decide on the actions necessary in the event of a plant breakdown such as power failure or gas supply failure.

Breakdown leading to temperature <45ºC, lasting for:	Risk Category	Action
<12 hrs	High	Verify
	Significant	Verify
	Moderate	Verify
>12 hrs	High	Thermally pasteurise
	Significant	Verify
	Moderate	Verify
>24 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Verify
>72 hrs	High	Thermally pasteurise
	Significant	Thermally pasteurise
	Moderate	Thermally pasteurise

In the event of a reduction in domestic hot water temperature the **Authorised Person (Water)** should be notified in writing as soon as possible. The reason for failure must be identified and rectified as soon as possible.
The **Authorised Person (Water)** shall notify the **Duty Holder** and users on the failed system that they must not draw off any hot water from the affected services until further notice.
The relevant **Duty Holder** shall ensure that their staff are aware of the situation, and that they in turn shall prevent patients from using affected services.

Where thermal pasteurisation is to be carried out, the temperature of the calorifier or plate heat exchanger shall be raised to 70ºC, and the water shall be circulated throughout the affected distribution system for at least one 1 hour. Each tap or appliance should be run in sequence until full temperature is achieved (this should be measured). To be effective the temperature in the calorifier or plate heat exchanger should be high enough to ensure that all distribution outlets receive water at a temperature of greater than 60ºC. Ensure the return flow to the calorifier or plate heat exchanger is no less than **55ºC**.

The **Authorised Person (Water)** shall inform users that the system is back in operation.
Bacteriological samples should be taken in consultation with the Infection Prevention and Control team.
The **Authorised Person (Water)** shall complete an Incident Report Record and ensure the **Responsible Person (Water)** is notified in writing as soon as possible. Maintain hard copy records in the Water Safety Log.

5.4 Positive Legionella Test Result

Microbiological Sampling (Legionella)

Sampling requirements and frequency are to be formulated by NHS GG&C and written scheme should be updated as appropriate.

Legionella testing may be required:

- In systems where the temperature control regimes are not consistently achieved, frequent testing e.g. weekly should be carried out to provide early warning of loss of control. Once the system is brought back under control as demonstrated by monitoring, the frequency of testing should be reviewed
- Weekly checks are recommended until the system is brought under control;
- When an outbreak is suspected or has been identified;
- In wards with at-risk patients – for example those who are immuno-compromised ("high risk patient" areas still to be confirmed to DMA).

As a minimum, samples should be taken as follows:

- From the cold water storage and the furthermost outlet from the tank, on every loop;
- From the calorifier flow, or the closest tap to the calorifier, and the furthermost tap on the hot water service circulating system (these should be identified on sentinel outlet register);
- Additional samples should be taken from the base of the calorifier via drain valves;
- From areas where the target control parameters are not met (i.e. where temperatures are below 55°c for hot water systems or ≥20°c for cold water systems);
- From areas subject to low usage, stagnation, excess storage capacity, dead legs, excessive heat loss, crossflow from the water system or other anomaly.
- High Risk Patient Areas
- Additional random samples may also be considered appropriate where systems are known to be susceptible to colonisation.

The temperature control regime is the preferred strategy for reducing the risk from *Legionella* and other waterborne organisms in water systems. This will require monitoring on a regular basis. The recommended test frequencies for various outlets are set out in Table 2 in Section 7.

HSG 274 Part 2 Table 2.3 Actions to be taken following legionella sampling in hot and cold water systems in healthcare premises with susceptible patients

Legionella bacteria (cfu/Litre)	Action required
More than 100 but less than 1,000	Low risk area Estates action only If only one or two samples are positive, system should be re-sampled. If a similar count is found again, a review should be carried out to identify any remedial actions a) If the majority of samples are positive, the system may be colonised, albeit at low level, with Legionella. Disinfection of the system should be considered but an immediate review of control measures and risk assessment should be carried out to identify any other remedial actions required. If remedial action is ineffective further measures will be discussed and approved by the Board Water Safety Group
More than 100 but less than 1,000	High Risk areas Impact on patient care Discuss results with ICD and agree actions and any closure of area.
More than 1,000	Low Risk Estates action only The system should be re-sampled and an immediate review of the control measures and risk assessment carried out to identify any remedial actions, including possible disinfection of the system. If remedial action is ineffective further measures will be discussed and approved by the Board Water Safety Group
More than 1,000	High Risk areas Discuss results with ICD and agree actions and any closure of area.

Communication pathway for Legionella results from water samples:

Water samples are sent to; UKASS-accredited laboratories which provide this service for NHS and other organisations that manage buildings. Reports will come back initially to the estates department.

Negative water samples are recorded as part of the documentation of Legionella control. If they are related to investigation of an "incident" such as a clinical case or a previous positive sample then these results are communicated to those managing that incident.

The information on the report which needs to be communicated is:

- Date of sampling
- Location and type of water outlet
- Identification of the organism, (Legionella pneumophila with serogroup, or Legionella species other than L pneumophila.)
- Count of organisms per Litre.

Estates will

- Inspect the system and take further action in accordance with HSE guidance and locally agreed procedures
- Inform Charge Nurse and or Clinical Nurse Manager of the Clinical Area concerned if appropriate of any control measures being taken/required
- Inform GM for the Sector if appropriate.

The results of this initial risk assessment must be communicated to all those noted above and also to the Facilities General Manager for the site involved.

The Infection Control Manager for Infection Prevention and Control will inform NHS GG&C

If there is impact on patient care then an Incident Management Team (IMT) may be convened to assess the risk and further actions.

Refer to WQS – 017 for out of spec procedure

See table in Appendix 2

5.5 Intermittent or Infrequently Used Water Outlets

If after investigation the taps or appliances identified within the reviewed list, to be updated on a quarterly basis, is deemed not necessary wherever possible the supply pipe work shall be cut back as close to the main circulating line as practicable to ensure that any dead leg formed is minimised and the appliance is removed from the water system.

In circumstances where there has been a lapse in the flushing regime, the stagnant and potentially contaminated water from within the shower or tap and associated dead leg should be purged to drain without discharge of aerosols before the appliance is used.

Where a ward or department is closed or taken out-of-use for an extended period of time e.g.: pending refurbishment, change in-use or other reason, arrangements shall be put in place to ensure the regular flushing and recording of water outlets within such areas. If such closures are considered to be long term or permanent consideration should be given to the disconnection of all water services to the affected areas.

5.6 Emergency Repairs

Emergency repairs may be required at any time and should be undertaken by trained and competent personnel. Such repairs can vary from a simple repair to a section of pipework, replacement of a component or major burst or loss of service. In all such cases the integrity and safety of the water distribution system must be maintained at all times.

5.7 Disinfection of Water System and Components

There are a number of different chemical and thermal disinfection methods available ALL of which shall be undertaken by trained and competent personnel in strict accordance with all Statutory Requirements, Safety Precautions and Manufacturers Instructions.

Disinfection – is the process of destroying or inactivating Pathogenic organisms and is generally applied to the water supply.

Sterilisation – is the process of destroying or inactivating all Organic Life Forms and is generally applied to all systems of transmission and storage materials.

In ALL instances no matter what disinfection method is employed, due regard shall be taken of patient groups, specialist equipment and processes which may be sensitive to the disinfection process being used – eg Renal Dialysis patients **must not** be exposed to Silver Hydrogen Peroxide chemicals as such the RO Water Treatment Plant and Dialysis Machines must be disconnected from the water system until the disinfection process is completed.

Silver Hydrogen Peroxide should NOT be used for a period of 90 days or longer, as required by the Drinking Water Inspectorate.

The disinfection process may be required for the following situations:

REPAIRS -	Repair fittings and exposed pipe ends should be clean and disinfected before use. Such items should be sprayed with a suitable disinfection solution such as a Sodium Hypochlorite @ a strength of 1000 mg/l (1000ppm) with a minimum contact time of 5 minutes or equal and approved.
MINOR ALTERATIONS -	Pipework should be cleaned internally by spraying with a suitable disinfection solution such as a Sodium Hypochlorite @ a strength of 1000 mg/l (1000ppm) or where pipes are long and internal surfaces cannot be reached with sprays then a swab soaked in a solution of 50mg/l (50ppm) with a contact time of one hour or equal and approved.
NEW SUPPLY PIPEWORK -	Pipes are filled with a solution such as a Sodium Hypochlorite @ a strength of 20 mg/l (20ppm) with a contact time of 24 hours. Or Sodium Hypochlorite and water at a strength of 50mg/l (50ppm) for a contact period of one hour. Minimum free chlorine after one hour – 30mg/l (30ppm) or equal and approved
SYSTEM DISINFECTION -	This will include water storage tanks and possibly the water distribution system. The advice and use of Legionella Control Association (LCA) approved contractors will be used for this purpose

NOTE:

Appropriate Method Statements and Risk Assessments will be compiled and obtained prior to any disinfection process commencing. Water Disinfection Risk Based Assessment Form (024) should be completed prior to any disinfection process being carried out. *(SHTM 04-01 Part G (V1 July 2015) Page 38 para 5.9)*

An alternative to chemical disinfection is to pasteurise the system. This involves increasing the temperature to greater than 60°C by increasing the thermostat setting at the calorifier or boiler and recirculation as necessary to maintain this temperature throughout for at least one hour. This should effectively sterilise the calorifier, and kill any *Legionella* organisms present.

The water should be flushed through the system more than once. It is important that all taps are run for at least 5 minutes (preferably longer) at full temperature to ensure that the complete system is pasteurised and that the hot water has reached all parts of the system.

5.8 Pseudomonas SOP

Standard Operating Procedure for minimising the risk of Pseudomonas

This SOP provides direction and guidance for ward based staff to meet their responsibilities as stated in *HPS(2013) Guidance for neonatal units (NNUs) (levels 1,2&3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water.* This document refers to critical control points 2 – 4 (inclusive) only. (Critical points 1, 5 and 6 are considered in the NHSGGC Water Safety Policy 2013.

*High Dependency Units (HDUs) which are adjoining/ integrated with an ICU should be included in this guidance.

Responsibilities:

Senior Charge Nurses (SCNs) must:

- Follow this SOP.
- Ensure that they are aware of access issues to wash hand basins. Where access is an issue they must arrange for flushing to occur and document this.
- Keep records of daily flushing for at least one month within the Facilities Folder.
- Inform a member of the local Estates Team if this SOP cannot be followed in relation to flushing water outlets.
- Inform a member of the local Estates Team of infrequently used outlets which could be removed.
- Allow members of the local Estates Team access to complete maintenance as appropriate.

Estates must:

- Undertake actions deemed the responsibility of the local Estates Department as per the Water Safety Policy.
- Keep a record of outlets reported that are deemed to be infrequently used and actions taken by them to remove this risk.
- Provide a report of maintenance actions and issues/ anomalies to the Sector Water Safety Group.
- Support staff locally to undertake their responsibilities in terms of reducing risk associated with pseudomonas.

Domestic Services must:

- Ensure that water outlets are flushed at full flow for 1 minute (not causing splashing) as part of the cleaning process and to ensure for Mixer taps that this ensures and equal mix of cold and hot. If full flow cannot be achieved taps should be flushed for a longer period following assessment.
- Ensure this is the first task completed of the day.
- Record this in the Domestic services Compliance Checklist "Water Outlets"
- Ensure the Checklist is retained within the facilities Folder at ward level for one month.
- Send a copy of flushing records to Water AP and to ensure any rooms/areas which were not flushed are identified.
- Domestic Services Supervisors and Managers must also notify Estates LAP, if they identify any unused areas or outlets as per SHTM04-01 Part G Section 8.3.

Managers must:

- Make this SOP available to their staff.
- Support SCNs in following this SOP.

Water Systems Group must:

- Keep this SOP up-to-date.
- Audit compliance with this SOP.
- Provide guidance via the Water Systems Policy.

5.9 Flushing Water Outlets

Flushing of water outlets is necessary to control the build-up of biofilm in water systems to reduce the risk of transmission of pathogens via the environment and equipment to patients.

The Senior Charge Nurse (SCN) in each unit has responsibility (under current guidance) to ensure that the following recommendations are complied with in their area. The SCN should ensure that:

All little used outlets outlets that are not used at least twice weekly in general areas and daily on high risk area identified on WS01a form. These must be flushed at full flow (but not so that splashing goes beyond the basin. However if taps cannot be flushed on full flow they should be flushed for longer based on specific assessment. The manager responsible for the ward or department must put systems in place for the outlet to be flushed to waste for 3 minutes as per SHTM04-01 Part G Page 111.

Where the outlet may be used by high-risk patients, more frequent flushing may be needed and the frequency should be determined following a risk assessment.

Additionally high high-risk environments (adult, paediatric and Neonatal ICUs and associated HDU's), flushed daily, first thing in am for 1 minute at full flow (but not so that splashing goes beyond the basin). However if taps cannot be flushed on full flow they should be flushed for longer based on specific assessment.

Additionally Facilities (Domestic Services) to ensure that the specific water outlets agreed through risk assessment are ran daily where access is available and all ran for 1 minute at full flow (but not so that splashing goes beyond the basin). However if taps cannot be ran at full flow then Domestic Supervisor must be informed to consider additional flushing based on specific assessment. Records must reflect where access is not available e.g. rooms/areas under Estates, Minor Works, Capital or no access at the weekend and flushing information sent to Estates monthly.

Domestic Services Supervisors and Managers will also notify Estates if they identify any unused areas or outlets or outlets not able to flush as per requirements of *SHTM04-01 Part G Section 8.3*.

These should be reflected on the department flushing records.

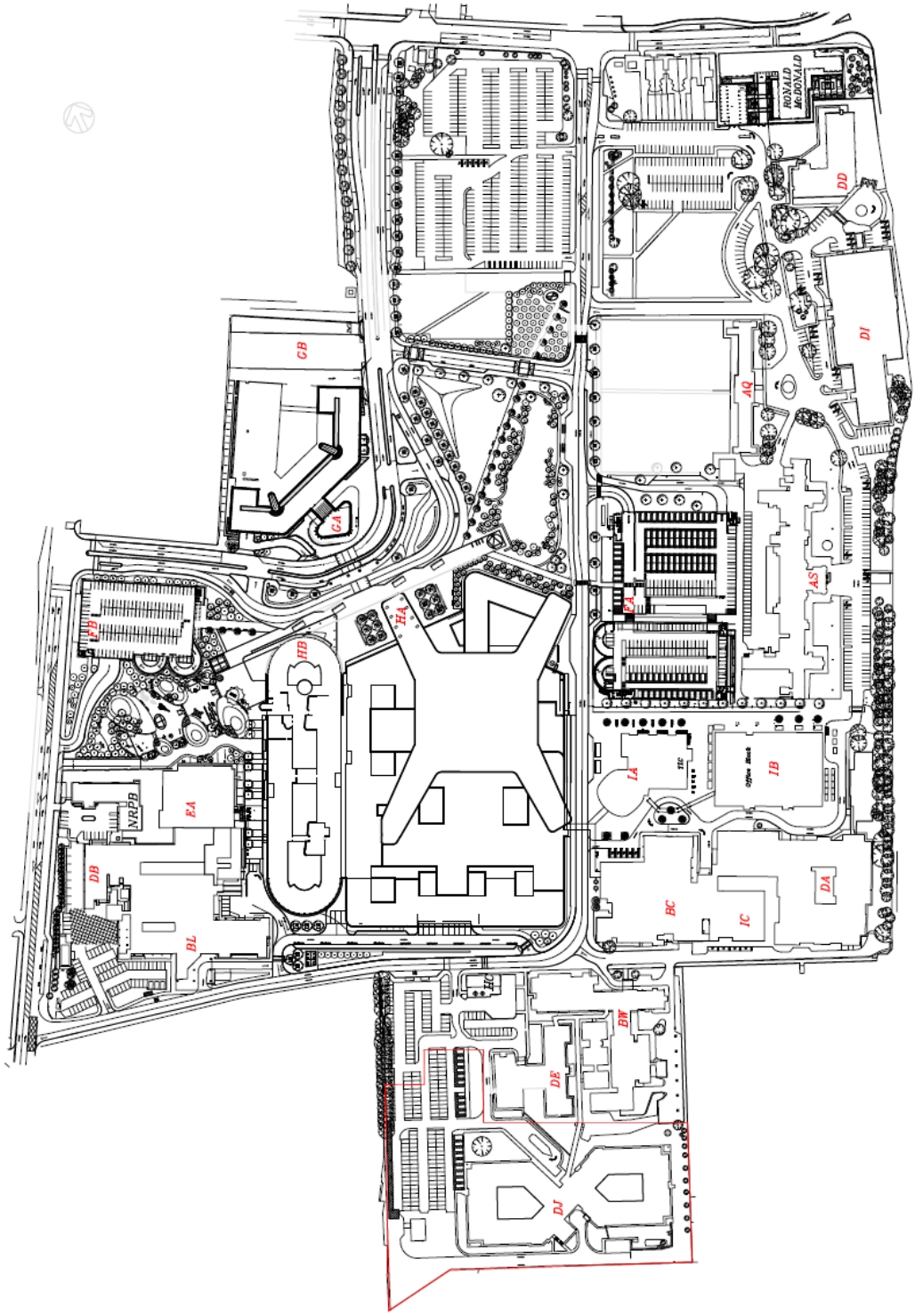
These must be reviewed on a daily basis by the SCN and appropriate action taken when this is identified as not having been completed.

Any problems or concerns relating to the safety, maintenance, reduced usage, any changes in use and cleanliness of all water outlets are identified and reported to the ICT, Facilities and Estates Department as relevant.

For more information refer to NHS Greater Glasgow and Clyde
'Water Systems Safety Policy Written Scheme and Operational Procedures'

Appendix 1

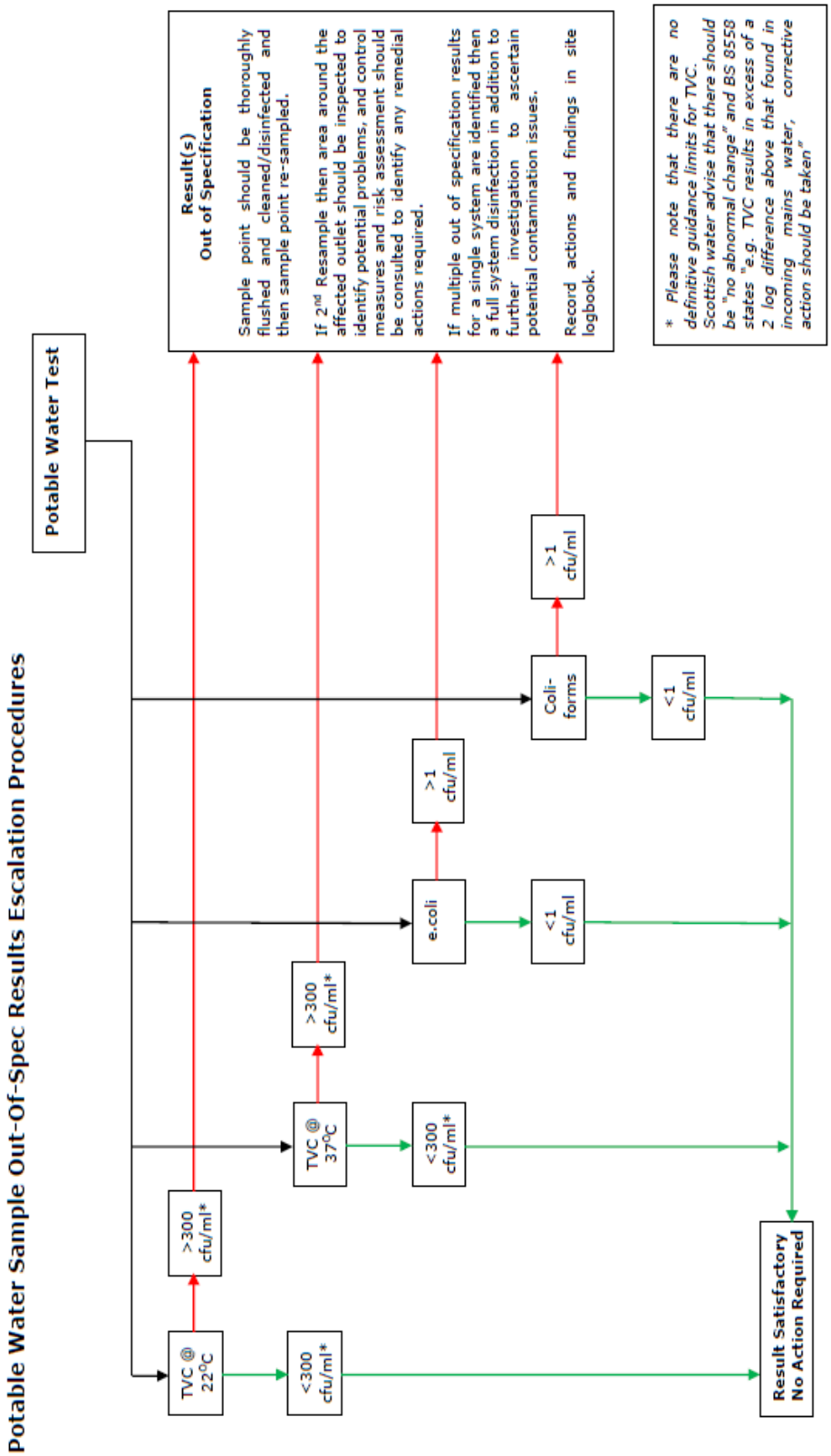
Site Plan with Block Codes



Queen Elizabeth University Hospital

Appendix 2

Escalation of Sampling Results out-of-spec.



Appendix 3

Risk Assessment Review Guidance

Summary of L8 Management Tasks Required for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Regular check to ensure that legislation and guidance has not changed	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 Management Structure to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of communication lines to ensure still accurate and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of escalation & emergency procedures to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties allocated to site staff and ensure accurate and recorded	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties of sub-contractors and ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered)	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of staff training requirements and update training matrix	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of method statements and risk assessments to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of site documentation to ensure all records up to date and present	L8 HSG 274 Pt 2 SHTM 04-01	
Regular update of "Patient Risk Rating" register for all areas of hospital.	SHTM 04-01 Part B	
Regular review of sentinel outlet locations register.	SHTM 04-01 Part B	
Regular review of primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	HSG 274 Pt 2	
Regular review of plant and equipment maintenance schedules.	Manufacturer's Instructions	
Regular review of BEMS temperature sensor locations to reflect any system alterations	HSG 274 Pt 2	
Regular review of schematic/as-fitted drawings to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of L8 risk assessment with a maximum period of two years between updates. (e.g. if change of use or changes in legislation or any other factor which could affect validity of current assessment)	L8 STHM 04-01	

Appendix 4

HAISCRIBE Risk Assessments

All relevant HAISCRIBE risk assessments produced and approved for Water Systems related tasks are stored on the QEUH Shared Drive within the folder path “

HAI SCRIBE

NHS Greater Glasgow and Clyde

Core brief

Daily update
(22 March 2021, 3pm)

Topics in this Core Brief:

- Publication of QEUH/RHC Reports

QEUH/RHC Case Note Review Overview Report

The Scottish Government has today published the QEUH/RHC Case Note Review Overview Report and its Final Oversight Board Report. The reports can be viewed here:

Queen Elizabeth University Hospital/ NHS Greater Glasgow and Clyde Oversight Board: final report - gov.scot (www.gov.scot)

Queen Elizabeth University Hospital: case note review overview report - gov.scot (www.gov.scot)

We have now issued our statement in response to the reports which is as follows:

NHSGGC statement in response to
Oversight Board Report and Case Note Review

The reports published today cover an extremely challenging situation as we investigated and responded to unusual infections in young patients and the possibility that these infections were linked to the environment.

The reports highlight a number of significant issues for the Board. We fully accept that there is important learning for NHSGGC and are committed to continuing to address the issues within the reports.

This has been an incredibly difficult period for patients, families and staff and we are very sorry for the distress caused. For those whose infection episodes were judged by the Case Note Review panel to be possibly or probably linked to the hospital environment, we apologise unreservedly.

The question over potential links between the hospital environment and infections amongst young patients treated in RHC haemato-oncology unit has persisted for a number of years. As the two reports published today have highlighted, this has been a very difficult question to answer.

Whilst it has not been possible to provide conclusive answers to these questions, significant action has been taken to mitigate the risk of infection from the environment. As soon as we recognised the potential risks with the water supply in 2018, we took action. This included point of use filters for water outlets, chlorination treatment of the water supply, and ultimately the relocation of Wards 2A and B to another part of the hospital.

In total, £6million was spent on addressing water supply issues. In addition, a further £8million has been invested in Wards 2A and B, including a significant upgrade of the ventilation system. This will deliver the one of the safest clinical environments within the UK and with the improvements that have already been made and continue to be made, infection rates at the hospital remain low.

Over the past year we have also worked closely with the Oversight Board and with Professor Angela Wallace, appointed by the Scottish Government as Interim Director of Infection Prevention and Control.

We have reviewed and strengthened our infection control and protection arrangements including the development of stronger relationships between the Infection Prevention and Control team and microbiologists. We have also worked to build and develop the Board's communications and engagement with patients and families. We are encouraged to note that the work to date has been endorsed by the Oversight Board.

There is undoubtedly further important learning for NHSGGC and for Scotland as a whole, from the unprecedented circumstances that we faced. We are fully committed to continuing to improve and to implementing the recommendations from these reviews.

Jane Grant, Chief Executive of NHS Greater Glasgow and Clyde, said: "This has been a very challenging time for patients, families and staff and I am truly sorry for this. For families, children and young people, undergoing cancer treatment is already an incredibly difficult situation and I very much regret the additional distress caused.

"Whilst we have taken robust and focused action to respond to issues, and at all times have made the best judgements we could, we accept that there are times when we should have done things differently.

"I would like to thank our staff who have worked so hard in difficult circumstances to deliver quality care, putting our young patients and their family at the centre of everything they do.

"With the improvements that have already been made and that continue to be made, infection rates at the hospital remain low. Patients and families can have confidence in the care they receive and in the environment within which they receive it."

Speaking on behalf of her clinical colleagues, Professor Brenda Gibson, Lead Clinician, Haemato-Oncology, said: "Throughout this exceptionally difficult period, our clinical team has been, and remains, entirely focused on caring for and supporting our young patients and their families.

"Person-centred cancer care involves a partnership between staff and families and we are committed to maintaining and developing strong relationships with parents and carers as we move forward."

Professor John Brown CBE, Chairman, added: "On behalf of the Board, I offer my sincere apologies to all the children and families who have been affected by these issues. The Board continues to take this situation very seriously, and has welcomed external support and advice as we have worked to understand, and respond to, an unprecedented set of circumstances not previously faced in the NHS.

"These reports provide further opportunity for improvement and learning for NHSGGC and we are fully committed to that course of action."

Please keep up-to-date with the latest guidance on our dedicated web pages at: www.nhsggc.org.uk/covid19. If you have any questions about the current situation please check the FAQs first. If you have any further questions, please email: [redacted]

Staff are reminded to make sure their personal contact details are up to date on eESS.

SCOTTISH HOSPITALS INQUIRY

POSITIONING PAPER ON BEHALF OF NHS GREATER GLASGOW AND CLYDE HEALTH BOARD

Introduction:

1. Between 20 September 2021 and 05 November 2021 the first evidential hearing of the Scottish Hospitals Inquiry, ("the Inquiry") heard evidence from a number of patients and families regarding their perceptions of how the issues being investigated by the Inquiry impacted upon each of them. Further evidential hearings were scheduled to commence on 31 October 2022 at which it was understood that their focus would be on leading evidence by way of response to the evidence of perceptions given by patients and families in relation to water contamination, ventilation, infection from both, and NHS Greater Glasgow and Clyde Health Board's, ("the Board") management of, and communication in relation to, all of these issues.

2. Having regard, however, to the complexity of the issues with which the Inquiry is concerned, Lord Brodie announced on 01 July 2022 that these hearings would be postponed, and it is now intended that the next evidential hearing relating to the Queen Elizabeth University Hospital Campus, ("QEUH") will commence on 12 June 2023, albeit the scope of this hearing appears to be likely to be more narrow than that which had been anticipated in relation to the October 2022 Hearing.

3. Nevertheless, on the assumption that at some point there will be evidential hearings which will explore all matters which were to have been addressed in the October 2022 Hearing, it is considered that it may be helpful to set out at a "high level" the Board's position in relation to these issues, and in relation to certain of the witnesses who may be called at some juncture, in particular "whistleblowers". In setting out its position it is, perhaps, of assistance to reiterate the Board's position in relation to the Remit and Terms of Reference of the Inquiry more generally, namely as I indicated in an earlier Note that,

> "From the perspective of the Board the overarching purpose of the Inquiry will be to ensure that (a) where there have been failings on its part that they are put in their fair and appropriate context; (b) where criticisms made are considered to be without foundation, in whole or in part, that all relevant evidence in support of its position is presented to the Inquiry; and (c) in relation to all Terms of Reference that all relevant evidence is presented to the Inquiry to provide reassurance to the Inquiry and to the public that, where mistakes have been made, lessons have been learnt, and appropriate actions taken to ensure the safety of all patients in the future".

4. This Positioning Paper concentrates on the period after the QEUH admitted patients in 2015; the period prior to its opening will be the subject of a separate Positioning Paper in due course.

5. Before setting out the issues to be considered in this Positioning Paper it is important that, at the outset, I should make clear the Board's position in relation to one particular matter which is of the greatest concern, both to the Board and its employees, and which has permeated many of the issues which were explored in evidence at the first evidential hearing, namely the perception that the Board engaged in a concerted "cover-up" of the true state of the hospital environment, in particular in relation to water contamination, over a period in excess of two years in the knowledge that patients may be, and in some cases were, exposed to infection.

6. The Board's position is, and always has been, clear: namely that the allegations of "cover-up" are entirely refuted. In my submission, having had the opportunity to consider all available material which relates to this issue, there is no sound evidential basis for the allegations which have been made; in fact, quite the contrary.

7. The reality is that, in relation to the issues with which the Inquiry is concerned following the admission of patients at the QEUH in 2015, the Board faced a situation which was both complex and unique. In making any assessment of the Board's handling of the challenges which it faced it is necessary to have regard to a number of matters including those set out at paragraphs 8 to 10 below.

8. The situation was, indeed, unique; one summarised by the Oversight Board in its Interim Report as a,

> "non-textbook situation", and that, "there was little precedent for the challenges arising from a large, newly-built hospital complex such as the QEUH – not least in understanding the scale and nature of the infection issues and the diversity of organisms that appeared";[1]

and by the Joint Independent Review as being one of a scale and complexity that,

> "….few Infection Prevention and Control teams internationally (would ever have encountered it)".[2]

9. The complexity of the situation was such that there was,

> "…limited experience that NHSGGC – and NHS Scotland more widely – could draw upon to fathom the particular issues relating to infection in the context of a modern hospital such as the QEUH".[3]

10. In these circumstances, the challenge which the Board faced in endeavouring to address the wholly understandable concerns of families was very considerable. As the Oversight Board correctly observed,

[1] Paragraph 43 at page 23 of the Oversight Board Interim Report dated December 2020.
[2] Page 133 of Queen Elizabeth University Hospital Review Report dated June 2020.
[3] Paragraph 43 at page 23 of the Oversight Board Interim Report.

> "….supporting patients and families in the midst of a prolonged crisis would have been challenging to any Health Board. It was made particularly complex for NHS GGC by the difficulties in providing the children, young people and families with certainty and clarity about what was happening".[4]

11. It does also require to be stated, albeit with regret, that the extraordinary challenges faced by the Board in the period post 2015 were significantly exacerbated by the conduct of "whistleblowers" whose various actions appeared to be have been designed to undermine their colleagues, and the steps being taken collectively to ensure the safety and welfare of patients and, in consequence, undermined the crucial bond of trust between the hospital and its patients; this particular issue is considered at paragraph 69 below.

12. Against the complex and concerning background summarised in paragraphs 7 to 11 above, the Board endeavoured at all times to address appropriately the uniquely challenging set of circumstances which it faced, and did so conscientiously, honestly and with the safety and welfare of its patients being paramount at all times. Throughout this period, there was extensive involvement of external agencies, including the Scottish Government and Health Protection Scotland, whose expertise guided and informed the Board's decision-making. It is considered that the Board's response, as set out below, to the issues raised in the first evidential hearing, and the evidence in support of its position to which the Inquiry is invited to take note, provides a comprehensive and robust basis for the position which has been taken.

Issues to be considered:

13. Insofar as the issues to be considered are concerned it may be of assistance to consider them under the following broad headings:

- Management of Infection Control;
- Decision-making in relation to closure of Wards 2A and 2B, decanting to Ward 6A, and communications relating to same;
- Communications;
- Alleged link between infection suffered by certain patients and the hospital environment;
- Allegations of "cover-up";
- allegations of professional misconduct by named clinicians and members of management;
- criticisms made by [redacted] beyond those listed above;
- criticisms made by [redacted] beyond those listed above; and
- the "whistleblowers".

There is clearly an overlap between many of these issues and therefore it is inevitable that when considering any particular issue it will be necessary, at times, to make reference to other issues which, otherwise, will be considered separately.

[4] Paragraph 142 at page 55 of Oversight Board Interim Report.

14. <u>Management of Infection Control:</u>

The criticisms made by witnesses at the first evidential hearing in relation to the issue of Infection Control focussed on a perception that, in relation to infection potentially caused by water contamination, adequate sampling was not undertaken by the Board to ascertain the source of individual patient's infections[5], and that independent confirmation of the validity of those criticisms was to be found in the findings of the Case Note Review.[6]

15. The criticisms which have been made, both by witnesses at the evidential hearing and by the authors of the Case Note Review report, are refuted. In making any assessment of the Board's handling of the unique challenges which it faced following the opening of the QEUH in 2015 it is necessary to have regard to a number of matters: these include

    a) that in key respects in relation to infection control there was an absence of available external guidance or expertise;
    b) that in terms of steps routinely taken in infection control the Board, in particular in relation to water testing and surveillance, went beyond what was available in any published guidance, and exceeded what was undertaken by any other Health Board in Scotland; and
    c) that in terms of sampling for environmental organisms during the operation of the various Incident Management Teams, ("IMT"), set up to investigate infection and their potential link with the hospital environment, all sampling for environmental organisms was reactive sampling, directed as a result of the relevant IMT and at the direction of the Chair of the IMT, most commonly Dr Teresa Inkster.

16. In relation to these issues the Inquiry is invited to have regard to the following:

    - Report of Dominique Chaput,[7] namely "Summary of legislation and guidance for routine microbiological water tests carried out at QEUH adults and RHC";[8]
    - Report of Dominique Chaput, namely "QEUH water sampling overview 2015-2020";[9]
    - Report of Professor Brian Jones[10], namely "Management of Infection Control incidents in Wards 2A/RHC during 2017";[11]

[5] Considered by Counsel to the inquiry in their Closing Statement at paragraphs 194 and 217.
[6] Page 6 of Case Note Review Overview Report dated March 2021.
[7] Healthcare Scientist, Scottish Microbiology Reference Laboratories, Glasgow Royal Infirmary.
[8] Dated 9 December 2022.
[9] Dated 13 April 2022.
[10] Head of Service for Microbiology, NHSGGC.
[11] Dated 31 August 2020.

- Report of Dr Iain Kennedy[12], namely "Descriptive analysis of five year trends in bacteraemia rates for selected gram negative organisms";[13]
- Report of Health Protection Scotland, namely "Summary of Incident and Findings of the NHSGGC: QEUH/RHI water contamination incident and recommendations for NHS Scotland";[14]
- Report of Health Protection Scotland, namely "Situational Assessment Wards 2A/B Royal Hospital for Children NHSGGC";[15]
- SBAR Review of 2017 Mortalities in which Stenotrophomonas was isolated;[16] and
- Report of Health Protection Scotland, namely "Review of NHSGGC paediatric haemato-oncology data".[17]

17. Further, the Inquiry is invited to have regard to the assistance which may be provided regarding these issues by Sandra Devine[18], Jennifer Rodgers[19], Pamela Joannidis[20] Jennifer Armstrong,[21] Professor Tom Evans[22] and Professor Alistair Leanord.[23]

18. <u>Decision-making in relation to closure of Wards 2A and 2B, decanting to Ward 6A, and communications relating to same:</u>

The criticisms made by witnesses at the first evidential hearing in relation to these matters were summarised by Counsel to the Inquiry in their Closing Statement at Theme 6.[24] Essentially, the criticisms were that the closure of Wards 2A and 2B and the decision to decant to Ward 6A had not been subject to an adequate risk assessment, and that the communication in relation to the closure and decant was wholly inadequate.

19. Insofar as the perception that no adequate risk assessment was undertaken is concerned, it is submitted that it is entirely without substance. The reality is that the decision to close Wards 2A and 2B, and decant to Ward 6A in September 2018 was the subject of a series of comprehensive and detailed risk assessments undertaken by appropriately qualified members of a multi-disciplinary team, namely the IMT established to investigate contaminated water-related issues in Wards 2A and 2B, and chaired by the then Lead Infection Control Doctor Teresa Inkster.

20. In relation to this issue the Inquiry is invited to have regard to,

[12] Consultant in Public Health, NHSGGC.
[13] Dated 01 October 2018.
[14] Dated 20 December 2018.
[15] Dated June 2019.
[16] Prepared by Dr Alan Mathers, Chief of Medicine for Women and Children, Nov 2019
[17] Dated October 2019.
[18] Infection Prevention Control Manager at QEUH.
[19] Chief Nurse of QEUH in September 2018.
[20] Nurse Consultant Infection Prevention and Control, QEUH.
[21] Medical Director of NHSGGC.
[22] Professor of Molecular Microbiology, University of Glasgow, and Honorary Consultant in Infectious Diseases and General Medicine, NHSGGC
[23] Consultant Microbiologist, NHSGGC.
[24] Pages 5 and 51 of Closing Statement of Counsel to the Inquiry.

- the Minutes of the IMT;
- Options Paper;[25]

and to the assistance which may be provided to the Inquiry regarding this issue by Jennifer Rodgers, Tom Steele,[26] and Jamie Redfern[27].

21. Insofar as the perception that communication in relation to the closure and decant was wholly inadequate is concerned it is entirely accepted that certain families and patients first learnt of the proposed closure of Wards 2A and 2B, and the decant to Ward 6A from media sources rather than the Board; that this occurred was a matter of deep regret and an immense source of frustration at the time to those within the Board who were responsible for communications.

22. The failure in communication was not deliberate, and requires to be put in a fair and proper context. That context is that, following the decision of the IMT that Wards 2A and 2B should be closed and that patients should be decanted to Ward 6A, a process was initiated in accordance with the National Manual[28] governing the operation of IMTs to agree the terms of the communications to be made to patients and families regarding the decision. Before any communication could be finalised and approved by the Chair of the IMT the decision of the IMT to close Wards 2A and 2B and decant to Ward 6A was leaked to the media and made public. The wholly inappropriate leaking of sensitive information by persons unknown fundamentally undermined the Board's ability to communicate effectively with many of those affected by the decision taken by the IMT, and was a matter over which the Board had no control.

23. In relation to this issue the Inquiry is invited to have regard to,

- the terms of the National Manual governing the operation of IMTs;
- the Minutes of the IMT;
- "Ward 2A/2B – decant to Ward 6A/6B, QEUH: Narrative and Timeline";[29] and

to the assistance which may be provided to the Inquiry regarding this issue by Sandra Bustillo;[30] Sandra Devine, Jennifer Rodgers and Jennifer Haynes.[31]

24. <u>Communications:</u>

[25] Authored by J Redfern, General Manager, Hospital Paediatrics and Neonatology, NHSGGC. Dated 17 September 2018.
[26] Director of Estates and Facilities for NHSGGC.
[27] General Manager, Hospital Paediatrics and Neonatology, NHSGGC.
[28] National Infection Prevention and Control Manual.
[29] Drafted by Sandra Bustillo, Director of Communications and Public Engagement.
[30] Director of Communications and Public Engagement.
[31] Corporate Services Manager, NHSGGC.

The criticisms made by witnesses at the first evidential hearing in relation to this issue were primarily addressed by Counsel to the Inquiry in their Closing Statement at Theme 11.[32] The particular areas of criticism relating to communications were

a) Communications regarding the use of prophylaxis medication;[33]
b) Communications regarding issues relating to Wards 2A and B, and 6A;[34]
c) The failure by management to take responsibility for communications to patients and families regarding a) and b) above;[35] and
d) The Board prioritising communications with the media over communications to patients and families.[36]

The overarching theme common to all criticisms made regarding communication was "…a belief that GGC managers had not communicated with patients and with the public openly and in good faith"[37] and that "…there was a lack of openness, transparency and honesty".[38]

I shall address each issue separately.

25. Communications regarding the use of prophylaxis medication:

It should be made clear at the outset that at all material times the prescribing of prophylaxis to haemato-oncology patients in Wards 2A, 2B and 6A was based on clear criteria, and an independent review has found that,

> "…that there is a demonstrable culture of engagement by prescribing clinicians with Infection Control and Infectious Disease specialists, and a strong Quality Improvement approach to ensure best practice for patients."[39]

Furthermore, it is not accepted that the communication in relation to the use of prophylaxis medication has been anything other than appropriate and transparent at all times. The prescribing of prophylaxis is a matter which would have been discussed by the clinical team with individual patients and their families through the ongoing management of the individual patient's care, following discussion and consultation with Infection Control and Infectious Disease specialists at the IMTs, in particular Dr Teresa Inkster. In addition, the use of prophylaxis was highlighted in the proactive communications from the Board to families in relation to the Water Incident and Cryptococcus incident. Prophylaxis was also raised in a series of questions put by families in 2019 and again in 2020, to which the Board responded appropriately; the answers to the 2019 questions

[32] Page 76 of Closing Statement of Counsel to the Inquiry.
[33] Paragraph 219 of Closing Statement of Counsel to the Inquiry.
[34] Paragraphs 141 and 218 of Closing Statement of Counsel to the Inquiry.
[35] Page 8 and paragraph 231 of Closing Statement of Counsel to the Inquiry.
[36] Page 8, paragraphs 172-173, and paragraph 234 of Closing Statement of Counsel to the Inquiry.
[37] Page 8 of Closing Statement of Counsel to the Inquiry.
[38] Paragraph 141 of Closing Statement of Counsel to the Inquiry (quoting evidence given by [redacted]).
[39] Review of prescribing in Haemato-oncology patients Royal Children's Hospital, Glasgow by Andrew Murray, Medical Director, NHS Forth Valley, December 2019.

were published on the NHSGGC website and responses to the 2020 questions were posted on the closed Facebook page.

26. In relation to this issue the Inquiry is invited to have regard to:

- Review of prescribing in Haemato-oncology patients Royal Children's Hospital, Glasgow by Andrew Murray, Medical Director, NHS Forth Valley, December 2019;
- The Minutes of the IMTS relating to water and cryptococcus;
- The proactive communications from the Board to families referred to at paragraph 25 above;
- The answers provided by the Board in relation to specific questions raised regarding prophylaxis to which reference is made at paragraph 25 above;
- Briefing to parents of 13th January 2019 on behalf of Board;

and to the assistance which may be provided to the Inquiry in relation to this matter by Sandra Bustillo.

27. <u>Communications regarding issues relating to Wards 2A and B, and 6A:</u>

It is entirely refuted that, in its communications with patients and families, the Board acted in anything other than good faith at all times. The processes for communications during the extensive IMTs relating to Wards 2A, 2B and 6A were governed by the terms of the National Manual, and the Healthcare Infection Incident Assessment Tool, ("HIIAT") to which the Board did all that it reasonably could to adhere at all times. In this regard the Inquiry is invited to consider:

- the Minutes of the IMTs which provide a contemporaneous account of the steps taken to comply with the terms of the National Manual;
- the National Manual;
- the HIIAT Document in place in 2018 and 2019;
- the NHSGGC Healthcare Associated Infection Communication Strategy;[40]
- NHSGGC Communication Handling Arrangements: Infection Control Issues;[41]
- Water Incident Communications narrative and documentation, including decant narrative and Ward 6A IMT narrative and documentation[42]; and

to have regard to the assistance which may be provided in relation to this issue by Sandra Bustillo, Jamie Redfern, Jennifer Rodgers and Professor Brenda Gibson.

28. <u>The failure by management to take responsibility for communications to patients and families regarding the use of prophylaxis and issues relating to Wards 2A and B, and 6A:</u>

Beyond making it clear that the responsibility to communicate to patients about any medication being prescribed must lie with the treating clinician who has the knowledge

[40] July 2015 and updated July 2017.
[41] Report by Sandra Bustillo dated 16 June 2021.
[42] Provided to Inquiry Team in response to RFI 6

of the individual patient's condition and whether the medication to be prescribed is appropriate, it is considered that this issue has been addressed in the responses set out at paragraphs 21, 22, 25, 26 and 27 above.

29. <u>The Board prioritising communications with the media over communications to patients and families:</u>

    The decision as to the communications which required to be made and to whom they required to be made was at all times a matter which was determined by the IMT and, ultimately, by the Chair of the IMT by reference to, and in accordance with, the terms of the National Manual and the HIIAT.

30. At all times communications with patients and staff were the key priority for the IMT as is clear from the Minutes of each IMT. Further, at all times the IMT strove to ensure that patients and families learned of issues from those authorised by the IMT, and not through the media. As has been stated at paragraphs 21 and 22 above, however, there were occasions during the period with which the Inquiry is concerned that information was leaked to the media before appropriate communications could be made on behalf of the IMT to patients and families. It is a matter of profound regret that such conduct occurred, and it requires to be made absolutely clear that, at no time, has the Board prioritised communications with media over communications to patients and families; to have done so would have been contrary to the paramount importance which the Board attaches to the welfare of all patients. In this regard the Inquiry is invited to have regard to the documents to which references is made at paragraph 27 above, and to the assistance which may be provided by those witnesses to whom reference is made at paragraph 27 above.

31. **<u>Alleged link between infection suffered by certain patients and the hospital environment:</u>**

    A number of witnesses gave evidence at the evidential hearing of their perception that there was a link between infection suffered by a number of patients on Wards 2A and 6A, and the hospital environment. As I submitted in the Closing Statement on behalf of the Board[43], frequently that perception appeared to have been based on "suspicion"[44], "assumption"[45], "rumours"[46], "speculation"[47], "media"[48], and "research on the internet."[49] It is accepted, however, that in certain cases the perception of individual witnesses appears to have been based on what they claim they were told by medical staff,[50] or what they learned from the findings of the Case Note Review. Irrespective of the basis for the perception held by witnesses it is not accepted that there is any causal

[43] 15 December 2021.
[44] Page 7 of Closing Statement of Counsel to the Inquiry.
[45] Page 7 of Closing Statement of Counsel to the Inquiry.
[46] Paragraph 121 of Closing Statement of Counsel to the Inquiry.
[47] Paragraph 121 and 141 of Closing Statement of Counsel to the Inquiry.
[48] Paragraph 197 of Closing Statement of Counsel to the Inquiry.
[49] Paragraph 216 of Closing Statement of Counsel to the Inquiry.
[50] See paragraph 198 of Closing Statement of Counsel to the Inquiry.

connection between infection suffered by any patient and the hospital environment save in the case of [redacted],[51] and in one case of cupriavidus in 2016.[52]

32. Insofar as medical staff may have given inaccurate information to patients and their families is concerned, that issue is addressed under the heading of "Whistleblowers". Insofar as reliance has been placed upon the findings of the Case Note Review Report, the basis upon which its findings were reached is challenged in a number of material respects.

33. In relation to the issue of causality arising in relation to Ward 2B and 6A the Inquiry is invited to have regard to the following reports:

- Report of the Cryptococcus Incident Management Team Expert Advisory Sub-Group;[53]
- PAG 19/2/2018; [54]
- Report of Professor Alistair Leanord;[55] and
- Reports of Professor Tom Evans[56],[57]

34. In addition to the named authors of the reports referred to at paragraph 33 above the Inquiry is also invited to have regard to the assistance relating to these issues which may be provided by Dr John Hood,[58] Sandra Devine, Jennifer Rodgers, Dr Iain Kennedy, and Professor Brian Jones.

35. <u>Allegation of "cover-up":</u>

By reference to the evidence led at the first evidential hearing and, thereafter, summarised by Counsel to the Inquiry in their Closing Statement the belief amongst certain witnesses that the Board had engaged in a concerted cover-up appears to have been based on perceptions held in relation to four matters: namely

a) That there was a lack of "openness, transparency and honesty"[59] in communications by the Board in the period from March to September 2018 in relation to Wards 2A and B;[60]
b) the explanation provided by the Board for the reason to decant from Ward 2A;[61]

[51] [redacted] tested positive for Myobacterium Chelonae in 2019; contracted upon line removal in surgery in February 2019. The case was investigated and reported to HPS in accordance with procedure. The Inquiry is invited to have regard to the IMT Minutes for 16 June 2019, 25 June 2019, 03 July 2019, 14 August 2019 and a timeline prepared for HPS on [redacted] movements through NHSGGC facilities in 2019.
[52] The circumstances of this were considered by a PAG in terms of the National Manual and no further action was required.
[53] Dated 05 April 2022.
[54] PAG Minute 19/02/2018
[55] Report of Professor Alistair Leanord.
[56]
[57]
[58] Consultant Microbiologist, NHSGGC.
[59] Witness statement of [redacted] at paragraph 238.
[60] Page 51 of Closing Statement of Counsel to the Inquiry.
[61] Page 52 of Closing Statement of Counsel to the Inquiry.

c) that a clinician had been instructed to lie to the [redacted] of a patient;[62] and
d) that since 2015 the Board had been fully aware of the true state of the water supply at the QEUH and "deliberately chose to tell patients less than they knew".[63]

I shall address each issue separately.

36. <u>That there was a lack of "openness, transparency and honesty" in communications in the period from March to September 2018 in relation to Wards 2A and B:</u>

This issue has been addressed at paragraphs 18 to 30 above.

37. <u>The explanation provided by the Board for the reason to decant from Ward 2A:</u>

At page 52 of their Closing Statement Counsel to the Inquiry summarised the evidence given by [redacted] that, on [redacted] September 2018, [redacted] were informed by Dr Inkster that [redacted] infection was linked to the drains on Ward 2A and that, against that background, there was a proposal to close the whole Schiehallion Unit amidst serious concerns about the risk of further infection. By contrast, the Note provided to patients on 18 September 2018 as to the reason for the decant suggested that the basis for the decision to close Wards 2A and 2B "was driven by the need for a new cleaning regime".[64] In these circumstances, it is alleged that there may have been a lack of candour on the part of the Board.

38. The position, however, is clear. Firstly, by way of clarification, the Note provided to patients provided considerably more information in respect of the decant than that which has been suggested. In particular, it set out that an IMT had been established to investigate and manage the situation which resulted in advice being sought from Scottish and UK experts, and a requirement for further examination and investigation to be carried out in Wards 2A and 2B by experts, without immune-compromised patients being *in* situ. Further, at no time in the course of the IMT relating to water contamination in 2018 was any hypothesis ever established to be accurate that infection suffered by patients on Ward 2A was linked to the water or the built environment; a fact consistently acknowledged in the minutes of the IMTs. It follows that, if Dr Inkster (Chair of the IMT) provided such misleading information to [redacted] and/or other families[65], she had no basis, in fact, for so doing. Furthermore, it is important to note that the Note provided to patients on 18 September 2018 as to the true purpose of the decant was, in fact, drafted by Dr Inkster.[66]

[62] Page 82 of Closing Statement of Counsel to the Inquiry.
[63] Page 83 of Closing Statement of Counsel to the Inquiry.
[64] Page 52 of Closing Statement of Counsel to the Inquiry.
[65] Reference is made at page 69 (para 198) of Closing Statement of Counsel to the Inquiry to the evidence of [redacted] and one witness who gave evidence in a closed session that they formed an understanding from what they were told by medical staff that "…a link between the hospital environment and the infection in question had been established".
[66] See Minutes of IMT Meeting 19 September 2018 at Item 2.

39. In relation to this issue the Inquiry is invited to have regard to the Minutes of the IMT, and to the assistance which may be provided to the Inquiry by Sandra Devine, Pamela Joannidis and Dr Iain Kennedy.[67]

40. <u>That a clinician had been instructed to lie to the father of a patient:</u>

    The clinician in question is Dr Inkster, and the [redacted] of the patient is [redacted]. The position may be stated very briefly. There is no truth in the suggestion that Dr Inkster was ever instructed to lie to [redacted]. The allegation is one which was investigated fully in the [redacted] raised by Dr Inkster, and reported upon by Dr Chris Deighan.[68]

41. In relation to this issue the Inquiry is invited to have regard to the Report of Dr Deighan,[69] and to the assistance which may be provided by Jamie Redfern, Kevin Hill[70], and the Lead Nurse for Infection Control.[71]

42. <u>That since 2015 the Board had been fully aware of the true state of the water supply at the QEUH and "deliberately chose to tell patients less than they knew":</u>

    In the course of giving evidence at the first evidential hearing [redacted] made repeated references to a report commissioned by the Board and produced by DMA Canyon Limited in 2015 which identified a number of concerns about the safety of the domestic water system at the QEUH. Adopting the language of the Oversight Board Report [redacted] described the report as having been "lost" and made clear his suspicion that it had, in fact, been concealed.

43. The position, in fact, is that the DMA Canyon Report was received in 2015 by Ian Powrie.[72] The findings of the report gave rise to the creation by Mr Powrie of an Action Plan, the delivery of which Mr Powrie delegated to two members of the Estates team, Mr Jim Guthrie and Mr David Brattey. At no time was the existence of the DMA Canyon Report concealed by Mr Powrie, and on its existence and contents being made known for the first time to more senior management in July 2018, it was immediately shared with a number of organisations including Health Protection Scotland, and Dr Inkster in her capacity as Chair of the IMT[73].

44. In relation to this issue the Inquiry is invited to have regard to the assistance which may be provided by Ian Powrie, Tom Steele and Jane Grant[74].

[67] Consultant in Public Health Medicine, NHSGGC.
[68] Deputy Medical Director of NHSGGC.
[69] Report of Issues raised by Dr Teresa Inkster to Medical Director dated May 2021.
[70] Director of Women and Children's Services of NHSGGC.
[71] Referred to in Dr Deighan's report at section 3.2 as person alleged by Dr Inkster to have given instruction to conceal truth from [redacted].
[72] Estates Manager, NHSGGC.
[73] The report was passed to Dr Inkster on 04 July 2018.
[74] Chief Executive Officer of NHSGGC.

45. <u>Allegations of professional misconduct by named clinicians and members of management:</u>

Allegations which, if true, would amount to professional misconduct were made by a number of witnesses against treating clinicians and members of management in the course of evidence led at the first evidential hearing. The issue is one which I addressed in the Closing Statement made on behalf of the Board at the conclusion of the first evidential hearing. For convenience I set out below the relevant extracts from the Closing Statement as follows:

"It is, in my submission, difficult to overstate the seriousness of the allegations which have been made; allegations which question the professional conduct, honesty and integrity of NHSGGC as a whole, and of named and un-named clinicians and members of management in particular. As I made clear in my Opening Statement the safety and welfare of its patients always has been, and remains of paramount concern to NHSGGC. The management of NHSGGC and its clinicians share the same common values and aims, namely to deliver the highest standard of safe and person-centred care to its patients. Allegations which so obviously call into question the fundamental integrity of members of management and clinicians could not be more serious, in particular in the context of care being provided for some of the most vulnerable patients.

At various points in their Closing Statement Counsel to the Inquiry note that in making criticisms of staff witnesses, at certain times, sought to draw a distinction between management and clinicians. As I have indicated, in my submission both management and clinicians share identical values in terms of their concerns for patients. It is, perhaps, worthy of note that many of those holding managerial positions within the Queen Elizabeth University Hospital are clinically qualified, some of whom were working with the affected families at the time of the matters complained of.

Furthermore, it is not in my submission sufficient to address unchallenged allegations of dishonesty merely by speculating that they may not have been meant. At paragraph 239 of their Closing Statement Counsel to the Inquiry submitted,

> *"Evidence was heard about the perceived inaccuracy of information communicated by GGC and hospital management. Some witnesses alleged dishonesty on the part of staff. It seems likely that not everyone who made this allegation really intended to suggest that clinical staff in particular deliberately or recklessly told untruths".*

The seriousness of such allegations cannot, and should not be dismissed so easily; the professional standing of a number of clinicians and members of management has been called into question, frequently in the most explicit terms.

In my submission, it is of paramount importance that an opportunity is provided to all those whose good character and professional conduct have been questioned to give evidence to the Inquiry at the earliest opportunity to address the allegations which

have been made against them. At this stage, it is, perhaps, sufficient to state that the allegations are not accepted as having any sound basis in fact. In my submission, unless and until these issues are addressed, individuals (both management and clinicians) will suffer significant and wholly unfair prejudice and, equally significantly, confidence in the Queen Elizabeth University Hospital will inevitably, and quite wrongly, be substantially undermined.

In this regard, the level of concern is made clear in an open letter written by Senior Clinical Leaders of the Queen Elizabeth University Hospital to the First Minister and the Cabinet Secretary for Health and Social care on 30 November 2021[75]*, and I would respectfully invite the Inquiry to have regard to its terms. Whilst It is acknowledged immediately that this letter was written, in part, in the context of matters raised in the Scottish Parliament and therefore not by reference to the evidence led in the Inquiry, it will be noted that the letter was also written with reference to "…the way in which our hospitals, our colleagues and the treatment of our patients is being portrayed in the press…",*[76] *and in these circumstances in my submission contains highly relevant observations as to some of the very concerning consequences of the unchallenged evidence which has been led."*[77]

46. In relation to this issue the Inquiry is invited to have regard to the following reports:

- report of Dr Jim Beattie[78], namely "Report on the clinical aspects of the management of patients with documented Blood Stream Infection with an environmentally classified Gram negative organism in the Paediatric Haemato-Oncology service, NHSGGC between June 1st 2015 and September 20th 2019";[79] and
- report of Ms Louise Proffitt[80] dated January 2022[81].

The Inquiry is also invited to have regard to the assistance which may be provided by Professor Brenda Gibson[82], Professor Alistair Leanord, Dr Jonathan Coutts[83], Dr Shazia Chaudhury[84], Dr Jairam Sastry[85], Dr Milind Ronghe[86], Jane Grant, Jonathan Best[87] and Jennifer Armstrong.

47. <u>Criticisms made by [redacted] beyond those listed above:</u>

[75] See Appendix 1 to Closing Statement.
[76] Paragraph 1 of letter.
[77] Paragraphs 4 to 9 of Closing Statement on behalf of NHSGGC.
[78] Associate Medical Director, Women and Children's directorate, QEUH.
[79] Dated 14 January 2020.
[80] Lead Nurse, Neonatal ODN for Kent, Surrey and Sussex.
[81] Dated January 2022
[82] Consultant Paediatric Haematologist, NHSGGC.
[83] Consultant Neonatologist, NHSGGC.
[84] Consultant Paediatric Haematologist.
[85] Consultant Paediatric Oncologist, NHSGGC.
[86] Consultant Paediatric Oncologist, NHSGGC.
[87] Chief Operating Officer, NHSGGC.

A number of concerns have been raised by [redacted], both in his oral testimony over two days in October 2021 and in a lengthy statement taken from him and made available to the Inquiry. Principal amongst those concerns are the suggestions that:

(i) the board engaged in suppression and concealment of information from patients, clinicians, the Case Note Review, and the public;
(ii) the board made decisions about the accommodation and treatment of patients without proper consideration of the safety and well-being of those patients; and
(iii) that the board failed to properly communicate with patients and families.

48. Suppression and concealment of information:

[redacted] interest in issues associated with infection control at the QEUH came into sharp focus in June 2018 when [redacted] contracted infection with mycobacterium chelonae. Prior to that time, [redacted] spoke of being aware that issues with the hospital environment were "in the background" within QEUH. As is highlighted elsewhere in this Paper in relation to other incidences of infection, it is not accepted that there is any causal link between the infection suffered by [redacted] and the hospital environment.

Water

49. [redacted] concerns in relation to the hospital environment largely related to water and, in particular, his concern that the Board concealed the information contained in the DMA Canyon reports. The position of the Board in relation to the DMA Canyon reports is addressed elsewhere in this Positioning Paper.

Ventilation

50. In addition to his concerns about water safety, [redacted] expressed concern that the Board had knowledge that the ventilation arrangements in ward 2A, as built, were not fit to allow accommodation of immunocompromised children and, indeed, placed paediatric patients at increased risk of airborne infection. In support of this view, reference was made by him in evidence to the report from Innovated Design Solutions[88] which considered the ventilation arrangements in Ward 2A. The statement from the Board to the media[89] that the ventilation system in ward 2A was to be "upgraded" whilst the ward was closed was described by [redacted] as disingenuous and a "narrative which downplayed the reality," given the information contained in the report.[90]

51. The Innovated Design Solutions report is not an expert report in the strict sense but rather a feasibility study regarding increasing ventilation air change rates on Ward 2A, against a background of evolving knowledge that the ventilation arrangements on the ward were not compliant with the standards as set out in SHTM 03-01. It has not been spoken to in evidence, beyond [redacted] thoughts on the matter.

[88] Dated 24 October 2018, and post-dating the closure of Ward 2A and decant to Ward 6A
[89] December 2018
[90] Statement of [redacted], para 98, 104; Transcript (morning) 27 October 2021, pg 43- 45

52. The position of the Board is that there is no evidence of any patient in ward 2A or 6A, or, indeed, elsewhere in the QEUH, contracting any infection which has any causal link to the ventilation arrangements within the hospital. Further, there is no evidential basis to suggest that the ventilation arrangements in wards 2A or 6A, or in other wards throughout the QEUH, have exposed patients to increased risk of infection.

53. It is important that the role of ventilation is placed in a proper context from the perspective of infection prevention and control. Whilst SHTM 03-01 sets out targets for rates of air changes, filtration and pressure levels in various clinical settings, the status of the document is as guidance and not mandatory. Professor Humphries questioned the evidential basis for the standards as set out in SHTM 03-01 from a microbiological perspective and, in particular, advised the Inquiry that there is no precise science that he is aware of which sets rates of air changes per hour as they appear in SHTM.[91]

54. Further, a joint expert opinion will be produced in due course on behalf of the Board from Dr Samir Agrawal, consultant haematologist at St Bartholomew's Hospital, London, and Professor Peter Hawkey, Emeritus Professor of Microbiology at the University of Birmingham, to demonstrate that there is no increased risk of infection from water or ventilation at the QEUH.

Sampling and data gap to Case Note Review and Oversight Board

55. [redacted] raised concern that, as is highlighted at para 14 of the Positioning Paper, the Board failed to conduct adequate sampling and that the Board restricted what information was provided to the Case Note Review[92] and to the Oversight Board.[93] The question of sampling is address at paras 15 - 17 above and reference is made to the witnesses and material listed in relation to the position of the Board on this issue. The suggestion that the Board restricted what information it provided to the Case Note Review and Oversight Board is refuted. At no stage was the Board being obstructive, rather the scale of the task of data and information collection, together with the challenges of data analysis with the existing internal systems, may have impeded progress on the provision of data as requested. These challenges were highlighted by Jane Grant in a letter to Professor Mike Stevens following publication of the Case Note Review. [94]

Paediatric Trigger Tool

56. An additional concern raised was about the non-publication by the Board of the Paediatric Trigger Tool, which [redacted] considered to be "further evidence of suppression of important information from those charged with impacting on infection control and patient safety."[95] However, the Paediatric Trigger Tool was used as a tool by the Case Note Review to inform their own reports. It was not used by NHSGGC. At the time of the start of the October 2021 Inquiry hearings, the report generated from the Case Note Review's use of the Paediatric Trigger Tool had not been shared with the families or, indeed, with

[91] Professor Hilary Humphries statement and parole evidence to Inquiry May 2022 hearings
[92] Statement of [redacted] para 298- 302, 381
[93] Transcript, 27 October 2021 (morning), page 95; statement para 280
[94] Letter from Jane Grant CEO to Professor Mike Stevens dated 1 March 2021
[95] Statement of [redacted] para 310

NHSGGC. Subsequently, and as a result of references to this being made during the October 2021 Inquiry hearings, the Case Note Review then emailed families (without notifying NHSGGC in advance) to advise that they could receive a redacted copy of the report on request. It follows, therefore, that at no time did the Board suppress any information which may have been generated by the use of the Paediatric Trigger Tool.

Concealment of information by and from clinicians

57. [redacted] was of the view that there was "an absolute divide between clinical and corporate information management" and, essentially, that the Board failed to communicate properly with clinicians. [96] This assertion is refuted and its basis is not clear. As is highlighted elsewhere in the Positioning Paper, during the course of the extensive IMTs, the process for communication was governed by the National Manual. The specific allegation that a clinician was instructed to lie to [redacted] about the second mycobacterium chelonae infection is refuted and is addressed elsewhere in the Positioning Paper.

58. <u>Accommodation of patients without consideration of their safety and well-being:</u>

The more general concern that the decision of the Board to decant wards 2A and 2B to ward 6A was not the subject of an adequate risk assessment is one which is addressed elsewhere in the Positioning Paper. [redacted] variously described the decant decision as one which was carried out in the absence of any "impact assessment," "business continuity plan," and without reference to any "risk register."[97] As has been highlighted earlier in the Positioning Paper, the decision to decant was made following thorough consideration of the feasibility of the exercise and its impact upon patients, families and continuity of service.

59. [redacted] raised a specific question as to whether, in making the decision to decant, the Board had considered the "Scottish Government's Impact Assessment for Children and Young People," assumed to be reference to a Child Rights and Wellbeing Impact Assessment. It is implicit in the extent of the risk assessments undertaken relative to the decant that the well-being of the paediatric patients was very much at the front and centre of the decant decision making process and the move toward 6A which followed.

60. <u>Failure to communicate with patients and families:</u>

Misinformation about infection

The more general criticism of a failure to properly communicate on the part of the Board is addressed elsewhere in the Positioning Paper. [redacted] raised a specific concern about misinformation which was communicated to him in relation to his daughter's infection. [redacted] advised that he was informed by Professor Stevens through the Case Note Review that a paediatric patient had contracted

[96] Statement of [redacted] para 83 and 157

[97] Transcript of evidence, Tues 26 October 2021, afternoon session, page 11, 15; Statement paras 94- 96, 149, 277

mycobacterium chelonae in 2016, contrary to previous information given to [redacted] that [redacted] was the first patient in paediatric oncology in Glasgow to have contracted the infection.[98] The IPC team did not hold any notes on the 2016 case of mycobacterium chelonae infection of a paediatric patient as the organism was not an alert at that time. It would appear that whoever advised [redacted] that [redacted] was the first case of that infection within the QEUH was simply unaware of the 2016 case as it was, at that time, an isolated incident which did not trigger any alert.

BBC Disclosure Scotland programme

61. [redacted] raised concern as to why the Board were not proactive in their communication to families ahead of the airing of this programme and, in particular, failed to advise families in advance as to the content of any statement to the programme from the Board. [99] It should be understood that, at the time of the broadcast of the BBC programme on 24 June 2020, the Board was under considerable restriction in relation to its communication process: from October 2019, communication clearance measures were imposed by the Scottish Government upon the Board, which included a requirement for review and approval of patient and family communications through Professor Craig White, who had become the point of liaison for families, prior to such communications being issued. Further, in November 2019, the Board was escalated to Stage 4 of the performance framework. From then on, in addition to clearance on family communications, all media statements required Scottish Government clearance prior to issue. This involved proposed media statements from the Board being subject to initial review by Craig White and Fiona McQueen, then processing by Scottish Government's communication and policy teams and ultimately requiring to go to the Cabinet Secretary for clearance prior to being issued. On 22 June 2020, in answer to a series of questions from the BBC in preparation of the Disclosure programme, the Board provided responses. These responses were not shared in advance with parents at that time. The reason for the Board not sharing these responses was that the content of the programme was not known ahead of its broadcast on 24 June, nor was it known as to which, if any, parents had participated in the programme. Furthermore, the clearance processes made it challenging for the Board to issue communications timeously. The statement given by the Board to the BBC was not broadcast in full on the Disclosure programme. Having gone through all stages of the Scottish Government communication clearance process, the Board wrote to patients and families at its first opportunity to do so. This was on 26 June. The communication to patients and families included a copy of the Board's statement in full.

62. <u>Criticisms made by [redacted] beyond those listed above:</u>

Issues on a similar theme to those raised by [redacted] have been aired by [redacted], notably failures by the Board to communicate information to patients and families and, further, the perception of a cover-up on the part of the Board of known information on infection issues within the QEUH, specifically in relation to their

[98] Statement of [redacted], para 300- 303

[99] Statement of [redacted] para 285- 290; transcript 27 October 2021 (morning), page 57- 61; transcript 27 October 2021 (afternoon) page 1-6

own [redacted] during his treatment on ward 2A. The issues in respect of communication are addressed in paras 18-30 of this Paper.

Concealment of information specific to their son's infection

63. Whilst receiving treatment in ward 2A, [redacted] contracted infection with [redacted], the day following [redacted]. As is highlighted elsewhere in the Positioning Paper, at no time during the course of the IMT was any definitive issue with water ever established to have been linked to any infection contracted by any patient on ward 2A. Despite this, and despite her pivotal role in the IMT as chair, Dr Inkster, together with Dr Ronghe, advised [redacted] on 17 September 2018 that their [redacted] infection had been hospital acquired and, specifically, had come from the drains.[100] Not only was this information without any factual basis, it was known, or ought to have been known, by Dr Inkster to be untrue: it is recorded in the minutes of the IMT from 10 September that Dr Inkster herself advised the group that the serratia organism had not been found either in drains or in water in Ward 2A.[101]

64. [redacted] was advised by Dr Ronghe that he had been unsure as to how much information he had been allowed to pass on in relation to the source of her [redacted] infection.[102] It is clear that Dr Ronghe had no role in the IMT and was reliant on information given to him as to known sources of infection, which appears, understandably, to have been taken at face value. The information given on the source of the infection, together with the statement from Dr Ronghe that he had been limited in the information he was permitted to pass on, combined to cause the [redacted] family's confidence in safety of the hospital to become undermined.

Concealment/ delay of information regarding cryptococcus in ward 6A

65. The [redacted] confidence and trust was yet further undermined in January 2019 following the reporting of the 2 incidences of cryptococcus infection.[103] The cryptococcus cases from December 2018 and January 2019 were the subject of an extensive IMT in the course of which the infections were discussed critically and significant steps were taken in order that the source of the infection might be identified and treated appropriately.[104] Significant work was undertaken by the microbiology, infection control and estates teams to explore possible infection sources. The hypothesis advanced at an early stage in the IMT was the ingress of pigeons to the plant room on the 12th floor of the hospital from the roof, leading to contamination of air handling units through the intake of fungal spores from pigeon faeces, a hypothesis which gave rise to speculation as to a link between infection and ventilation. This hypothesis was thought not to be feasible from a very early

[100] Statement of [redacted], para 103; Transcript [redacted] 20 Sept 2021 (morning), page 25
[101] IMT minutes 10 Sept 2018, para 2 under "Patient Report" heading
[102] Transcript [redacted] 21 September 2021 (morning), page 105
[103] Statement [redacted] para 134, 188- 189
[104] As set out in Cryptococcus Narrative provided to Inquiry Team in response to RFI 6

stage. However, by that stage, the whistleblowing process had already been instigated due to, amongst other matters, concerns on the adequacy of ventilation and, consequently, an expert sub-group was convened to fully explore a variety of hypotheses as to any link to ventilation and these infections. Following the work of the sub-group, the Board was able to publicly confirm in January 2020 that the hypothesis involving the plant room and pigeon droppings had been ruled out.

66. As is highlighted elsewhere in the Positioning Paper, the operation of the IMT was governed by the terms of the National Manual. The press became aware, and reported on the occurrence of the infections following information being leaked to them, a matter which was beyond the Board's control. [redacted] spoke of frustration at the lack of information presented from the Board and having to rely on the media reporting. The Board issued a letter of information and reassurance to families on 23 January 2019 but damage to families' confidence had already occurred by that point as a result of the leak to the media. It was always the intention of the Board to issue communication to patients and families, in accordance with the National Manual, but the Board had wished to do so in a way which respected patient confidentiality and maintained the confidence of patients and families. Whilst the Board were engaged in that process and following their communication strategy, an unauthorised and inaccurate leak to the media occurred, in breach of patient confidentiality. This was a matter beyond the control of the Board which caused deep concern and frustration and which completely frustrated the Board's efforts to comply with the requirements of the National Manual.

67. The hypothesis focusing on the ingress of fungal spores from pigeon faeces into ventilation was demonstrated, following investigation, to have been unfeasible at an early stage in the inquiry led by the IMT; however, it was a theory which was kept alive by the "[redacted]" long after it had been demonstrated to be without basis in fact. Reference is made to the report by Dr John Hood which concluded that it was highly unlikely that the 2 patients who contracted the infection contracted it from the hospital environment. The evidence which can be given by Dr Hood and Tom Steele may assist the Inquiry.

68. <u>The "[redacted]"</u>

As has been made clear in the Introduction to this Positioning Paper it is considered that the conduct of "[redacted]" undermined in a number of significant respects the efforts that were being made by many of the "[redacted]'" colleagues to address the issues being faced in the management of infection control in the period with which the Inquiry is concerned, and had the effect of fundamentally undermining the bond of trust which is at the heart of any relationship between any hospital and its patients. It is not intended in this Paper to do more than provide a non-exhaustive list of examples of the conduct to which reference has been made. The Inquiry is urged, however, to interview the various clinicians and others whose names appear below in order that it may have a comprehensive understanding of the gravity of this issue in the context of the matters to be considered by the Inquiry.

69. The following are examples of conduct by "[redacted]", or in the examples cited at (j) and (k) below, believed to have been the actions of "[redacted]", which undermined the efforts taken to manage infection control, and protect patient safety and welfare: namely

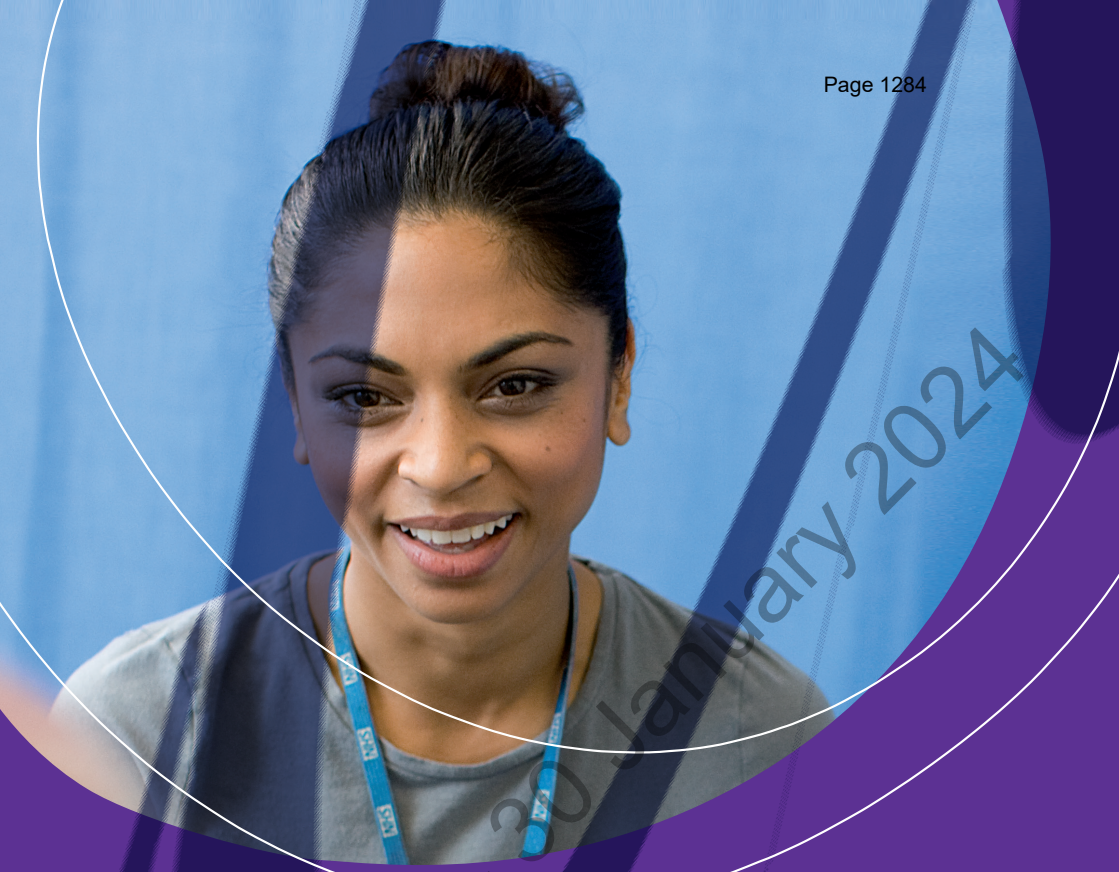
    a) A history of excessive and unnecessary demands being made of members of the IPCT;
    b) A history of excessive and unnecessary demands being made of members of Estates and Facilities;
    c) A history of excessive and unnecessary demands being made of members of IMTs;
    d) A failure to recognise and respect professional boundaries;
    e) A failure to acknowledge and respect the professional opinions of colleagues;
    f) Refusing to accept and apply the principles of Dignity at Work towards colleagues;
    g) Engaging in conduct which was designed to undermine and/or intimidate professional colleagues;
    h) A failure to apply basic principles of risk management in infection control;
    i) A failure to apply and/or accept recognised scientific principles in the testing of a hypothesis regarding potential sources of infection;
    j) Providing inaccurate information to patients and families regarding infection and links to the hospital environment;
    k) Providing inaccurate information to the media and/or politicians regarding patients, infection and a causal link to the QEUH;
    l) Breaching patient confidentiality in providing information to the media and/or politicians;
    m) Making false allegations against colleagues in relation to their professional conduct, including in relation to conduct in IMTs;
    n) Making false accusations on the accuracy of public statements by the Board; and
    o) Deliberately failing to follow proper processes in airing and/or having examined any concerns which they raised regarding the management of infection control.

70. In relation to these issues the Inquiry is invited to have regard to the Whistleblowing Narrative,[105] and to the assistance which may be provided to the Inquiry regarding this issue by Professor Brian Jones, Professor Alistair Leanord, Dr Iain Kennedy, Dr Linda Balgarde,[106]Sandra Devine, Jennifer Rodgers, Pamela Joannidis, Tom Walsh, Tom Steele, Dr Rachel Green[107], Jane Grant, Jennifer Armstrong, Linda de Caestecker, Professor Angela Wallace[108] and Professor Marion Bain[109].

Peter Gray KC
and
Emma Toner, Advocate

[105] Document authored by Linda de Caestecker, Director of Public Health at NHSGGC, dated February 2022.
[106] Lead Infection Control Doctor, NHSGGC.
[107] Chief of Medicine, NHSGGC.
[108] Director of Nursing NHSGGC.
[109] Medical Director, NHS National Services Scotland

14 December 2022.



Good medical practice

General Medical Council

A49585984

The duties of a doctor registered with the GMC

Patients must be able to trust doctors with their lives and health. To justify that trust you must show respect for human life and make sure your practice meets the standards expected of you in four domains.

Knowledge, skills and performance

- Make the care of your patient your first concern.
- Provide a good standard of practice and care.
  - Keep your professional knowledge and skills up to date.
  - Recognise and work within the limits of your competence.

Safety and quality

- Take prompt action if you think that patient safety, dignity or comfort is being compromised.
- Protect and promote the health of patients and the public.

Communication, partnership and teamwork

- Treat patients as individuals and respect their dignity.
  - Treat patients politely and considerately.
  - Respect patients' right to confidentiality.
- Work in partnership with patients.
  - Listen to, and respond to, their concerns and preferences.
  - Give patients the information they want or need in a way they can understand.
  - Respect patients' right to reach decisions with you about their treatment and care.
  - Support patients in caring for themselves to improve and maintain their health.
- Work with colleagues in the ways that best serve patients' interests.

Maintaining trust

- Be honest and open and act with integrity.
- Never discriminate unfairly against patients or colleagues.
- Never abuse your patients' trust in you or the public's trust in the profession.

You are personally accountable for your professional practice and must always be prepared to justify your decisions and actions.

Good medical practice

This guidance has been edited for plain English.

Published 25 March 2013
Comes into effect 22 April 2013.

This guidance was updated on 29 April 2014 to include paragraph 14.1 on doctors' knowledge of the English language. It was further updated on 29 April 2019 to remove the sub-heading 'honesty' from immediately before paragraph 65.

You can find the latest version of this guidance on our website at **www.gmc-uk.org/guidance**.

For the full website addresses of references in this guidance, please see the online version on our website.

Contents

About this guidance

Good medical practice includes references to explanatory guidance. A complete list of explanatory guidance is at the end of the booklet.

All our guidance is available on our website, along with:

- learning materials, including interactive case studies which bring to life the principles in the guidance and show how they might apply in practice

- cases heard by medical practitioners tribunals, which provide examples of where a failure to follow the guidance has put a doctor's registration at risk.

Professionalism in action

1 Patients need good doctors. Good doctors make the care of their patients their first concern: they are competent, keep their knowledge and skills up to date, establish and maintain good relationships with patients and colleagues,[1] are honest and trustworthy, and act with integrity and within the law.

2 Good doctors work in partnership with patients and respect their rights to privacy and dignity. They treat each patient as an individual. They do their best to make sure all patients receive good care and treatment that will support them to live as well as possible, whatever their illness or disability.

3 *Good medical practice* describes what is expected of all doctors registered with the General Medical Council (GMC). It is your responsibility to be familiar with *Good medical practice* and the explanatory guidance[2] which supports it, and to follow the guidance they contain.

4 You must use your judgement in applying the principles to the various situations you will face as a doctor, whether or not you hold a licence to practise, whatever field of medicine you work in, and whether or not you routinely see patients. You must be prepared to explain and justify your decisions and actions.

5 In *Good medical practice*, we use the terms 'you must' and 'you should' in the following ways.

- 'You must' is used for an overriding duty or principle.
- 'You should' is used when we are providing an explanation of how you will meet the overriding duty.
- 'You should' is also used where the duty or principle will not apply in all situations or circumstances, or where there are factors outside your control that affect whether or how you can follow the guidance.

6 To maintain your licence to practise, you must demonstrate, through the revalidation process, that you work in line with the principles and values set out in this guidance. Only serious or persistent failure to follow our guidance that poses a risk to patient safety or public trust in doctors will put your registration at risk.

Domain 1: Knowledge, skills and performance

Develop and maintain your professional performance

7 You must be competent in all aspects of your work, including management, research and teaching.[3, 4, 5]

8 You must keep your professional knowledge and skills up to date.

9 You must regularly take part in activities that maintain and develop your competence and performance.[6]

10 You should be willing to find and take part in structured support opportunities offered by your employer or contracting body (for example, mentoring). You should do this when you join an organisation and whenever your role changes significantly throughout your career.

11 You must be familiar with guidelines and developments that affect your work.

12 You must keep up to date with, and follow, the law, our guidance and other regulations relevant to your work.

13 You must take steps to monitor and improve the quality of your work.

Apply knowledge and experience to practice

14 You must recognise and work within the limits of your competence.

14.1 You must have the necessary knowledge of the English language to provide a good standard of practice and care in the UK.[7]

15 You must provide a good standard of practice and care. If you assess, diagnose or treat patients, you must:

a adequately assess the patient's conditions, taking account of their history (including the symptoms and psychological, spiritual, social and cultural factors), their views and values; where necessary, examine the patient

b promptly provide or arrange suitable advice, investigations or treatment where necessary

c refer a patient to another practitioner when this serves the patient's needs.[8]

16 In providing clinical care you must:

- **a** prescribe drugs or treatment, including repeat prescriptions, only when you have adequate knowledge of the patient's health and are satisfied that the drugs or treatment serve the patient's needs[9]
- **b** provide effective treatments based on the best available evidence
- **c** take all possible steps to alleviate pain and distress whether or not a cure may be possible[10]
- **d** consult colleagues where appropriate
- **e** respect the patient's right to seek a second opinion
- **f** check that the care or treatment you provide for each patient is compatible with any other treatments the patient is receiving, including (where possible) self-prescribed over-the-counter medications
- **g** wherever possible, avoid providing medical care to yourself or anyone with whom you have a close personal relationship.[9]

17 You must be satisfied that you have consent or other valid authority before you carry out any examination or investigation, provide treatment or involve patients or volunteers in teaching or research.[4, 11, 12]

18 You must make good use of the resources available to you.[3]

Record your work clearly, accurately and legibly

19 Documents you make (including clinical records) to formally record your work must be clear, accurate and legible. You should make records at the same time as the events you are recording or as soon as possible afterwards.

20 You must keep records that contain personal information about patients, colleagues or others securely, and in line with any data protection law requirements.[14]

21 Clinical records should include:

- **a** relevant clinical findings
- **b** the decisions made and actions agreed, and who is making the decisions and agreeing the actions
- **c** the information given to patients
- **d** any drugs prescribed or other investigation or treatment
- **e** who is making the record and when.

Domain 2: Safety and quality

Contribute to and comply with systems to protect patients

22 You must take part in systems of quality assurance and quality improvement to promote patient safety. This includes:

- **a** taking part in regular reviews and audits of your work and that of your team, responding constructively to the outcomes, taking steps to address any problems and carrying out further training where necessary
- **b** regularly reflecting on your standards of practice and the care you provide
- **c** reviewing patient feedback where it is available.

23 To help keep patients safe you must:

- **a** contribute to confidential inquiries
- **b** contribute to adverse event recognition
- **c** report adverse incidents involving medical devices that put or have the potential to put the safety of a patient, or another person, at risk
- **d** report suspected adverse drug reactions
- **e** respond to requests from organisations monitoring public health.

When providing information for these purposes you should still respect patients' confidentiality.[14]

Respond to risks to safety

24 You must promote and encourage a culture that allows all staff to raise concerns openly and safely.[3, 15]

25 You must take prompt action if you think that patient safety, dignity or comfort is or may be seriously compromised.

a If a patient is not receiving basic care to meet their needs, you must immediately tell someone who is in a position to act straight away.

b If patients are at risk because of inadequate premises, equipment[13] or other resources, policies or systems, you should put the matter right if that is possible. You must raise your concern in line with our guidance[15] and your workplace policy. You should also make a record of the steps you have taken.

c If you have concerns that a colleague may not be fit to practise and may be putting patients at risk, you must ask for advice from a colleague, your defence body or us. If you are still concerned you must report this, in line with our guidance and your workplace policy, and make a record of the steps you have taken.[14, 16]

26 You must offer help if emergencies arise in clinical settings or in the community, taking account of your own safety, your competence and the availability of other options for care.

27 Whether or not you have vulnerable[17] adults or children and young people as patients, you should consider their needs and welfare and offer them help if you think their rights have been abused or denied.[18, 19]

Risks posed by your health

28 If you know or suspect that you have a serious condition that you could pass on to patients, or if your judgement or performance could be affected by a condition or its treatment, you must consult a suitably qualified colleague. You must follow their advice about any changes to your practice they consider necessary. You must not rely on your own assessment of the risk to patients.

29 You should be immunised against common serious communicable diseases (unless otherwise contraindicated).

30 You should be registered with a general practitioner outside your family.

Domain 3: Communication, partnership and teamwork

Communicate effectively

31 You must listen to patients, take account of their views, and respond honestly to their questions.

32 You must give patients[20] the information they want or need to know in a way they can understand. You should make sure that arrangements are made, wherever possible, to meet patients' language and communication needs.[21]

33 You must be considerate to those close to the patient and be sensitive and responsive in giving them information and support.

34 When you are on duty you must be readily accessible to patients and colleagues seeking information, advice or support.

Working collaboratively with colleagues

35 You must work collaboratively with colleagues, respecting their skills and contributions.[3]

36 You must treat colleagues fairly and with respect.

37 You must be aware of how your behaviour may influence others within and outside the team.

38 Patient safety may be affected if there is not enough medical cover. So you must take up any post you have formally accepted, and work your contractual notice period before leaving a job, unless the employer has reasonable time to make other arrangements.

Teaching, training, supporting and assessing

39 You should be prepared to contribute to teaching and training doctors and students.

40 You must make sure that all staff you manage have appropriate supervision.

41 You must be honest and objective when writing references, and when appraising or assessing the performance of colleagues, including locums and students. References must include all information relevant to your colleagues' competence, performance and conduct.[22]

42 You should be willing to take on a mentoring role for more junior doctors and other healthcare professionals.[3]

43 You must support colleagues who have problems with their performance or health. But you must put patient safety first at all times.[3]

Continuity and coordination of care

44 You must contribute to the safe transfer of patients between healthcare providers and between health and social care providers. This means you must:

- **a** share all relevant information with colleagues involved in your patients' care within and outside the team, including when you hand over care as you go off duty, and when you delegate care or refer patients to other health or social care providers[8, 14]
- **b** check, where practical, that a named clinician or team has taken over responsibility when your role in providing a patient's care has ended. This may be particularly important for patients with impaired capacity or who are vulnerable for other reasons.

45 When you do not provide your patients' care yourself, for example when you are off duty, or you delegate the care of a patient to a colleague, you must be satisfied that the person providing care has the appropriate qualifications, skills and experience to provide safe care for the patient.[8]

Establish and maintain partnerships with patients

46 You must be polite and considerate.

47 You must treat patients as individuals and respect their dignity and privacy.[16]

48 You must treat patients fairly and with respect whatever their life choices and beliefs.

49 You must work in partnership with patients, sharing with them the information they will need to make decisions about their care,[21] including:

a their condition, its likely progression and the options for treatment, including associated risks and uncertainties

b the progress of their care, and your role and responsibilities in the team

c who is responsible for each aspect of patient care, and how information is shared within teams and among those who will be providing their care

d any other information patients need if they are asked to agree to be involved in teaching or research.[12]

50 You must treat information about patients as confidential. This includes after a patient has died.[14]

51 You must support patients in caring for themselves to empower them to improve and maintain their health. This may, for example, include:

a advising patients on the effects of their life choices and lifestyle on their health and well-being

b supporting patients to make lifestyle changes where appropriate.

52 You must explain to patients if you have a conscientious objection to a particular procedure. You must tell them about their right to see another doctor and make sure they have enough information to exercise that right. In providing this information you must not imply or express disapproval of the patient's lifestyle, choices or beliefs. If it is not practical for a patient to arrange to see another doctor, you must make sure that arrangements are made for another suitably qualified colleague to take over your role.[23]

Domain 4: Maintaining trust

Show respect for patients

53 You must not use your professional position to pursue a sexual or improper emotional relationship with a patient or someone close to them.[16]

54 You must not express your personal beliefs (including political, religious and moral beliefs) to patients in ways that exploit their vulnerability or are likely to cause them distress.[23]

55 You must be open and honest with patients if things go wrong. If a patient under your care has suffered harm or distress, you should:

a put matters right (if that is possible)

b offer an apology

c explain fully and promptly what has happened and the likely short-term and long-term effects.

Treat patients and colleagues fairly and without discrimination

56 You must give priority to patients on the basis of their clinical need if these decisions are within your power. If inadequate resources, policies or systems prevent you from doing this, and patient safety, dignity or comfort may be seriously compromised, you must follow the guidance in paragraph 25b (see section *Domain 2: Safety and quality*).

57 The investigations or treatment you provide or arrange must be based on the assessment you and your patient make of their needs and priorities, and on your clinical judgement about the likely effectiveness of the treatment options. You must not refuse or delay treatment because you believe that a patient's actions or lifestyle have contributed to their condition.

58 You must not deny treatment to patients because their medical condition may put you at risk. If a patient poses a risk to your health or safety, you should take all available steps to minimise the risk before providing treatment or making other suitable alternative arrangements for providing treatment.

59 You must not unfairly discriminate against patients or colleagues by allowing your personal views[24] to affect your professional relationships or the treatment you provide or arrange. You should challenge colleagues if their behaviour does not comply with this guidance, and follow the guidance in paragraph 25c (see section *Domain 2: Safety and quality*) if the behaviour amounts to abuse or denial of a patient's or colleague's rights.

60 You must consider and respond to the needs of disabled patients and should make reasonable adjustments[25] to your practice so they can receive care to meet their needs.

61 You must respond promptly, fully and honestly to complaints and apologise when appropriate. You must not allow a patient's complaint to adversely affect the care or treatment you provide or arrange.

62 You should end a professional relationship with a patient only when the breakdown of trust between you and the patient means you cannot provide good clinical care to the patient.[26]

63 You must make sure you have adequate insurance or indemnity cover so that your patients will not be disadvantaged if they make a claim about the clinical care you have provided in the UK.

64 If someone you have contact with in your professional role asks for your registered name and/or GMC reference number, you must give this information to them.

Act with honesty and integrity

65 You must make sure that your conduct justifies your patients' trust in you and the public's trust in the profession.

66 You must always be honest about your experience, qualifications and current role.

67 You must act with honesty and integrity when designing, organising or carrying out research, and follow national research governance guidelines and our guidance.[4]

Communicating information

68 You must be honest and trustworthy in all your communication with patients and colleagues. This means you must make clear the limits of your knowledge and make reasonable checks to make sure any information you give is accurate.

69 When communicating publicly, including speaking to or writing in the media, you must maintain patient confidentiality. You should remember when using social media that communications intended for friends or family may become more widely available.[14, 27]

70 When advertising your services, you must make sure the information you publish is factual and can be checked, and does not exploit patients' vulnerability or lack of medical knowledge.

71 You must be honest and trustworthy when writing reports, and when completing or signing forms, reports and other documents.[22] You must make sure that any documents you write or sign are not false or misleading.

a You must take reasonable steps to check the information is correct.

b You must not deliberately leave out relevant information.

Openness and legal or disciplinary proceedings

72 You must be honest and trustworthy when giving evidence to courts or tribunals.[28] You must make sure that any evidence you give or documents you write or sign are not false or misleading.

a You must take reasonable steps to check the information is correct.

b You must not deliberately leave out relevant information.

73 You must cooperate with formal inquiries and complaints procedures and must offer all relevant information while following the guidance in *Confidentiality*.

74 You must make clear the limits of your competence and knowledge when giving evidence or acting as a witness.[28]

75 You must tell us without delay if, anywhere in the world:

a you have accepted a caution from the police or been criticised by an official inquiry

b you have been charged with or found guilty of a criminal offence

c another professional body has made a finding against your registration as a result of fitness to practise procedures.[29]

76 If you are suspended by an organisation from a medical post, or have restrictions placed on your practice, you must, without delay, inform any other organisations you carry out medical work for and any patients you see independently.

Honesty in financial dealings

77 You must be honest in financial and commercial dealings with patients, employers, insurers and other organisations or individuals.[30]

78 You must not allow any interests you have to affect the way you prescribe for, treat, refer or commission services for patients.

79 If you are faced with a conflict of interest, you must be open about the conflict, declaring your interest formally, and you should be prepared to exclude yourself from decision making.

80 You must not ask for or accept – from patients, colleagues or others – any inducement, gift or hospitality that may affect or be seen to affect the way you prescribe for, treat or refer patients or commission services for patients. You must not offer these inducements.

Endnotes

1 Colleagues include anyone a doctor works with, whether or not they are also doctors.

2 You can find all the explanatory guidance on our website.

3 *Leadership and management for all doctors* (2012) GMC, London

4 *Good practice in research* (2010) GMC, London

5 *Developing teachers and trainers in undergraduate medical education* (2011) GMC, London

6 *Continuing professional development: guidance for all doctors* (2012) GMC, London

7 This paragraph was added on 29 April 2014. Section 35C(2)(da) of the *Medical Act 1983*, inserted by the *Medical Act 1983 (Amendment) (Knowledge of English) Order 2014*.

8 *Delegation and referral* (2013) GMC, London

9 *Good practice in prescribing and managing medicines and devices* (2013) GMC, London

10 *Treatment and care towards the end of life: good practice in decision-making* (2010), GMC, London

11 *Making and using visual and audio recordings of patients* (2011) GMC, London

12 *Consent to research* (2013) GMC, London

13 Follow the guidance in paragraph 23c if the risk arises from an adverse incident involving a medical device.

14 *Confidentiality: good practice in handling patient information* (2017) GMC, London

15 *Raising and acting on concerns about patient safety* (2012) GMC, London

16 Maintaining boundaries (2013) GMC, London

- *Intimate examinations and chaperones* (paragraphs 47, 25c)
- *Maintaining a professional boundary between you and your patient* (paragraph 53)
- *Sexual behaviour and your duty to report* (paragraphs 53, 25c)

17 Some patients are likely to be more vulnerable than others because of their illness, disability or frailty or because of their current circumstances, such as bereavement or redundancy. You should treat children and young people under 18 years as vulnerable. Vulnerability can be temporary or permanent.

18 *0–18 years: guidance for all doctors* (2007) GMC, London

19 *Protecting children and young people: the responsibilities of all doctors* (2012) GMC, London

20 Patients here includes those people with the legal authority to make healthcare decisions on a patient's behalf.

21 *Decision making and consent* (2020) GMC, London

22 *Writing references* (2012) GMC, London

23 *Personal beliefs and medical practice* (2013) GMC, London

24 This includes your views about a patient's or colleague's lifestyle, culture or their social or economic status, as well as the characteristics protected by legislation: age, disability, gender reassignment, race, marriage and civil partnership, pregnancy and maternity, religion or belief, sex and sexual orientation.

25 'Reasonable adjustments' does not only mean changes to the physical environment. It can include, for example. Being flexible about appointment time or length, and making arrangements for those with communication difficulties such as impaired hearing. For more information see the EHRC website.

26 *Ending your professional relationship with a patient* (2013) GMC, London

27 *Doctors' use of social media* (2013) GMC, London

28 *Acting as a witness in legal proceedings* (2013) GMC, London

29 *Reporting criminal and regulatory proceedings within and outside the UK* (2013) GMC, London

30 *Financial and commercial arrangements and conflicts of interest* (2013) GMC, London

Index

Email: **gmc@gmc-uk.org**
Website: **www.gmc-uk.org**
Telephone: **0161 923 6602**

General Medical Council, 3 Hardman Street, Manchester M3 3AW

Textphone: please dial the prefix **18001** then **0161 923 6602** to use the Text Relay service

Join the conversation

@gmcuk
facebook.com/gmcuk
linkd.in/gmcuk
youtube.com/gmcuktv

To ask for this publication in Welsh, or in another format or language, please call us on **0161 923 6602** or email us at **publications@gmc-uk.org**.

Published March 2013 | Updated November 2020

ISBN: 978-0-901458-73-5

The GMC is a charity registered in England and Wales (1089278) and Scotland (SC037750).

Printed on 100% recycled paper.

Code: GMC/GMP/0122

A49585984

General Medical Council

Good medical practice 2024

General Medical Council

Good medical practice

A49585984

Good medical practice

This guidance was published 22 August 2023.

This guidance came into effect 30 January 2024.

You can find the latest version of all our professional standards at www.gmc-uk.org/guidance.

Contents

About Good medical practice

What is *Good medical practice*?

Good medical practice sets out the principles, values, and standards of care and professional behaviour expected of all medical professionals registered with us. It is an ethical framework, which supports medical professionals to deliver safe care to a good standard, in the interests of patients.

We work closely with medical professionals, patients and others to develop *Good medical practice*, so it is a shared agreement of what the professional standards should be.

We use the term 'medical professionals' to describe all our registrants[1] who we address directly (as 'you') throughout this guidance.

Good medical practice is divided into four domains to make it easier to navigate. Each domain is equally important in describing what makes a good medical professional.

How to use *Good medical practice*

It's your responsibility to be familiar with *Good medical practice* and the professional standards it contains, wherever you practise, whatever your field of medicine or practice setting.

But it isn't a set of rules. You must use your professional judgement to apply the standards in *Good medical practice* to your day-to-day practice. This means working out which of the professional standards are relevant to the specific circumstances you are facing, and using your knowledge, skills and experience to follow them in that context.

If you do this, act in good faith and in the interests of patients, you'll be able to explain and justify your decisions and actions.

We use the terms 'you must' and 'you should' in the following ways.

- 'You must' is used for a legal or ethical duty you're expected to meet (or be able to justify why you didn't).

[1] At the time of publication we regulate doctors. We are preparing to regulate Physician Associates and Anaesthesia Associates in the future, at which point this guidance will also apply to them.

- 'You should' is used for duties or principles that either:
  - may not apply to you or to the situation you're currently in, or
  - you may not be able to comply with because of factors outside your control.

What are the professional standards?

Good medical practice is our core guidance on professional standards. It's supported by a range of more detailed guidance which expands on some of the standards set out in *Good medical practice*.

When we use the term 'professional standards' we mean *Good medical practice* and the more detailed guidance.

How the professional standards relate to revalidation

Revalidation supports you to develop your practice, drives improvements in clinical governance, and gives your patients confidence that you're up to date.

To maintain your licence to practise, you must continuously engage with local clinical governance systems, including annual appraisal. This will demonstrate that you're working in line with the principles, values and standards of care, and behaviour set out in the professional standards.

How the professional standards relate to our fitness to practise process

The professional standards describe good practice, and not every departure from them will be considered serious.

When a concern is raised with us about a medical professional, we must assess if that medical professional poses any current and ongoing risk to one or more of the three parts of public protection:

- protecting, promoting and maintaining the health, safety and wellbeing of the public
- promoting and maintaining public confidence in the medical professions, and
- promoting and maintaining proper professional standards and conduct for members of those professions.

We do this by considering the following.

a How serious the concern is. This includes looking at the extent of the medical professional's departure from the professional standards and/or the impact of a health condition on their behaviour or performance. It also includes other factors that may impact on seriousness, such as premeditated or persistent behaviour, abuse of power,

and whether the behaviour or poor performance the concern relates to is an isolated incident or has been repeated.

b Any relevant context that may impact on risk, for example systems factors and interpersonal factors in the medical professional's working environment or their role and level of experience.

c How the medical professional responded to the concern, including evidence of insight and remediation.

Once we've assessed the risk, we'll need to consider if regulatory action may be required in response to the concern. You can read more about our processes and the types of action we might need to take on our fitness to practise webpages.

The duties of medical professionals registered with the GMC

Patients must be able to trust medical professionals with their lives and health. To justify that trust you must make the care of patients your first concern, and meet the standards expected of you in all four domains.

Knowledge, skills and development

- Provide a good standard of practice and care, and work within your competence.
- Keep your knowledge and skills up to date.

Patients, partnership and communication

- Respect every patient's dignity and treat them as an individual.
- Listen to patients and work in partnership with them, supporting them to make informed decisions about their care.
- Protect patients' personal information from improper disclosure.

Colleagues, culture and safety

- Work with colleagues in ways that best serve the interests of patients, being willing to lead or follow as circumstances require.
- Be willing to share your knowledge, skills and experience with colleagues, whether informally or through teaching, training, mentoring or coaching.
- Treat people with respect and help to create a working and training environment that is compassionate, supportive and fair, where everyone feels safe to ask questions, talk about errors and raise concerns.
- Act promptly if you think that patient safety or dignity may be seriously compromised.
- Take care of your own health and wellbeing needs, recognising and taking appropriate action if you may not be fit to work.

Trust and professionalism

- Act with honesty and integrity, and be open if things go wrong.
- Protect and promote the health of patients and the public.
- Never unfairly discriminate against patients or colleagues.
- Never abuse patients' trust in you or the public's trust in your profession.

Domain 1: Knowledge, skills and development

Introduction

Medical practice is a lifelong journey. Keeping pace with rapidly changing social, legal and technological developments means learning new skills while maintaining others. Sharing knowledge – gained through research and innovation, as well as experience – is fundamental to being a medical professional.

Good medical professionals are competent, keep their knowledge and skills up to date and provide a good standard of practice and care. They strive to develop and improve their professional performance. They reflect regularly on their standards of practice and use feedback and evidence to develop personal and professional insight.

Being competent

1 You must be competent in all aspects of your work including, where applicable, formal leadership or management roles, research and teaching.

2 You must recognise and work within the limits of your competence.

3 You must keep up to date with guidelines and developments that affect your work.

4 You must follow the law, our guidance on professional standards, and other regulations relevant to your work.

5 You must have the necessary knowledge of the English language to provide a good standard of practice and care in the UK.

Providing good clinical care

6 You must provide a good standard of practice and care. If you assess, diagnose, or treat patients, you must work in partnership with them to assess their needs and priorities. The investigation or treatment you propose, provide or arrange must be based on this assessment, and on your clinical judgement about the likely effectiveness of the treatment options.

7 In providing clinical care you must:

a adequately assess a patient's condition(s), taking account of their history, including

i. symptoms

ii. relevant psychological, spiritual, social, economic, and cultural factors

iii. the patient's views, needs, and values

b carry out a physical examination where necessary

c promptly provide (or arrange) suitable advice, investigation or treatment where necessary

d propose, provide or prescribe drugs or treatment (including repeat prescriptions) only when you have adequate knowledge of the patient's health and are satisfied that the drugs or treatment will meet their needs

e propose, provide or prescribe effective treatment based on the best available evidence

f follow our more detailed guidance on professional standards, *Good practice in prescribing and managing medicines and devices*, if you prescribe

g consult colleagues or seek advice from your supervising clinician, where appropriate

h refer a patient to another suitably qualified practitioner when this serves their needs.

8 If relevant to your area of practice, you must follow our *Guidance for doctors who offer cosmetic interventions*.

Offering remote consultations

9 You must provide safe and effective clinical care whether face to face, or through remote consultations via telephone, video link, or other online services. If you can't provide safe care through the mode of consultation you're using, you should offer an alternative if available, or signpost to other services.

Considering research opportunities

10 Research is vital in improving our understanding of health conditions, and increasing the availability of options for effective prevention, treatment, and care. You should consider opportunities to conduct or participate in research that may benefit current and/or future patients, and help to improve the health of the population. You should tell patients if you're aware of opportunities for them to participate in appropriate research.

Maintaining, developing and improving your performance

11 You must keep your professional knowledge and skills up to date.

12 When you join an organisation, or when your role changes significantly throughout your career, you should be willing to find and take part in structured support opportunities offered by your employer or contracting body, such as mentoring or coaching schemes.

13 You must take steps to monitor, maintain, develop, and improve your performance and the quality of your work, including taking part in systems of quality assurance and quality improvement to promote patient safety across the whole scope of your practice.

This includes:

a contributing to discussions and decisions about improving the quality of services and outcomes

b taking part in regular reviews and audits of your work, and your team's work, and responding constructively to the outcomes, taking steps to address problems, and carrying out further training where necessary

c regularly taking part in training and/or continuing professional development

d regularly reflecting on your standards of practice and the care you provide, including

i. reflecting on any constructive feedback available to you

ii. considering how your life experience, culture and beliefs influence your interactions with others and may impact on the decisions you make and the care you provide.

Managing resources effectively and sustainably

14 You must make good use of the resources available to you, and provide the best service possible, taking account of your responsibilities to patients and the wider population.

15 You should choose sustainable solutions when you're able to, provided these don't compromise care standards. You should consider supporting initiatives to reduce the environmental impact of healthcare.

Domain 2: Patients, partnership and communication

Introduction

The approach and attitude of a medical professional can have a lasting impact on a patient. Treating patients with kindness, compassion and respect can profoundly shape their experience of care.

Good medical professionals recognise that patients are individuals with diverse needs, and don't make assumptions about the options or outcomes a patient will prefer. They listen to patients and work in partnership with them. They do their best to make sure all patients receive good care and treatment that will support them to live as well as possible, whatever their illness or disability.

Treating patients fairly and respecting their rights

16 You must recognise and respect every patient's dignity and right to privacy.

17 If relevant to your practice, you must follow our more detailed guidance on *Intimate examinations and chaperones.*

18 You must recognise a patient's right to choose whether to accept your advice, and respect their right to seek a second opinion.

19 You must treat patients fairly. You must not discriminate against them or allow your personal views to affect your relationship with them, or the treatment you provide or arrange. You must not refuse or delay treatment because you believe that a patient's actions or choices contributed to their condition.

20 You must give priority to patients based on their clinical need if these decisions are within your power. If inadequate resources, policies, or systems prevent you from doing this – and patient safety or dignity may be seriously compromised as a result – you must follow the guidance in paragraph *75*.

21 If you have a conscientious objection to a particular procedure, you must make sure that the way you manage this doesn't act as a barrier to a patient's access to appropriate care to meet their needs. You must follow the guidance in paragraph 87 and our more detailed guidance on *Personal beliefs and medical practice*.

22 You must treat information about patients as confidential, including after a patient has died. You must follow our more detailed guidance on *Confidentiality: good practice in handling patient information*.

Treating patients with kindness, courtesy and respect

23 You must treat patients with kindness, courtesy and respect. This doesn't mean agreeing to every request (see paragraph 7d) or withholding relevant information that may be upsetting or unwelcome (see paragraph 28). It means:

a communicating sensitively and considerately, particularly when you're sharing potentially distressing issues about the patient's prognosis and care

b listening to patients, recognising their knowledge and experience of their health, and acknowledging their concerns

c trying not to make assumptions about what a patient will consider significant or the importance they will attach to different outcomes

d being willing to explain your reasons for the options you offer (and the options you don't) and any recommendations you make

e recognising that patients may be vulnerable, even if they don't seem it

f being alert to signs of pain or distress, and taking steps to alleviate pain and distress whether or not a cure may be possible.

Supporting patients to make decisions about treatment and care

24 All patients have the right to be involved in decisions about their treatment and care, and be supported to make informed decisions if they are able to. You must start from the presumption that all adult patients have capacity to make decisions about their treatment and care.

25 You must be satisfied that you have consent or other valid authority before examining or treating patients, or involving patients or volunteers in teaching or research. More detail about this is given in our guidance on *Decision making and consent* which you must follow. If relevant to your practice, you must also follow our guidance on *Making and using visual and audio recordings of patients*.

26 You must be aware of your legal and ethical duties relating to consent and capacity. This means you must:

a be aware of the relevant law on capacity and mental health

b have regard to relevant codes of practice

c follow our guidance on *Decision making and consent.*

27 When treating patients coming to the end of their lives, you must follow our more detailed guidance on *Treatment and care towards the end of life: good practice in decision making*.

Sharing information with patients

28 The exchange of information between medical professionals and patients is central to good decision making. You must give patients the information they want or need in a way they can understand. This includes information about:

a their condition(s), likely progression, and any uncertainties about diagnosis and prognosis

b the options for treating or managing the condition(s), including the option to take no action

c the potential benefits, risks of harm, uncertainties about, and likelihood of success for each option.

29 You must listen to patients and encourage an open dialogue about their health, asking questions to allow them to express what matters to them, and responding honestly to their questions.

30 You must make sure that the information you give patients is clear, accurate and up to date, and based on the best available evidence.

31 You should check patients' understanding of the information they've been given, and do your best to make sure they have the time and support they need to make informed decisions if they are able to.

32 You must take steps to meet patients' language and communication needs, so you can support them to engage in meaningful dialogue and make informed decisions about their care. The steps you take should be proportionate to the circumstances, including the patient's needs and the seriousness of their condition(s), the urgency of the situation and the availability of resources.

33 You must consider and respond to the needs of patients with impairments or disabilities. Not all impairments and disabilities are easy to identify so you should ask patients what support they need, and offer reasonable adjustments that are proportionate to the circumstances.

34 You must treat each patient as an individual. You must not rely on assumptions about the treatment options or outcomes a patient will prefer, or the factors they will consider significant.

35 If patients are asked to agree to be involved in teaching or research, you must share any information they'll need to make a decision and you must follow the guidance in paragraph 85 and our more detailed guidance on *Good practice in research*.

36 You must be open and honest with patients about any interests you have that may affect (or could be seen to affect) the way you propose, provide or prescribe treatments, or refer patients. You must follow our more detailed guidance on *Identifying and managing conflicts of interest*.

Communicating with those close to a patient

37 You must be considerate and compassionate to those close to a patient and be sensitive and responsive in giving them support and information. You must follow our more detailed guidance on *Confidentiality: good practice in handling patient information*.

Caring for the whole patient

38 You must support patients in caring for themselves and empower them to improve and maintain their health. This may include:

a helping them to access information and support to manage their health successfully

b supporting them to make decisions that improve their health and wellbeing.

39 You should ask patients about any other care or treatment they are receiving – including over-the-counter medications – and check that any care or treatment you propose, provide or prescribe is compatible.

40 If a patient is taking multiple medications, you should discuss the importance of regular reviews to check that the medications continue to meet the patient's needs and are optimised for them. You should consider the overall impact of the patient's treatments, and whether the benefits outweigh any risk of harm.

Safeguarding children and adults who are at risk of harm

41 You must consider the needs and welfare of people (adults, children and young people) who may be vulnerable, and offer them help if you think their rights are being abused or denied. You must follow our more detailed guidance on *Protecting children and young people* and *0-18 years: guidance for all doctors*.

42 You must act promptly[2] on any concerns you have about a patient – or someone close to them – who may be at risk of abuse or neglect, or is being abused or neglected.

Helping in emergencies

43 You must offer help in an emergency, taking account of your own safety, your competence, and the availability of other options for care.

Making sure patients who pose a risk of harm to others can access appropriate care

44 Patients must not be denied care because their condition puts others at risk. If a patient poses a risk to your health or safety, you should take all available steps to minimise the risk before either providing treatment yourself, or making alternative arrangements for the patient to access care to meet their needs.

Being open if things go wrong

45 You must be open and honest with patients if things go wrong. If a patient under your care has suffered harm or distress, you must follow our guidance on *Openness and honesty when things go wrong: the professional duty of candour*, and you should:

a put matters right, if possible

b apologise (apologising does not, of itself, mean that you are admitting legal liability for what's happened)

[2] See our ethical hub advice on Adult safeguarding which you can find at https://www.gmc-uk.org/ethical-guidance/ethical-hub/adult-safeguarding

c explain fully and promptly what has happened and the likely short-term and long-term effects

d report the incident in line with your organisation's policy so it can be reviewed or investigated as appropriate – and lessons can be learnt and patients protected from harm in the future.

46 You must respond promptly, fully and honestly to complaints. You must not allow a patient's complaint to adversely affect the care or treatment you provide or arrange.

47 You should only end a professional relationship with a patient when the breakdown of trust between you and the patient means you can't continue to provide good clinical care to them. You must follow our more detailed guidance on *Ending your professional relationship with a patient*.

Domain 3: Colleagues, culture and safety

Introduction

Culture is determined by the shared values and behaviours of a group of people. Everyone has the right to work and train in an environment which is fair, free from discrimination, and where they're respected and valued as an individual.

Good medical professionals communicate clearly and work effectively with colleagues in the interests of patients. They develop their self-awareness, manage their impact on others, and do what they can to help create civil and compassionate cultures where all staff can ask questions, talk about errors and raise concerns safely.

Treating colleagues with kindness, courtesy and respect

48 You must treat colleagues[3] with kindness, courtesy and respect.

49 To develop and maintain effective teamworking and interpersonal relationships you must:

a listen to colleagues

b communicate clearly, politely and considerately

c recognise and show respect for colleagues' skills and contributions

d work collaboratively with colleagues and be willing to lead or follow as the circumstances require.

50 When you are on duty you must be accessible to colleagues seeking information, advice, or support.

51 You must be compassionate towards colleagues who have problems with their performance or health. But you must put patient safety first at all times.

[3] 'Colleagues' includes anyone you work with, whether or not they are a medical professional.

Contributing to a positive working and training environment

52 You must help to create a culture that is respectful, fair, supportive, and compassionate by role modelling behaviours consistent with these values.

53 You should be aware of how your behaviour may influence others within and outside the team.

54 You should be aware of the risk of bias, and consider how your own life experience, culture and beliefs influence your interactions with others, and may impact on your decisions and actions.

55 You must show respect for, and sensitivity towards, others' life experience, cultures and beliefs.

56 You must not abuse, discriminate against, bully, or harass anyone based on their personal characteristics, or for any other reason. By 'personal characteristics' we mean someone's appearance, lifestyle, culture, their social or economic status, or any of the characteristics protected by legislation – age, disability, gender reassignment, race, marriage and civil partnership, pregnancy and maternity, religion or belief, sex and sexual orientation.

57 You must not act in a sexual way towards colleagues with the effect or purpose of causing offence, embarrassment, humiliation or distress. What we mean by acting 'in a sexual way' can include – but isn't limited to – verbal or written comments, displaying or sharing images, as well as unwelcome physical contact. You must follow our more detailed guidance on *Maintaining personal and professional boundaries*.

58 If you witness any of the behaviours described in paragraphs 56 or 57 you should act, taking account of the specific circumstances. For example, you could:

a check in and offer support to anyone targeted or affected by the behaviour, and/or let them know that you feel that the behaviour you witnessed is unacceptable

b challenge the behaviour by speaking to the person responsible – either at the time, if safe to do so, or at an appropriate time and place

c speak to a colleague and/or consider reporting the behaviour in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*. Before you report the behaviour you witnessed, try and make sure that the person who was targeted is aware of, and supports, your intention to report it.

We recognise some people may find it harder than others to speak up[4] but everyone has a responsibility – to themselves and their colleagues – to do something to prevent these behaviours continuing and contributing to a negative, unsafe environment.

59 If you have a formal leadership or management role and you witness – or are made aware of – any of the behaviours described in paragraphs 56 or 57, you must act. You must:

a make sure such behaviours are adequately addressed

b make sure people are supported where necessary, and

c make sure concerns are dealt with promptly, being escalated where necessary.

Demonstrating leadership behaviours

60 You must follow our more detailed guidance on *Leadership and management for all doctors*.

61 You must make sure that all colleagues whose work you are overseeing have appropriate supervision.

62 You must be accurate, fair and objective when writing references, and when appraising or assessing the performance of colleagues, including locums and students. You should not leave out any information relevant to your colleagues' competence, performance, and conduct.

63 You should be willing to offer professional support to colleagues, including students, for example through mentoring, coaching, teaching or training. This type of support is especially important for those new to practice in the UK, those returning from a period away from practice, and those who cannot easily access support.

64 If part of your role is helping staff access training, development and employment opportunities, you should do this fairly.

[4] See our ethical hub advice on Speaking up which you can find at https://www.gmc-uk.org/ethical-guidance/ethical-hub/speaking-up

Contributing to continuity of care

65 Continuity of care is important for all patients, but especially those who may struggle to navigate their healthcare journey or advocate for themselves. Continuity is particularly important when care is shared between teams, between different members of the same team, or when patients are transferred between care providers.

a You must promptly share all relevant information about patients (including any reasonable adjustments and communication support preferences) with others involved in their care, within and across teams, as required.

b You must share information with patients[5] about:

i. the progress of their care

ii. who is responsible for which aspect of their care

iii. the name of the lead clinician or team with overall responsibility for their care.

c You must be confident that information necessary for ongoing care has been shared:

i. before you go off duty

ii. before you delegate care, or

iii. before you refer the patient to another health or social care provider.

d You must check, where practical, that a named clinician or team has taken over responsibility when your role in a patient's care has ended.

Delegating safely and appropriately

66 You must be confident that any person you delegate to has the necessary knowledge, skills and training to carry out the task you're delegating. You must give them clear instructions and encourage them to ask questions and seek support or supervision if they need it.

[5] If a patient lacks capacity, information should be shared with those with legal authority to make decisions on a patient's behalf.

67 If a task is delegated to you by a colleague but you're not confident you have the necessary knowledge, skills or training to carry it out safely, you must prioritise patient safety and seek help, even if you've already agreed to carry out the task independently.

68 You must follow our more detailed guidance on *Delegation and referral*.

Recording your work clearly, accurately, and legibly

69 You must make sure that formal records of your work (including patients' records) are clear, accurate, contemporaneous[6] and legible.

70 You should take a proportionate approach to the level of detail but patients' records should usually include:

a relevant clinical findings

b drugs, investigations or treatments proposed, provided or prescribed

c the information shared with patients

d concerns or preferences expressed by the patient that might be relevant to their ongoing care, and whether these were addressed

e information about any reasonable adjustments and communication support preferences

f decisions made, actions agreed (including decisions to take no action) and when/whether decisions should be reviewed

g who is creating the record and when.

71 You must keep records that contain personal information about patients, colleagues or others securely, and in line with any data protection law requirements and you must follow our guidance on *Confidentiality: good practice in handling patient information*.

[6] Contemporaneous means making records at the same time as the events you are recording, or as soon as possible afterwards.

Keeping patients safe

72 You should be familiar with, and use, the clinical governance and risk management structures and processes in any organisation that you work for or are contracted to.

73 To help keep patients safe you must:

a contribute to confidential inquiries[7]

b contribute to adverse event recognition

c report adverse incidents involving medical devices (including software, diagnostic tests, and digital tools) that put the safety of a patient or another person at risk, or have the potential to do so

d contribute to incident reviews and/or investigations

e report suspected adverse drug reactions

f respond to requests from organisations monitoring public health.

When providing information for these purposes you must follow our guidance on *Confidentiality: good practice in handling patient information*.

74 You must take up any post you have accepted, work any shift you have agreed to, and work your contractual notice period before leaving a job, unless the employer has reasonable time to make other arrangements or your personal circumstances prevent this.

Responding to safety risks

75 You must act promptly if you think that patient safety or dignity is, or may be, seriously compromised.

a If a patient is not receiving basic care to meet their needs, you must act to make sure the patient is cared for as soon as possible, for example by asking someone who delivers basic care to attend to the patient straight away.

[7] A confidential inquiry (or enquiry) is a method of investigating adverse events without attributing blame. Examples include NCEPOD - National Confidential Enquiry into Patient Outcome and Death , CIPOLD (Confidential Inquiry into Premature Deaths of People with Learning Disabilities) and Confidential Enquiry into Maternal Deaths | MBRRACE-UK | NPEU (ox.ac.uk)

b If patients are at risk because of inadequate premises, equipment or other resources, policies or systems, you should first protect patients and put the matter right if that's possible. Then you must raise your concern in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*.

c If you have concerns that a colleague may not be fit to practise and may be putting patients at risk, you must ask for advice from a colleague, your defence body, or us. If you are still concerned, you must report this, in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*.

76 If you have a formal leadership or management role, you must take active steps to create an environment in which people can talk about errors and concerns safely. This includes making sure that any concerns raised with you are dealt with promptly and adequately, in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*.

Managing risks posed by your health

77 You should avoid seeking medical care from a family member or anyone you work closely with. If you are registered with a general practitioner this should be someone outside your family and your workplace.

78 You should try to take care of your own health and wellbeing, recognising if you may not be fit for work. You should seek independent professional advice about your fitness for work, rather than relying on your own assessment.

79 You must consult a suitably qualified professional and follow their advice about any changes to your practice they consider necessary if:

a you know or suspect that you have a serious condition that you could pass on to patients

b your judgement or performance could be affected by a condition or its treatment.

You must not rely on your own assessment of the risk to patients.

80 You should be immunised against common serious communicable diseases (unless contraindicated).

Domain 4: Trust and professionalism

Introduction

Patients must be able to trust medical professionals with their lives and health, and medical professionals must be able to trust each other.

Good medical professionals uphold high personal and professional standards of conduct. They are honest and trustworthy, act with integrity, maintain professional boundaries and do not let their personal interests affect their professional judgements or actions.

Acting with honesty and integrity

81 You must make sure that your conduct justifies patients' trust in you and the public's trust in your profession.

82 You must always be honest about your experience, qualifications, and current role.

83 If a patient, colleague, or anyone else you have contact with in your professional role asks for your registered name and/or GMC reference number, you must give this information to them.

84 You must be honest in financial and commercial dealings with patients, employers, insurers, indemnifiers and other organisations or individuals.

Acting with honesty and integrity in research

85 When designing, organising or carrying out research, you must put the interests of participants first. You must act with honesty and integrity, and follow national research governance guidelines and our more detailed guidance on *Good practice in research*.

Maintaining professional boundaries

86 You must not act in a sexual way towards patients or use your professional position to pursue a sexual or improper emotional relationship with a patient or someone close to them. You must follow our more detailed guidance on *Maintaining personal and professional boundaries*.

87 You must not express your personal beliefs (including political, religious and moral beliefs) to patients in ways that exploit their vulnerability or could reasonably cause them distress. You must follow our more detailed guidance on *Personal beliefs and medical practice*.

Communicating as a medical professional

All professional communication

88 You must be honest and trustworthy, and maintain patient confidentiality in all your professional written, verbal and digital communications.

89 You must make sure any information you communicate as a medical professional is accurate, not false or misleading. This means:

a you must take reasonable steps to check the information is accurate

b you must not deliberately leave out relevant information

c you must not minimise or trivialise risks of harm

d you must not present opinion as established fact.

Public professional communication, including using social media, advertising, promotion, and endorsement

90 When communicating publicly as a medical professional – including using social media, advertising your services, and promoting or endorsing any services or products:

a you must follow the guidance in paragraph 88 and 89

b you must declare any conflicts of interest

c you must not exploit people's vulnerability or lack of medical knowledge

d you must make sure what you communicate is in line with your duty to promote and protect the health of patients and the public.

91 You must follow our more detailed guidance on *Using social media as a medical professional*.

Giving evidence and acting as a witness

92 When giving evidence or acting as a witness, you must follow the guidance in paragraphs 88 to 90 and our more detailed guidance on *Providing witness statements or expert evidence as part of legal proceedings*, and you must make clear the limits of your knowledge and expertise.

Private communication

93 When communicating privately, including using instant messaging services, you should bear in mind that messages or other communications in private groups may become public.

Managing conflicts of interest

94 You must not allow any interests you have to affect, or be seen to affect the way you propose, provide or prescribe treatments, refer patients, or commission services.

95 If you are faced with a conflict of interest, you must be open about it with patients and employers, declare it in line with local and national arrangements, and be prepared to exclude yourself from decision making. You must follow our more detailed guidance in *Identifying and managing conflicts of interest.*

96 You must not ask for or accept – from patients, colleagues or others – any incentive payments, gifts or hospitality that may affect or be seen to affect the way you propose, provide or prescribe treatments, refer or commission services for patients. You must not offer such incentives to others.

97 You must, wherever possible, avoid providing medical care to yourself or anyone with whom you have a close personal relationship. You must follow our more detailed guidance on *Good practice in prescribing and managing medicines and devices*.

Cooperating with legal and regulatory requirements

98 To maintain patient safety, you must cooperate with formal inquiries, patient safety investigations, and complaints procedures. You must provide all relevant information and be open and honest.

99 You must tell us without delay if, anywhere in the world:

a you have accepted a caution (or equivalent) from a prosecuting authority

b you have been charged with a criminal offence in person or by post

c you have been found guilty of a criminal offence

d you have been criticised by an official inquiry[8]

e another professional body has made a finding against your registration as a result of fitness to practise process.

See our guidance on *Reporting criminal and regulatory proceedings* for more detailed information.

100 If you are suspended by an organisation from a healthcare role or post requiring professional registration, or have restrictions placed on your practice, you must, without delay, inform any organisations for which you carry out medical work, and any patients you see independently of these organisations.

101 You must make sure that you have appropriate and adequate insurance or indemnity that covers the full scope of your practice. You should keep your level of cover under regular review.

[8] By 'official inquiry' we mean a public or formal inquiry or a tribunal in the public domain. These are publicly funded, investigate matters in the public interest and publish their findings. See our more detailed guidance on *Reporting criminal and regulatory proceedings* for more information

Footnotes

1 At the time of publication we regulate doctors. We are preparing to regulate Physician Associates and Anaesthesia Associates in the future, at which point this guidance will also apply to them.

2 See our ethical hub advice on adult safeguarding which you can find at https://www.gmc-uk.org/ethical-guidance/ethical-hub/adult-safeguarding

3 'Colleagues' includes anyone you work with, whether or not they are a medical professional.

4 See our ethical hub advice on Speaking up which you can find at https://www.gmc-uk.org/ethical-guidance/ethical-hub/speaking-up

5 If a patient lacks capacity, information should be shared with those with legal authority to make decisions on a patient's behalf.

6 Contemporaneous means making records at the same time as the events you are recording, or as soon as possible afterwards.

7 A confidential inquiry (or enquiry) is a method of investigating adverse events without attributing blame. Examples include NCEPOD - National Confidential Enquiry into Patient Outcome and Death , CIPOLD (Confidential Inquiry into Premature Deaths of People with Learning Disabilities) and Confidential Enquiry into Maternal Deaths | MBRRACE-UK | NPEU (ox.ac.uk)

8 By 'official inquiry' we mean a public or formal inquiry or a tribunal in the public domain. These are publicly funded, investigate matters in the public interest and publish their findings. See our more detailed guidance on *Reporting criminal and regulatory proceedings* for more information

Email: **gmc@gmc-uk.org**
Website: **gmc-uk.org**
Telephone: **0161 923 6602**

General Medical Council, 3 Hardman Street, Manchester M3 3AW

Textphone: **please dial the prefix 18001** then **0161 923 6602** to use the Text Relay service.

Join the conversation

@gmcuk **facebook.com/gmcuk**
linkd.in/gmcuk **youtube.com/gmcuktv**

To ask for this publication in another format or language, please call us on **0161 923 6602** or email us at **gmc@gmc-uk.org**.

I ofyn am y cyhoeddiad hwn mewn fformat neu iaith arall, ffoniwch ni ar **0161 923 6602** neu e-bostiwch ni ar **gmc@gmc-uk.org**.

You are welcome to contact us in Welsh. We will respond in Welsh, without this causing additional delay.

Mae croeso i chi gysylltu â ni yn Gymraeg. Byddwn yn ymateb yn Gymraeg, heb i hyn achosi oedi ychwanegol.

Published January 2024

Code: GMC/GMP24/0124

General Medical Council

Professional standards

In effect: 12 March 2012

Leadership and management for all doctors

Leadership and management for all doctors

Professional standards: More detailed guidance

This guidance came into effect 12 March 2012.

You can find the latest version of all our professional standards at www.gmc-uk.org/guidance.

Contents

About our Leadership and management guidance

Being a good doctor means more than simply being a good clinician. In their day-to-day role doctors can provide leadership to their colleagues and vision for the organisations in which they work and for the profession as a whole. However, unless doctors are willing to contribute to improving the quality of services and to speak up when things are wrong, patient care is likely to suffer.

This guidance, which forms part of the professional standards, sets out the wider management and leadership responsibilities of doctors in the workplace, including:

- responsibilities relating to employment issues
- teaching and training
- planning, using and managing resources
- raising and acting on concerns
- helping to develop and improve services.

The principles in this guidance apply to all doctors, whether they work directly with patients or have a formal management role.[1]

How these principles will apply in practical terms to a particular doctor depends on their role and responsibility. For example, how a junior or locum doctor will show leadership or take responsibility for managing resources will be different from a doctor working in a more senior role.

You continue to have responsibility for the safety and wellbeing of patients when you perform non-clinical duties, including when you work as a manager. You are still accountable to the General Medical Council (GMC) for your decisions and actions, even if someone without medical training could perform your role.

This guidance applies across the UK and should be interpreted in the context of the relevant national and local arrangements for the delivery of health services. It sets out:

- the duties and principles that apply to all doctors
- the extra responsibilities that may only apply to some doctors (for example, doctors with management or leadership responsibilities at a personal, team, organisation or policy level). This may include doctors working in formal management roles, such as clinical or medical directors, or doctors who are responsible for supervising and managing staff, resources and services.

How this guidance applies to you

In this guidance, the terms ‘you must’ and ‘you should’ are used in the following ways.

- ‘You must’ is used for a legal or ethical duty you’re expected to meet (or be able to justify why you didn’t).
- 'You should’ is used for duties or principles that either:
  - may not apply to you or to the situation you’re currently in, or
  - you may not be able to comply with because of factors outside your control

The professional standards describe good practice, and not every departure from them will be considered serious. You must use your professional judgement to apply the standards to your day-to-day practice. If you do this, act in good faith and in the interests of patients, you will be able to explain and justify your decisions and actions. We say more about professional judgement, and how the professional standards relate to our fitness to practise processes, appraisal and revalidation, at the beginning of *Good medical practice*.

Duties of a doctor in the workplace

1. Doctors make an important contribution to the management and leadership of health services and the delivery of healthcare across the UK as part of a multidisciplinary team. All doctors have some responsibilities for using resources; many will also lead teams or be involved in supervising colleagues.

2. The primary duty of all doctors is for the care and safety of patients. Whatever their role, doctors must do the following.

   a. Engage with colleagues[2] to maintain and improve the safety and quality of patient care.

   b. Contribute to discussions and decisions about improving the quality of services and outcomes.

   c. Raise and act on concerns about patient safety.

   d. Demonstrate effective team working and leadership.

   e. Promote a working environment free from unfair discrimination, bullying and harassment, bearing in mind that colleagues and patients come from diverse backgrounds.

   f. Contribute to teaching and training doctors and other healthcare professionals, including by acting as a positive role model.

   g. Use resources efficiently for the benefit of patients and the public.

Working with colleagues

Leadership

All doctors

3. Most doctors work in multidisciplinary teams. The work of these teams is primarily focused on the needs and safety of patients. The formal leader of the team is accountable for the performance of the team, but the responsibility for identifying problems, solving them and taking the appropriate action is shared by the team as a whole.
4. You must be willing to work with other people and teams to maintain and improve performance and change systems where this is necessary for the benefit of patients.
5. You should respect the leadership and management roles of other team members, including non-medical colleagues.

Respect for colleagues

All doctors

6. It is essential for good and safe patient care that doctors work effectively with colleagues from other health and social care disciplines, both within and between teams and organisations. Whatever the composition of the teams you work in, you must respect and value each person's skills and contribution.
7. You must tackle discrimination where it arises and encourage your colleagues to do the same. You must treat your colleagues fairly and with respect. You must not bully or harass them or unfairly discriminate against them. You should challenge the behaviour of colleagues who do not meet this standard.
8. You must follow and keep up to date with your organisation's policies about employment, equality and diversity. You must get advice on these issues if you need it.

Doctors with extra responsibilities

9. You must actively advance equality and diversity by creating or maintaining a positive working environment free from discrimination, bullying and harassment. You must make sure that your organisation’s policies on employment and equality and diversity are up to date and reflect the law.[3]

Communication within and between teams

10. Multidisciplinary teams can bring benefits to patient care when communication is timely and relevant, but problems can arise when communication is poor or responsibilities are unclear.

All doctors

11. You must make sure that you communicate relevant information clearly to:

a. colleagues in your team

b. colleagues in other services with which you work

c. patients and those close to them in a way that they can understand, including who to contact if they have questions or concerns. This is particularly important when patient care is shared between teams.

12. You should not assume that someone else in the team will pass on information needed for patient care. You should check if you are unclear about the responsibility for communicating information, including during handover, to members of the healthcare team, other services involved in providing care and patients and those close to them.

13. You should encourage team members to cooperate and communicate effectively with each other and other teams or colleagues with whom they work. If you identify problems arising from poor communication or unclear responsibilities within or between teams, you should take action to deal with them.

Doctors with extra responsibilities

14. You must provide necessary and timely information to those you manage so they can carry out their roles effectively. You should also pass on any relevant information to senior managers and make sure that arrangements are in place for relevant information to be passed on to the team promptly.

15. You must be satisfied that systems are in place to communicate information about patient care.

Responsibility and accountability

16. Whether you have a management role or not, your primary duty is to patients. Their care, dignity and safety must be your first concern. You also have a duty to the health of the wider community, your profession, your colleagues and the organisation in which you work.

All doctors

17. You should establish clearly with your employer the scope of your role and the responsibilities it involves, including non-clinical responsibilities. You should raise any issues

of ambiguity or uncertainty about responsibilities, including in multidisciplinary or multi-agency teams, to clarify:

a. supervision arrangements for staff and lines of accountability for the care provided to individual patients (for more information on supervision see paragraphs 60 - 62 of this guidance)

b. who should take on leadership roles or line-management responsibilities

c. where responsibility lies for the quality and standard of care provided by the team.

Doctors with extra responsibilities

18. If you are responsible for leading or managing a team, you must make sure that staff are clear about:

a. their individual and team roles and objectives

b. their personal and collective responsibilities for patient and public safety

c. their personal and collective responsibilities for honestly recording and discussing problems.

19. You should:

a. contribute to setting up and maintaining systems to identify and manage risks in the team's area of responsibility

b. make sure that all team members have an opportunity to contribute to discussions

c. make sure that team members understand the decisions taken and the process for putting them into practice

d. make sure that each patient's care is properly coordinated and managed.

20. You are accountable to the GMC for your own conduct and any medical advice you give. This includes while you serve as a member of a decision-making body for a health or social care organisation, such as a hospital or health board.

21. If, as a member of a board or similar body, you are concerned that a decision would put patients or the health of the wider community at risk of serious harm, you should raise the matter promptly with the chair. You must also ask for your objections to be formally recorded and you should consider taking further action in line with our guidance in *Raising and acting on concerns about patient safety* [4]

Maintaining and improving standards of care

Reflecting on your practice

All doctors

22. You should regularly reflect on your own performance, your professional values and your contribution to any teams in which you work. You should ask for, and be prepared to act on, feedback from colleagues and patients, including through the outcomes of audits, appraisals and performance reviews (see paragraphs 30 - 32), and through patient complaints and comments.

Doctors with extra responsibilities

23. Leading by example, you should promote and encourage a culture that allows all staff to contribute and give constructive feedback on individual and team performance. You should make sure that systems are in place to achieve this.

Ensuring high standards of care

24. Early identification of problems or issues with the performance of individuals, teams or services is essential to help protect patients.

All doctors

25. You must take part in regular reviews and audits of the standards and performance of any team you work in, taking steps to resolve any problems.

26. You should be familiar with, and use, the clinical governance and risk management structures and processes within the organisations you work for or to which you are contracted. You must also follow the procedure where you work for reporting adverse incidents and near misses. This is because routinely identifying adverse incidents or near misses at an early stage, can allow issues to be tackled, problems to be put right and lessons to be learnt.

27. You must follow the guidance in *Good medical practice* [5] and *Raising and acting on concerns about patient safety* [4] when you have reason to believe that systems, policies, procedures or colleagues are, or may be, placing patients at risk of harm.

Doctors with extra responsibilities

28. If you have a management role or responsibility, you must make sure that systems are in place to give early warning of any failure, or potential failure, in the clinical performance of individuals or teams. These should include systems for conducting audits and considering

patient feedback. You must make sure that any such failure is dealt with quickly and effectively.

29. If you are managing or leading a team, you should make sure that systems, including auditing and benchmarking, are in place to monitor, review and improve the quality of the team's work. You must work with others to collect and share information on patient experience and outcomes. You must make sure that teams you manage are appropriately supported and developed and are clear about their objectives.

Performance review and revalidation

All doctors

30. You should be familiar with the individual performance review process in all the organisations in which you work.

31. You must take part in annual appraisals and you must make sure that your appraisal covers your whole practice, including any non-clinical roles.

32. If you hold a licence to practise, you must take part in revalidation.

Doctors with extra responsibilities

33. You must make sure that staff you manage, including doctors in sessional and other non-training posts, have enough time to prepare for their appraisals or performance reviews and that they have the opportunity to complete them fully and on time.

34. You must be honest and objective and keep to the principles of equality and diversity when appraising or assessing colleagues' performance. This includes when assessing trainees during the Annual Review of Competence Progression (ARCP) or other equivalent process. The safety of patients and the public could be put at risk if you make false, exaggerated or incomplete comments about another professional's competence or experience.

35. You should support staff you manage to complete learning and development activities identified by appraisals or performance reviews.

36. If you appraise or assess colleagues, you should make sure that you have the appropriate knowledge and skills. You should make sure that any staff you manage who also carry out appraisals have the knowledge and skills to do so, and are given regular feedback on how they perform this role.

37. If you are responsible for designing and delivering services, you should make sure that there is an appropriate appraisal or performance review process in place and that staff understand and follow it. You should also make sure that there are ways of dealing with any problems that appraisals bring to light. If the appraisal process includes clinical academic staff, you should make sure it follows the Follett principles.[6]

38. If you are a responsible officer within a designated body, you will have extra responsibilities as set out in the relevant regulations[7] and you must take account of any guidance produced by the departments of health[8] or your organisation.

Keeping up to date

All doctors

39. You must keep your skills and knowledge up to date in all areas of your work, whether in a clinical or non-clinical setting.

40. You must keep up to date with, and follow, the laws and statutory codes of practice relevant to your particular responsibilities and location[9] and you should get expert advice when you need it. You must be familiar with the relevant guidelines and developments that affect your work and use them to help you with your practice.

Information governance

41. Doctors need accurate, up-to-date and accessible information to deliver good and safe care to patients. Patients need to understand how information about them will be collected, stored and used and how their confidentiality and privacy will be protected. Good information governance systems can help to achieve this and contribute to providing high quality and safe care. They can also provide valuable information to allow teams and services to improve the quality and safety of care they deliver. All doctors have a role to play in contributing to these systems.

All doctors

42. You must keep accurate and clear patient records following the advice in Good medical practice.5 You should make sure that non-clinical records you keep, including financial records, are clear, accurate and up to date.

43. You must follow the guidance in Confidentiality: good practice in handling patient information on protecting information and disclosing information for patient care or secondary purposes.10

44. You should be familiar with, and follow, the confidentiality, data protection and record management policies and procedures where you work and know where to get advice on these issues.

Doctors with extra responsibilities

45. If you are responsible for managing patient records or other patient information, you must follow the specific guidance for managers on protecting information set out in *Confidentiality:*

good practice in handling patient information.[11]

46. You must make sure that any other records you are responsible for, including financial, management or human resources records, or records relating to complaints, are kept securely and are clear, accurate and up to date.

47. You must make sure that records you are responsible for are made, stored, transferred and disposed of in line with the data protection law and other relevant legislation.

Employment

48. If you are involved in any aspects of employing staff such as recruiting, promoting or rewarding staff, including sitting on appointment or reward committees, you must work within your professional values and your organisation's policies and procedures, and observe the principles of fairness, equality and diversity.

Recruitment, rewards and compensation

All doctors

49. When applying for posts, you must always be open and honest about your experience, qualifications and current employment status.

50. When applying for and accepting posts, you must follow the guidance in *Good medical practice* [5], bearing in mind how your decisions may affect patient safety.

Doctors with extra responsibilities

51. If you have specific responsibility for recruitment, promotion or other staff rewards or compensation, you must make sure that the process is fair and transparent, and that decisions are based on objective criteria.

52. You must make sure you have, and anyone you appoint to take part in these activities has, the skills and competence needed and the opportunity to undertake appropriate training, including in relation to equality, diversity and non-discrimination in employment matters.

Induction and mentoring

53. Understanding the systems in place and how an organisation operates helps to make sure that doctors can deliver safe, effective and efficient care to patients as soon as they start a new job. Induction and mentoring schemes and access to other support mechanisms are important ways of achieving this. While important for all doctors, this may be particularly important for doctors if they are new to clinical practice, have trained outside the UK[12] or are taking on a role in a new area or at a higher level.

Induction

All doctors

54. You must take part in the induction offered by your employer when you join an organisation or move into a new role. You should also contribute to the induction of colleagues when asked.

Doctors with extra responsibilities

55. You must make sure that any new doctor or other healthcare professional you manage is offered relevant induction and that induction policies and procedures contain information that is relevant, accessible and proportionate to the doctor's role and length of employment within your organisation.

Mentoring

All doctors

56. You should be willing to take part in a mentoring scheme offered by your employer.

Doctors with extra responsibilities

57. You should be willing to take on a mentoring role for more junior doctors and other healthcare professionals.

58. If you have agreed to act as a mentor, you must make sure that you are competent to take on the role and that you can fulfil your responsibilities, including undertaking appropriate training and keeping your skills up to date. You must be clear about the aims and purpose of the mentoring, the scope of your role as a mentor and your availability to provide advice and support when needed.

59. You must make sure that staff who are new to an organisation or are moving into a new role have access to an appropriate mentoring arrangement[13] , where relevant, depending on the nature of their clinical practice and their responsibilities.[13]

Supervision

All doctors

60. You must recognise and work within the limits of your competence and you must make sure, to the best of your ability, that you are appropriately supervised for any task you perform. You must be willing to ask for advice and support from colleagues when necessary.

Doctors with extra responsibilities

61. You must make sure that the people you manage have appropriate supervision, whether

through close personal supervision (for junior doctors, for example) or through a managed system with clear reporting structures.

62. If you are responsible for supervising staff, whatever your role, you must understand the extent of your supervisory responsibilities, give clear instructions about what is expected and be available to answer questions or provide help when needed. You must support any colleagues you supervise or manage to develop their roles and responsibilities by appropriately delegating tasks and responsibilities. You must be satisfied that the staff you supervise have the necessary knowledge, skills and training to carry out their roles.

Teaching and training

All doctors

63. Many of the skills of being a doctor can be learnt only by specific, on the job training in the work placements begun at medical school and continuing through the early postgraduate years. Every doctor who comes into contact with trainee doctors, medical students and other healthcare professionals in training should act as a positive role model in their behaviour towards patients, colleagues and others.

64. If you are formally involved in teaching in the workplace - for example, teaching trainee doctors on placements - you must develop the skills, attitudes and practices of a competent teacher. This includes respecting cultural diversity and making reasonable adjustments for those with a disability without affecting patient safety or educational outcomes.

Doctors with extra responsibilities

65. If you are responsible for managing teaching and training in your organisation, you must make sure:

a. Only people with the appropriate knowledge, skills and attitudes carry out any teaching and training for which you are responsible.

b. There are enough staff members from appropriate disciplines, and with the necessary skills and experience[14], to deliver teaching and training and to support the learning and development of trainees and students.

c. Systems are in place to identify and record the educational and training needs of students, trainees and staff, including locums, so that the best use is made of the time and resources available for keeping knowledge and skills up to date.

d. An appropriate environment for training is provided, including by implementing reasonable adjustments to meet individual trainees' needs in line with the *Equality Act 2010*.[15]

e. You provide opportunities for those you manage to keep up to date and develop their skills as teachers and trainers, and make sure that there are systems in place for

regular feedback and appraisal of those skills.

Grievance, performance and health

Grievance

All doctors

66. You should understand the difference between a personal grievance, that is a complaint about your own employment situation, and a concern about a risk, malpractice or wrongdoing that affects others. This is particularly important if patients or members of the public are at risk of harm.16 It can sometimes be difficult to separate personal grievances from a concern about patient safety. If these overlap, you should acknowledge any personal grievance that may arise from the situation, but focus on patient safety.17 You should as far as possible make sure you use the correct procedure to make your personal grievance known or raise your concern.18

67. If you have a personal grievance that you cannot resolve informally, you should follow your organisations grievance procedure. If you have a concern about patient safety, you must follow the guidance in Raising and acting on concerns about patient safety 4

Doctors with extra responsibilities

68. You should help staff you manage to identify the appropriate procedure for dealing with their personal grievance or concern about patient safety.

Performance and health

All doctors

69. You must make sure that your own health does not put patients at risk and you must follow the guidance in *Good medical practice* [5] on doctors' responsibilities in relation to their own health.

70. You should be aware that poorly performing colleagues may have health problems and respond constructively where this is the case. You should encourage such colleagues to seek and follow professional advice and offer them appropriate help and support. You must not unfairly discriminate against colleagues because of an issue related to their health or a disability.

71. You should, as far as possible, support colleagues who are experiencing performance problems.

72. But, in all cases, you should remember your duty to raise concerns where you believe a colleague may not be fit to practise or may otherwise pose a risk of serious harm to patients.[4]

Doctors with extra responsibilities

73. You must promote the health and wellbeing of staff you manage.

74. You must make sure that there are clear and effective procedures for responding to concerns about colleagues' conduct, performance or health. This includes referring them to occupational health or other services, where appropriate, and making sure that staff are aware of these procedures.

75. You should be prepared to discuss constructively and sympathetically any work problems that the people you manage may have. You must deal supportively and, where possible, openly with problems in the conduct, performance or health of people you manage.19

76. You must make sure that people you manage have access to support for any health or performance problems they have. You must make sure that people are not unfairly discriminated against because of their health or disability.

77. You must make sure that you respond appropriately to requests for reasonable adjustments for staff with a disability or health condition in line with the Equality Act 2010.

Writing references

78. If you have been asked to or have agreed to write a reference for a colleague, you must follow the guidance in paragraph 68 of *Good medical practice*.[20]

Planning, using and managing resources

All doctors

79. Whatever your role or level in your organisation, whether you are a junior, non-training grade or other doctor, you should be willing to demonstrate leadership in managing and using resources effectively. This means that you should be prepared to contribute to discussions and decisions about:

a. allocating resources and setting priorities in any organisation in which you work

b. commissioning services for the wider population of patients.

80. You should have enough understanding of how finances are allocated and managed in the services in which you work to help with your role in committing resources for the benefit of patients.

81. To minimise waste, improve services and promote the effective use of resources, you should take financial responsibility for delivering your service at a level appropriate to your role. You should understand the roles and policies of local and, where relevant, regional and national agencies involved in healthcare if they affect your role as a doctor.

Doctors with extra responsibilities

82. If you are responsible for managing resources, or commissioning or delivering health services, you should have detailed knowledge of how management processes work and how they affect the delivery of patient care.

83. You must make sure that you are competent and have the necessary training or advice for any financial responsibilities that are part of your role. You must make sure that those you manage have the necessary skills and advice to fulfil their roles.

Allocating resources

84. All doctors must make the care of patients their first concern. However, the treatment options that can be offered to patients may be affected by limits on resources.

All doctors

85. If you make decisions about access to treatments on a case by case basis, without referring to agreed policy or guidelines, you risk introducing elements of unfair discrimination or may fail to consider properly the patient's other legal rights. When making decisions about using resources, you must do the following.

1. Provide the best service possible within the resources available, taking account of your responsibilities towards your patients and the wider population.
2. Be familiar with any local and national policies that set out agreed criteria for access to a particular treatment.[21]
3. Make sure that decisions about setting priorities that affect patients are fair and based on clinical need and the likely effectiveness of treatments, and are not based on factors that may introduce discriminatory access to care.[22]
4. Be open and honest with patients[23] and the rest of the healthcare team about the decision-making process and the criteria for setting priorities in individual cases.

86. You should involve colleagues, including other healthcare professionals, in discussions about how to allocate wider resources. If issues or disputes about allocating resources arise, you should try to sort them out by discussing options with, for example, patients, the healthcare team, other colleagues (including other health and social care professionals) and managers. You should be open and honest with patients when resource constraints may affect the treatment options available.[24]

Doctors with extra responsibilities

87. If you have a management role or responsibility, you will often have to make judgements about competing demands on available resources. When making these decisions, you must

consider your primary duty for the care and safety of patients. You must take account of any local and national policies that set out agreed criteria for access to particular treatments and allocating resources, and make sure that these policies are available to clinical staff.

88. If you are concerned about how management decisions might conflict with your primary duty to patients, you must take steps to manage or deal with any conflict; for example, by:

a. asking for colleagues' advice

b. declaring the conflict to your board or other decision-making body

c. asking for advice from external professional or regulatory bodies, including defence organisations, if necessary.

Honesty, integrity and conflicts of interest

All doctors

89. If you have financial or other personal interests in organisations providing health or social care, or in products used in health or social care, you must follow the advice in *Identifying and managing conflicts of interest* [25] and in *Good medical practice* [5]

Doctors with extra responsibilities

90. If you are responsible for managing and allocating funds or resources, you must make sure that they are used for the purposes they were intended for and are clearly and properly accounted for. You should also make sure that appropriate professional services, including audits, are commissioned when necessary.

91. You should make sure there are adequate systems in place to monitor financial and management information. You and those you manage should make full use of these systems, including when awarding contracts and managing waiting lists and service plans.

92. You must make sure that there are appropriate systems in place to make sure that actual or perceived conflicts of interests are managed in an open way, and in line with the guidance in *Identifying and managing conflicts of interest* [25] and *Good medical practice*.[5]

Endnotes

1. Although these principles are relevant to all doctors, whatever roles they have, the judgment in Remedy UK Ltd, R (on the application of Remedy UK Ltd) v General Medical Council [2010] EWHC 1245 (Admin) found that there are some roles that are so far removed from practising medicine that the GMC's fitness to practise procedures do not apply to them. However, doctors are still accountable to the GMC when they are performing a wide range of clinical management roles (for example, as a clinical or medical director) or other non-clinical roles (for example, as a medical educator or researcher), even if medical knowledge or expertise is not needed for the roles (for example, as a chief executive of a hospital).
2. Those you work with, including managers of services, whether or not they are also doctors.
3. For example, you must make sure policies accurately reflect employment and related legislation, including the Equality Act 2010. If you are working in Northern Ireland, see The Gaps between GB and NI Equality Law (pdf) (January 2011), which sets out the differences between the legislative framework and protections in Northern Ireland.
4. General Medical Council (2012) *Raising and acting on concerns about patient safety* London, GMC
5. General Medical Council (2024) *Good medical practice* London, GMC.
6. Follett B, Paulson-Ellis M (2001) A review of appraisal, disciplinary and reporting arrangements for senior NHS and university staff with academic and clinical duties London, Department for Education and Skills.
7. Medical Profession (Responsible Officers) Regulations 2010 (which cover England, Wales and Scotland) or the Medical Profession (Responsible Officers) Regulations (Northern Ireland) 2010.
8. Department of Health (England 2010) The Role of the Responsible Officer - Closing the gap in Medical Regulation - Responsible Officer Guidance (pdf), Department of Health. Department of Health, Social Services and Public Safety (2011) Confidence in care: Guidance on the role of responsible officers for doctors and employers (pdf) Belfast, Department of Health, Social Services and Public Safety. At the time of printing, no additional guidance had been published by the departments of health in Scotland and Wales.
9. For example, you must be familiar with the Equality Act 2010, data protection law and relevant employment legislation.
10. General Medical Council (2017) *Confidentiality: good practice in handling patient information* London, GMC.
11. General Medical Council (2017) *Confidentiality: good practice in handling patient information* London, GMC, paragraphs 128 - 130 (Records management and retention).
12. Slowther A et al (2009) Non UK qualified doctors and Good Medical Practice: the experience of working within a different professional framework University of Warwick.
13. The Standing Committee on Postgraduate Medical and Dental Education (1998) Supporting

doctors and dentists at work: an inquiry into mentoring London, SCOPME, described mentoring as: 'The process whereby an experienced, highly regarded, empathic person (the mentor), guides another individual (the mentee) in the development and re-examination of their own ideas, learning, and personal and professional development. The mentor who often, but not necessarily, works in the same organisation or field as the mentee, achieves this by listening and talking in confidence to the mentee.'

14. GP trainers are required to be approved under section 34I(1) of the Medical Act 1983

15. General Medical Council (2011) Gateways to the professions: advising medical schools: encouraging disabled students London, General Medical Council.

16. A more detailed discussion on the difference between a personal grievance and raising a concern can be found in Speak up for a healthy NHS, produced by Protect.

17. For further information see *Raising and acting on concerns about patient safety*.

18. For further information see the Protect website.

19. General Medical Council (2017) *Confidentiality: good practice in handling patient information* London, GMC.

20. General Medical Council (2013) *Good medical practice* London, GMC, paragraph 62.

21. For example, national service frameworks and National Institute for Health and Clinical Excellence (NICE) and Scottish Intercollegiate Guidelines Network (SIGN) guidelines.

22. For example, a patient's age, colour, culture, disability, ethnic or national origin, gender, lifestyle, marital or parental status, race, religion or beliefs, sex, sexual orientation or socioeconomic status. For further information see the Equality Act 2010. If you are working in Northern Ireland, see The Gaps between GB and NI Equality Law (January 2011), which sets out the differences between the legislative framework and protections in Northern Ireland.

23. And those close to the patient where the patient lacks capacity or has asked you to communicate with a family member, carer or friend.

24. General Medical Council (2020) *Decision making and consent* London, GMC, paragraph 13.

25. General Medical Council (2024) *Identifying and managing conflicts of interest* London, GMC.

Email: **gmc@gmc-uk.org**
Website: **gmc-uk.org**
Telephone: **0161 923 6602**

General Medical Council, 3 Hardman Street, Manchester M3 3AW

Textphone: **please dial the prefix 18001** then **0161 923 6602** to use the Text Relay service.

Join the conversation

@gmcuk **facebook.com/gmcuk**
linkd.in/gmcuk **youtube.com/gmcuktv**

To ask for this publication in another format or language, please call us on **0161 923 6602** or email us at **gmc@gmc-uk.org**.

I ofyn am y cyhoeddiad hwn mewn fformat neu iaith arall, ffoniwch ni ar **0161 923 6602** neu e-bostiwch ni ar **gmc@gmc-uk.org**.

You are welcome to contact us in Welsh. We will respond in Welsh, without this causing additional delay.

Mae croeso i chi gysylltu â ni yn Gymraeg. Byddwn yn ymateb yn Gymraeg, heb i hyn achosi oedi ychwanegol.

Code: GMC/LMAD/0124

A49585984

Nursing & Midwifery Council

The Code

Professional standards of practice and behaviour for nurses, midwives and nursing associates

prioritise people

practise effectively

preserve safety

promote professionalism and trust

About us

The Nursing and Midwifery Council exists to protect the public. We do this by making sure that only those who meet our requirements are allowed to practise as a nurse or midwife in the UK, or a nursing associate in England. We take action if concerns are raised about whether a nurse, midwife or nursing associate is fit to practise.

It is against the law to claim to be, or to practise as, a nurse or midwife in the UK, or as a nursing associate in England, if you are not on the relevant part of our register.

It is also a criminal offence for anyone who, with intent to deceive, causes or permits someone else to falsely represent them as being on the register, or makes a false representation about them being on the NMC register.

Publication date: 29 January 2015 **Effective from:** 31 March 2015
Updated to reflect the regulation of nursing associates: 10 October 2018

A note on this version of the Code

All regulators review their Codes from time to time to make sure they continue to reflect public expectations. This new version of the Code is substantially similar to the 2015 version, but it has been updated to reflect our new responsibilities for the regulation of nursing associates. In joining the register, nursing associates will uphold the Code.

The current versions of our Code, standards and guidance can always be found on our website. Those on our register should make sure they are using the most up to date version of the Code.

For more information about the Code, please visit:
www.nmc.org.uk/code

Introduction

The Code contains the professional standards that registered nurses, midwives and nursing associates[1] must uphold. Nurses, midwives and nursing associates must act in line with the Code, whether they are providing direct care to individuals, groups or communities or bringing their professional knowledge to bear on nursing[2] and midwifery practice in other roles, such as leadership, education, or research. The values and principles set out in the Code can be applied in a range of different practice settings, but they are not negotiable or discretionary.

Our role is to set the standards in the Code, but these are not just our standards. They are the standards that patients and members of the public tell us they expect from health professionals. They are the standards shown every day by those on our register.

When joining our register, and then renewing their registration, nurses, midwives and nursing associates commit to upholding these standards. This commitment to professional standards is fundamental to being part of a profession. We can take action if those on our register fail to uphold the Code. In serious cases, this can include removing them from the register.

1 Anyone practising as a registered nurse or midwife in the UK, or a nursing associate in England, has to be registered with us. The nursing associate role is being used only in England.

2 We have used the word 'nursing' in this document to apply to the work of nurses and nursing associates. Nursing associates are a distinct profession with their own part of our register, but they are part of the nursing team.

The Code sets out common standards of conduct and behaviour for those on our register. This provides a clear, consistent and positive message to patients, service users and colleagues about what they can expect of those who provide nursing or midwifery care.

The professions we regulate have different knowledge and skills, set out in three distinct standards of proficiency. They can work in diverse contexts and have different levels of autonomy and responsibility. However, all of the professions we regulate exercise professional judgement and are accountable for their work.

Nurses, midwives and nursing associates uphold the Code within the limits of their competence. This means, for example, that while a nurse and nursing associate will play different roles in an aspect of care, they will both uphold the standards in the Code within the contribution they make to overall care. The professional commitment to work within one's competence is a key underpinning principle of the Code (see section 13) which, given the significance of its impact on public protection, should be upheld at all times.

In addition, nurses, midwives and nursing associates are expected to work within the limits of their competence, which may extend beyond the standards they demonstrated in order to join the register.

The Code should be useful for everyone who cares about good nursing and midwifery.

- Patients and service users, and those who care for them, can use it to provide feedback to nurses, midwives and nursing associates about the care they receive.
- Those on our register can use it to promote safe and effective practice in their place of work.
- Employer organisations should support their staff in upholding the standards in their professional Code as part of providing the quality and safety expected by service users and regulators.
- Educators can use the Code to help students understand what it means to be a registered professional and how keeping to the Code helps to achieve that.

For the many committed and expert practitioners on our register, this Code should be seen as a way of reinforcing professionalism. Through revalidation, nurses, midwives and nursing associates provide evidence of their continued ability to practise safely and effectively. The Code is central to the revalidation process as a focus for professional reflection. This gives the Code significance in the professional life of those on our register, and raises its status and importance for employers.

The Code contains a series of statements that taken together signify what good practice by nurses, midwives and nursing associates looks like. It puts the interests of patients and service users first, is safe and effective, and promotes trust through professionalism.

Prioritise people

You put the interests of people using or needing nursing or midwifery services first. You make their care and safety your main concern and make sure that their dignity is preserved and their needs are recognised, assessed and responded to. You make sure that those receiving care are treated with respect, that their rights are upheld and that any discriminatory attitudes and behaviours towards those receiving care are challenged.

1 Treat people as individuals and uphold their dignity

To achieve this, you must:

1.1 treat people with kindness, respect and compassion

1.2 make sure you deliver the fundamentals of care effectively

1.3 avoid making assumptions and recognise diversity and individual choice

1.4 make sure that any treatment, assistance or care for which you are responsible is delivered without undue delay

1.5 respect and uphold people's human rights

The fundamentals of care include, but are not limited to, nutrition, hydration, bladder and bowel care, physical handling and making sure that those receiving care are kept in clean and hygienic conditions. It includes making sure that those receiving care have adequate access to nutrition and hydration, and making sure that you provide help to those who are not able to feed themselves and drink fluid unaided.

2 Listen to people and respond to their preferences and concerns

To achieve this, you must:

- **2.1** work in partnership with people to make sure you deliver care effectively
- **2.2** recognise and respect the contribution that people can make to their own health and wellbeing
- **2.3** encourage and empower people to share in decisions about their treatment and care
- **2.4** respect the level to which people receiving care want to be involved in decisions about their own health, wellbeing and care
- **2.5** respect, support and document a person's right to accept or refuse care and treatment
- **2.6** recognise when people are anxious or in distress and respond compassionately and politely

3 Make sure that people's physical, social and psychological needs are assessed and responded to

To achieve this, you must:

- **3.1** pay special attention to promoting wellbeing, preventing ill health and meeting the changing health and care needs of people during all life stages
- **3.2** recognise and respond compassionately to the needs of those who are in the last few days and hours of life

3.3 act in partnership with those receiving care, helping them to access relevant health and social care, information and support when they need it

3.4 act as an advocate for the vulnerable, challenging poor practice and discriminatory attitudes and behaviour relating to their care

4 Act in the best interests of people at all times

To achieve this, you must:

4.1 balance the need to act in the best interests of people at all times with the requirement to respect a person's right to accept or refuse treatment

4.2 make sure that you get properly informed consent and document it before carrying out any action

4.3 keep to all relevant laws about mental capacity that apply in the country in which you are practising, and make sure that the rights and best interests of those who lack capacity are still at the centre of the decision-making process

4.4 tell colleagues, your manager and the person receiving care if you have a conscientious objection to a particular procedure and arrange for a suitably qualified colleague to take over responsibility for that person's care

You can only make a 'conscientious objection' in limited circumstances. For more information please visit our website at **www.nmc.org.uk/standards**

5 Respect people's right to privacy and confidentiality

As a nurse, midwife or nursing associate, you owe a duty of confidentiality to all those who are receiving care. This includes making sure that they are informed about their care and that information about them is shared appropriately.

To achieve this, you must:

5.1 respect a person's right to privacy in all aspects of their care

5.2 make sure that people are informed about how and why information is used and shared by those who will be providing care

5.3 respect that a person's right to privacy and confidentiality continues after they have died

5.4 share necessary information with other health and care professionals and agencies only when the interests of patient safety and public protection override the need for confidentiality

5.5 share with people, their families and their carers, as far as the law allows, the information they want or need to know about their health, care and ongoing treatment sensitively and in a way they can understand

Practise effectively

You assess need and deliver or advise on treatment, or give help (including preventative or rehabilitative care) without too much delay, to the best of your abilities, on the basis of best available evidence. You communicate effectively, keeping clear and accurate records and sharing skills, knowledge and experience where appropriate. You reflect and act on any feedback you receive to improve your practice.

6 Always practise in line with the best available evidence

To achieve this, you must:

6.1 make sure that any information or advice given is evidence-based including information relating to using any health and care products or services

6.2 maintain the knowledge and skills you need for safe and effective practice

7 Communicate clearly

To achieve this, you must:

7.1 use terms that people in your care, colleagues and the public can understand

7.2 take reasonable steps to meet people's language and communication needs, providing, wherever possible, assistance to those who need help to communicate their own or other people's needs

7.3 use a range of verbal and non-verbal communication methods, and consider cultural sensitivities, to better understand and respond to people's personal and health needs

7.4 check people's understanding from time to time to keep misunderstanding or mistakes to a minimum

7.5 be able to communicate clearly and effectively in English

8 Work co-operatively

To achieve this, you must:

8.1 respect the skills, expertise and contributions of your colleagues, referring matters to them when appropriate

8.2 maintain effective communication with colleagues

8.3 keep colleagues informed when you are sharing the care of individuals with other health and care professionals and staff

8.4 work with colleagues to evaluate the quality of your work and that of the team

8.5 work with colleagues to preserve the safety of those receiving care

8.6 share information to identify and reduce risk

8.7 be supportive of colleagues who are encountering health or performance problems. However, this support must never compromise or be at the expense of patient or public safety

9 Share your skills, knowledge and experience for the benefit of people receiving care and your colleagues

To achieve this, you must:

9.1 provide honest, accurate and constructive feedback to colleagues

9.2 gather and reflect on feedback from a variety of sources, using it to improve your practice and performance

9.3 deal with differences of professional opinion with colleagues by discussion and informed debate, respecting their views and opinions and behaving in a professional way at all times

9.4 support students' and colleagues' learning to help them develop their professional competence and confidence

10 Keep clear and accurate records relevant to your practice

This applies to the records that are relevant to your scope of practice. It includes but is not limited to patient records.

To achieve this, you must:

10.1 complete records at the time or as soon as possible after an event, recording if the notes are written some time after the event

10.2 identify any risks or problems that have arisen and the steps taken to deal with them, so that colleagues who use the records have all the information they need

10.3 complete records accurately and without any falsification, taking immediate and appropriate action if you become aware that someone has not kept to these requirements

10.4 attribute any entries you make in any paper or electronic records to yourself, making sure they are clearly written, dated and timed, and do not include unnecessary abbreviations, jargon or speculation

10.5 take all steps to make sure that records are kept securely

10.6 collect, treat and store all data and research findings appropriately

11 Be accountable for your decisions to delegate tasks and duties to other people

To achieve this, you must:

11.1 only delegate tasks and duties that are within the other person's scope of competence, making sure that they fully understand your instructions

11.2 make sure that everyone you delegate tasks to is adequately supervised and supported so they can provide safe and compassionate care

11.3 confirm that the outcome of any task you have delegated to someone else meets the required standard

12 Have in place an indemnity arrangement which provides appropriate cover for any practice you take on as a nurse, midwife or nursing associate in the United Kingdom

To achieve this, you must:

12.1 make sure that you have an appropriate indemnity arrangement in place relevant to your scope of practice

For more information, please visit our website at **www.nmc.org.uk/indemnity**

Preserve safety

You make sure that patient and public safety is not affected. You work within the limits of your competence, exercising your professional 'duty of candour' and raising concerns immediately whenever you come across situations that put patients or public safety at risk. You take necessary action to deal with any concerns where appropriate.

13 Recognise and work within the limits of your competence

To achieve this, you must, as appropriate:

13.1 accurately identify, observe and assess signs of normal or worsening physical and mental health in the person receiving care

13.2 make a timely referral to another practitioner when any action, care or treatment is required

13.3 ask for help from a suitably qualified and experienced professional to carry out any action or procedure that is beyond the limits of your competence

13.4 take account of your own personal safety as well as the safety of people in your care

13.5 complete the necessary training before carrying out a new role

---

The professional duty of candour is about openness and honesty when things go wrong. "Every healthcare professional must be open and honest with patients when something goes wrong with their treatment or care which causes, or has the potential to cause, harm or distress." Joint statement from the Chief Executives of statutory regulators of healthcare professionals.

14 Be open and candid with all service users about all aspects of care and treatment, including when any mistakes or harm have taken place

To achieve this, you must:

14.1 act immediately to put right the situation if someone has suffered actual harm for any reason or an incident has happened which had the potential for harm

14.2 explain fully and promptly what has happened, including the likely effects, and apologise to the person affected and, where appropriate, their advocate, family or carers

14.3 document all these events formally and take further action (escalate) if appropriate so they can be dealt with quickly

15 Always offer help if an emergency arises in your practice setting or anywhere else

To achieve this, you must:

15.1 only act in an emergency within the limits of your knowledge and competence

15.2 arrange, wherever possible, for emergency care to be accessed and provided promptly

15.3 take account of your own safety, the safety of others and the availability of other options for providing care

16 Act without delay if you believe that there is a risk to patient safety or public protection

To achieve this, you must:

16.1 raise and, if necessary, escalate any concerns you may have about patient or public safety, or the level of care people are receiving in your workplace or any other health and care setting and use the channels available to you in line with our guidance and your local working practices

16.2 raise your concerns immediately if you are being asked to practise beyond your role, experience and training

16.3 tell someone in authority at the first reasonable opportunity if you experience problems that may prevent you working within the Code or other national standards, taking prompt action to tackle the causes of concern if you can

16.4 acknowledge and act on all concerns raised to you, investigating, escalating or dealing with those concerns where it is appropriate for you to do so

16.5 not obstruct, intimidate, victimise or in any way hinder a colleague, member of staff, person you care for or member of the public who wants to raise a concern

16.6 protect anyone you have management responsibility for from any harm, detriment, victimisation or unwarranted treatment after a concern is raised

For more information, please visit our website at **www.nmc.org.uk/raisingconcerns.**

17 Raise concerns immediately if you believe a person is vulnerable or at risk and needs extra support and protection

To achieve this, you must:

17.1 take all reasonable steps to protect people who are vulnerable or at risk from harm, neglect or abuse

17.2 share information if you believe someone may be at risk of harm, in line with the laws relating to the disclosure of information

17.3 have knowledge of and keep to the relevant laws and policies about protecting and caring for vulnerable people

18 Advise on, prescribe, supply, dispense or administer medicines within the limits of your training and competence, the law, our guidance and other relevant policies, guidance and regulations

To achieve this, you must:

18.1 prescribe, advise on, or provide medicines or treatment, including repeat prescriptions (only if you are suitably qualified) if you have enough knowledge of that person's health and are satisfied that the medicines or treatment serve that person's health needs

18.2 keep to appropriate guidelines when giving advice on using controlled drugs and recording the prescribing, supply, dispensing or administration of controlled drugs

18.3 make sure that the care or treatment you advise on, prescribe, supply, dispense or administer for each person is compatible with any other care or treatment they are receiving, including (where possible) over-the-counter medicines

18.4 take all steps to keep medicines stored securely

18.5 wherever possible, avoid prescribing for yourself or for anyone with whom you have a close personal relationship

Prescribing is not within the scope of practice of everyone on our register. Nursing associates don't prescribe, but they may supply, dispense and administer medicines. Nurses and midwives who have successfully completed a further qualification in prescribing and recorded it on our register are the only people on our register that can prescribe.

For more information, please visit our website at **www.nmc.org.uk/standards.**

19 Be aware of, and reduce as far as possible, any potential for harm associated with your practice

To achieve this, you must:

19.1 take measures to reduce as far as possible, the likelihood of mistakes, near misses, harm and the effect of harm if it takes place

19.2 take account of current evidence, knowledge and developments in reducing mistakes and the effect of them and the impact of human factors and system failures (see the note below)

19.3 keep to and promote recommended practice in relation to controlling and preventing infection

19.4 take all reasonable personal precautions necessary to avoid any potential health risks to colleagues, people receiving care and the public

Human factors refer to environmental, organisational and job factors, and human and individual characteristics, which influence behaviour at work in a way which can affect health and safety – Health and Safety Executive. You can find more information at **www.hse.gov.uk**

Promote professionalism and trust

You uphold the reputation of your profession at all times. You should display a personal commitment to the standards of practice and behaviour set out in the Code. You should be a model of integrity and leadership for others to aspire to. This should lead to trust and confidence in the professions from patients, people receiving care, other health and care professionals and the public.

20 Uphold the reputation of your profession at all times

To achieve this, you must:

20.1 keep to and uphold the standards and values set out in the Code

20.2 act with honesty and integrity at all times, treating people fairly and without discrimination, bullying or harassment

20.3 be aware at all times of how your behaviour can affect and influence the behaviour of other people

20.4 keep to the laws of the country in which you are practising

20.5 treat people in a way that does not take advantage of their vulnerability or cause them upset or distress

20.6 stay objective and have clear professional boundaries at all times with people in your care (including those who have been in your care in the past), their families and carers

20.7 make sure you do not express your personal beliefs (including political, religious or moral beliefs) to people in an inappropriate way

20.8 act as a role model of professional behaviour for students and newly qualified nurses, midwives and nursing associates to aspire to

20.9 maintain the level of health you need to carry out your professional role

20.10 use all forms of spoken, written and digital communication (including social media and networking sites) responsibly, respecting the right to privacy of others at all times

For more guidance on using social media and networking sites, please visit our website at **www.nmc.org.uk/standards**

21 Uphold your position as a registered nurse, midwife or nursing associate

To achieve this, you must:

21.1 refuse all but the most trivial gifts, favours or hospitality as accepting them could be interpreted as an attempt to gain preferential treatment

21.2 never ask for or accept loans from anyone in your care or anyone close to them

21.3 act with honesty and integrity in any financial dealings you have with everyone you have a professional relationship with, including people in your care

21.4 make sure that any advertisements, publications or published material you produce or have produced for your professional services are accurate, responsible, ethical, do not mislead or exploit vulnerabilities and accurately reflect your relevant skills, experience and qualifications

21.5 never use your status as a registered professional to promote causes that are not related to health

21.6 cooperate with the media only when it is appropriate to do so, and then always protecting the confidentiality and dignity of people receiving treatment or care

22 Fulfil all registration requirements

To achieve this, you must:

22.1 keep to any reasonable requests so we can oversee the registration process

22.2 keep to our prescribed hours of practice and carry out continuing professional development activities

22.3 keep your knowledge and skills up to date, taking part in appropriate and regular learning and professional development activities that aim to maintain and develop your competence and improve your performance

For more information, please visit our website at **www.nmc.org.uk/standards.**

A49585984

23 Cooperate with all investigations and audits

This includes investigations or audits either against you or relating to others, whether individuals or organisations. It also includes cooperating with requests to act as a witness in any hearing that forms part of an investigation, even after you have left the register.

To achieve this, you must:

23.1 cooperate with any audits of training records, registration records or other relevant audits that we may want to carry out to make sure you are still fit to practise

23.2 tell both us and any employers as soon as you can about any caution or charge against you, or if you have received a conditional discharge in relation to, or have been found guilty of, a criminal offence (other than a protected caution or conviction)

23.3 tell any employers you work for if you have had your practice restricted or had any other conditions imposed on you by us or any other relevant body

23.4 tell us and your employers at the first reasonable opportunity if you are or have been disciplined by any regulatory or licensing organisation, including those who operate outside of the professional health and care environment

---

When telling your employers, this includes telling (i) any person, body or organisation you are employed by, or intend to be employed by, as a nurse, midwife or nursing associate; and (ii) any person, body or organisation with whom you have an arrangement to provide services as a nurse, midwife or nursing associate.

23.5 give your NMC Pin when any reasonable request for it is made

For more information, please visit our website at **www.nmc.org.uk.**

24 Respond to any complaints made against you professionally

To achieve this, you must:

24.1 never allow someone's complaint to affect the care that is provided to them

24.2 use all complaints as a form of feedback and an opportunity for reflection and learning to improve practice

25 Provide leadership to make sure people's wellbeing is protected and to improve their experiences of the health and care system

To achieve this, you must:

25.1 identify priorities, manage time, staff and resources effectively and deal with risk to make sure that the quality of care or service you deliver is maintained and improved, putting the needs of those receiving care or services first

25.2 support any staff you may be responsible for to follow the Code at all times. They must have the knowledge, skills and competence for safe practice; and understand how to raise any concerns linked to any circumstances where the Code has, or could be, broken

Throughout their career, all our registrants will have opportunities to demonstrate leadership qualities, regardless of whether or not they occupy formal leadership positions.

nmc
Nursing &
Midwifery
Council

23 Portland Place,
London W1B 1PZ
+44 20 7637 7181
www.nmc.org.uk
@nmcnews
@nmcuk

General Medical Council

Professional standards

In effect: 12 March 2012

Raising and acting on concerns about patient safety

Raising and acting on concerns about patient safety

Professional standards: More detailed guidance

This guidance came into effect 12 March 2012.
You can find the latest version of all our professional standards at www.gmc-uk.org/guidance.

Contents

You must take prompt action if you think patient safety, dignity or comfort is being compromised.

In this guidance we explore who the best person or organisation is for you to raise your concerns with. It also covers how to raise your concerns and how you can overcome any barriers that might be preventing you.

There is also a section on how to handle concerns that are brought to you.

This guidance came into effect 12 March 2012.

About our Raising and acting on concerns guidance

1. This guidance sets out our expectation that all doctors will, whatever their role, take appropriate action to raise and act on concerns about patient care, dignity and safety.

2. *Good medical practice* (2024) says:

> **75.** You must take prompt action if you think that patient safety, dignity or comfort is or may be seriously compromised.
>
> > **a.** If a patient is not receiving basic care to meet their needs, you must act to make sure the patient is cared for as soon as possible, for example by asking someone who delivers basic care to attend to the patient straight away.
> >
> > **b.** If patients are at risk because of inadequate premises, equipment or other resources, policies or systems, you should first protect patients and put the matter right if that's possible. Then you must raise your concern in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*.
> >
> > **c.** If you have concerns that a colleague may not be fit to practise and may be putting patients at risk, you must ask for advice from a colleague, your defence body, or us. If you are still concerned, you must report this, in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*.
>
> **76.** If you have a formal leadership or management role, you must take active steps to create an environment in which people can talk about errors and concerns safely. This includes making sure that any concerns raised with you are dealt with promptly and adequately, in line with your workplace policy and our more detailed guidance on *Raising and acting on concerns about patient safety*

3. This guidance, which forms part of the professional standards, explains how to apply the principles in *Good medical practice*. It is separated into two parts.

- **Part 1: Raising a concern** gives advice on raising a concern that patients might be at risk of serious harm, and on the help and support available to you.
- **Part 2: Acting on a concern** explains your responsibilities when colleagues or others raise concerns with you and how those concerns should be handled. [1]

4. In this guidance, the terms ‘you must’ and ‘you should’ are used in the following ways.

- ‘You must’ is used for a legal or ethical duty you’re expected to meet (or be able to justify why you didn’t).
- 'You should’ is used for duties or principles that either:
  - may not apply to you or to the situation you’re currently in, or
  - you may not be able to comply with because of factors outside your control

5. The professional standards describe good practice, and not every departure from them will be considered serious. You must use your professional judgement to apply the standards to your day-to-day practice. If you do this, act in good faith and in the interests of patients, you will be able to explain and justify your decisions and actions. We say more about professional judgement, and how the professional standards relate to our fitness to practise processes, appraisal and revalidation, at the beginning of *Good medical practice*.

6. If you are not sure how this guidance applies to your situation, you should get advice from the individuals and bodies suggested in this guidance.

Part 1: Raising a concern

Duty to raise concerns

7. All doctors have a duty to raise concerns where they believe that patient safety or care is being compromised by the practice of colleagues or the systems, policies and procedures in the organisations in which they work. They must also encourage and support a culture in which staff can raise concerns openly and safely.

8. You must not enter into contracts or agreements with your employing or contracting body that seek to prevent you from or restrict you in raising concerns about patient safety. Contracts or agreements are void if they intend to stop an employee from making a protected disclosure.[2]

Overcoming obstacles to reporting

9. You may be reluctant to report a concern for a number of reasons. For example, because you fear that nothing will be done or that raising your concern may cause problems for colleagues; have a negative effect on working relationships; have a negative effect on your career; or result in a complaint about you.

10. If you are hesitating about reporting a concern for these reasons, you should bear the following in mind.

    a. You have a duty to put patients' interests first and act to protect them, which overrides personal and professional loyalties.
    b. The law provides legal protection against victimisation or dismissal for individuals who reveal information to raise genuine concerns and expose malpractice in the workplace.[3]
    c. You do not need to wait for proof – you will be able to justify raising a concern if you do so honestly, on the basis of reasonable belief and through appropriate channels, even if you are mistaken.

Steps to raise a concern

11. You must follow the procedure where you work for reporting adverse incidents and near misses. This is because routinely identifying adverse incidents or near misses at an early stage, can allow issues to be tackled, problems to be put right and lessons to be learnt.

12. If you have reason to believe that patients are, or may be, at risk of death or serious harm for any reason, you should report your concern to the appropriate person or organisation immediately. Do not delay doing so because you yourself are not in a position to put the matter right.

13. Wherever possible, you should first raise your concern with your manager or an appropriate officer of the organisation you have a contract with or which employs you – such as the consultant in charge of the team, the clinical or medical director or a practice partner. If your concern is about a partner, it may be appropriate to raise it outside the practice – for example, with the medical director or clinical governance lead responsible for your organisation. If you are a doctor in training, it may be appropriate to raise your concerns with a named person in the deanery – for example, the postgraduate dean or director of postgraduate general practice education.

14. You must be clear, honest and objective about the reason for your concern. You should acknowledge any personal grievance that may arise from the situation, but focus on the issue of patient safety.

15. You should also keep a record of your concern and any steps that you have taken to deal with it.

Raising a concern with a regulator

16. You should contact a regulatory body such as the General Medical Council (GMC)[4] or another body with authority to investigate the issue (such as those listed at the end of this guidance) in the following circumstances.

    a. If you cannot raise the issue with the responsible person or body locally because you believe them to be part of the problem.
    b. If you have raised your concern through local channels but are not satisfied that the responsible person or body has taken adequate action.
    c. If there is an immediate serious risk to patients, and a regulator or other external body has responsibility to act or intervene.

Making a concern public

17. You can consider making your concerns public if you:

    a. have done all you can to deal with any concern by raising it within the organisation in which you work or which you have contract with, or with the appropriate external body, and
    b. have good reason to believe that patients are still at risk of harm, and

c. do not breach patient confidentiality.

But, you should get advice (see paragraph 18 below) before making a decision of this kind.

Help and advice

18. If you are not sure whether, or how, to raise your concern, you should get advice from:

a. a senior member of staff or other impartial colleague
b. the GMC's Confidential Helpline[5]
c. your medical defence body, your royal college or a professional association such as the British Medical Association (BMA)
d. the appropriate regulatory body listed at the end of this guidance if your concern relates to a colleague in another profession, or other relevant systems regulators if your concern relates to systems or organisations rather than individuals
e. Protect - A whistleblowing charity that advises and supports individuals and encourages safe whistleblowing.

Part 2: Acting on a concern

All doctors

19. All doctors have a responsibility to encourage and support a culture in which staff can raise concerns openly and safely.

20. Concerns about patient safety can come from a number of sources, such as patients' complaints, colleagues' concerns, critical incident reports and clinical audit. Concerns may be about inadequate premises, equipment, other resources, policies or systems, or the conduct, health or performance of staff or multidisciplinary teams. If you receive this information, you have a responsibility to act on it promptly and professionally. You can do this by putting the matter right (if that is possible), investigating and dealing with the concern locally, or referring serious or repeated incidents or complaints to senior management or the relevant regulatory authority.

Doctors with extra responsibilities

21. If you are responsible for clinical governance or have wider management responsibilities in your organisation, you have a duty to help people report their concerns and to enable people to act on concerns that are raised with them.

22. If you have a management role or responsibility, you must make sure that:

    a. there are systems and policies in place to allow concerns to be raised and for incidents, concerns and complaints to be investigated promptly and fully[6]
    b. you do not try to prevent employees or former employees raising concerns about patient safety – for example, you must not propose or condone contracts or agreements that seek to restrict or remove the contractor's freedom to disclose information relevant to their concerns
    c. clinical staff understand their duty to be open and honest about incidents or complaints with both patients and managers
    d. all other staff are encouraged to raise concerns they may have about the safety of patients, including any risks that may be posed by colleagues or teams
    e. staff who raise a concern are protected from unfair criticism or action, including any detriment or dismissal.

Investigating concerns

23. If you are responsible for investigating incidents or complaints, you have a responsibility towards those who raise a concern. You must:

    a. protect them from unfair criticism or action, including any detriment or dismissal
    b. tell them what action has been or will be taken to prevent a recurrence of the problem (if this applies)
    c. outline the process if they are still not satisfied with the response – for example, if complaints are considered within the Local Authority Social Services and National Health Service Complaints (England) Regulations 2009, the process for escalating the concern to the Health Service Ombudsman.

24. If you are responsible for investigating incidents or complaints, you should also make sure that:

    a. any investigations or resulting actions are carried out in a way which is consistent with the law, including, for example, the *Public Interest Disclosure Act 1998* [7]
    b. you have a working knowledge of the relevant law and procedures under which investigations and related proceedings are carried out
    c. those being investigated are treated fairly
    d. appropriate adverse event and critical incident reports are made within the organisation and to other relevant external bodies
    e. recommendations that arise from investigations are put into practice or referred to senior management
    f. patients who make a complaint receive a prompt, open, constructive and honest response.

25. You must also make sure that patients who suffer harm receive an explanation and, where appropriate, an apology.[8]

Help and advice

26. If you are not sure how to act on a concern, you should get advice from:

    a. a more senior member of staff, your organisation's management team or other impartial colleague
    b. your responsible officer or, if you are a responsible officer or medical director, a GMC employer liaison adviser[9]
    c. your medical defence body, royal college or a professional association such as the BMA

d. the relevant regulatory authorities (such as the Care Quality Commission, the GMC, or other professional regulators)
e. Protect, a whistleblowing charity that advises and supports individuals and encourages safe whistleblowing.

Useful contacts

Advice and help

Protect
A whistleblowing charity that advises and supports individuals and encourages safe whistleblowing.
Website: https://protect-advice.org.uk/

British Medical Association
Website: www.bma.org.uk

Medical and Dental Defence Union of Scotland
Website: www.mddus.com

Medical Defence Union
Website: www.themdu.com

Medical Protection Society
Website: www.medicalprotection.org

NHS Whistleblowing Helpline
Website: https://speakup.direct/

Regulatory and investigatory bodies

Professional regulatory bodies

General Chiropractic Council
Website: www.gcc-uk.org

General Dental Council
Website: www.gdc-uk.org

General Medical Council
Website: www.gmc-uk.org
Phone: 0161 923 6602
Confidential Helpline: 0161 923 6399

General Optical Council
Website: www.optical.org

General Osteopathic Council
Website: www.osteopathy.org.uk

General Pharmaceutical Council
Website: www.pharmacyregulation.org

Pharmaceutical Society of Northern Ireland
Website: www.psni.org.uk

Health and Care Professions Council
Website: www.hcpc-uk.co.uk

Nursing and Midwifery Council
Website: www.nmc.org.uk

Other regulatory and investigatory bodies

Care Quality Commission
Website: www.cqc.org.uk
See also Raising a concern with CQC: A quick guide for health and care staff about whistleblowing

NHS improvement
Website: https://improvement.nhs.uk/

NHS England (National Patient Safety Agency)
Website: www.england.nhs.uk

Professional Standards Authority
Website: www.professionalstandards.org.uk

Northern Ireland

Regulation and Quality Improvement Authority in Northern Ireland
Website: www.rqia.org.uk

Scotland

The Care Inspectorate
Website: www.careinspectorate.com

Healthcare Improvement Scotland
Website: www.healthcareimprovementscotland.org

Wales

Healthcare Inspectorate Wales
Website: www.hiw.org.uk

Endnotes

1. General Medical Council (2012) *Leadership and management for all doctors*.
2. The *Public Interest Disclosure Act 1998* protects individuals making disclosures that 'tend to show' that the health or safety of a person is or may be endangered. These are 'protected disclosures'.
3. For further information see the *Public Interest Disclosure Act 1998*, the NHS Constitution or Protect, a whistleblowing charity that advises and supports individuals and encourages safe whistleblowing.
4. For more information on how we respond to concerns, see the Concerns section of our site.
5. Updated in June 2013 to refer to the GMC's confidential helpline. Further information can be found on the Concerns section of our site. You can contact the Helpline on 0161 923 6399.
6. For guidance in establishing systems and policies in England see Protect.

   In Scotland see NHS Scotland, Implementing & Reviewing Whistleblowing Arrangements in NHSScotland PIN Policy (May 2011).
7. For information about the Public Interest Disclosure Act 1998 see Protect, a whistleblowing charity that advises and supports individuals and encourages safe whistleblowing and legislation.gov.uk.
8. For more information, see *Good medical practice*, paragraph 45, on our website.
9. Updated in June 2013 to reflect the most appropriate avenues for seeking advice following the introduction of revalidation.

Email: **gmc@gmc-uk.org**
Website: **gmc-uk.org**
Telephone: **0161 923 6602**

General Medical Council, 3 Hardman Street, Manchester M3 3AW

Textphone: **please dial the prefix 18001** then **0161 923 6602** to use the Text Relay service.

Join the conversation

@gmcuk **facebook.com/gmcuk**
linkd.in/gmcuk **youtube.com/gmcuktv**

To ask for this publication in another format or language, please call us on **0161 923 6602** or email us at **gmc@gmc-uk.org**.

I ofyn am y cyhoeddiad hwn mewn fformat neu iaith arall, ffoniwch ni ar **0161 923 6602** neu e-bostiwch ni ar **gmc@gmc-uk.org**.

You are welcome to contact us in Welsh. We will respond in Welsh, without this causing additional delay.

Mae croeso i chi gysylltu â ni yn Gymraeg. Byddwn yn ymateb yn Gymraeg, heb i hyn achosi oedi ychwanegol.

Code: GMC/RAC/0124

A49585984

NHS SCOTLAND | Workforce

Introduction

If you are an employee or former employee, this guide will help you to understand the ways you can raise a whistleblowing concern.

The National Whistleblowing Standards apply to all employees and former employees. In addition, they apply to workers such as bank, agency and sessional workers.

Types of concerns

The National Whistleblowing Standards provide an overview of what should be considered when raising a concern.

A whistleblowing concern is different to a grievance. A grievance is typically a personal complaint about an individual's own employment situation.

If your concern relates to a grievance, please refer to the NHSScotland Grievance Policy.

Where the concern relates to bullying or harassing behaviours that impact on the working environment, please refer to the NHSScotland Bullying and Harassment Policy.

Roles and responsibilities

There is a range of standard expectations on all parties including HR, trade union representatives and occupational health which underpins all policies. Find out more about NHSScotland workforce policy standard roles and responsibilities. In addition, specific responsibilities that apply to whistleblowing are provided in Part 4 of the Whistleblowing Standards.

These include the requirement to record reported whistleblowing concerns. A mechanism has been developed for this and details are available in our guide to Recording whistleblowing concerns.

How to raise a concern

The procedures for raising and handling whistleblowing concerns are detailed in the National Whistleblowing Standards. The Independent National Whistleblowing Officer (INWO) website also provides information about who can raise a concern.

A concern would normally be raised with the manager, or a more senior manager where this is more appropriate. NHSScotland Boards have designated whistleblowing contacts, who have been given special responsibility and training in dealing with whistleblowing concerns.

NHSScotland Boards also have dedicated non-executive whistleblowing champions. Their role is to seek and provide assurance that their Health Board is complying with the whistleblowing policy. The whistleblowing champion does not have an operational role and will not investigate cases.

The INWO is the final stage for whistleblowing concerns about the NHS in Scotland. If you remain dissatisfied with an NHS organisation after its process has concluded, you can ask the INWO to look into your concern.

Other ways to raise concerns

Healthcare Improvement Scotland (HIS)
HIS is a statutory body that works with healthcare providers to drive and support improvements in the quality of healthcare.

If your concern is about the quality of health care in NHSScotland, you can raise your concern directly with HIS.

HIS can be contacted on 0131 623 4300 or 0141 225 6999.

Visit the Healthcare Improvement Scotland website.

NHSScotland Counter Fraud Services (CFS)
CFS works in partnership with all of the NHS in Scotland. Their job is to protect Scotland's health from the impact of financial crime. They provide a comprehensive counter fraud service through a centrally based, professionally qualified team of experienced specialists, dedicated only to counter fraud work.

If your concern is about fraud in NHSScotland you can raise your concern directly with CFS*.*

CFS can be contacted on 01506 705200.

Visit the Counter Fraud Services website.

Health and Safety Executive (HSE)
HSE is the regulator for health and safety at work in Great Britain. HSE leads the health and safety system and, in partnership with local authority co-regulators, secures compliance with the Health and Safety at Work etc. Act 1974.

HSE's aim is to prevent death, injury and ill health to those at work and those affected by work activities. If your concern is about health and safety issues at work, you can raise your concern directly with HSE.

HSE can be contacted on 0300 003 1647.

Visit the Health and Safety Executive website.

Audit Scotland
Audit Scotland helps the Auditor General and the Accounts Commission to make sure organisations that spend public money in Scotland use it properly, efficiently and effectively.

Audit Scotland staff and firms of auditors appointed by Audit Scotland carry out the audits to check whether organisations manage their finances to the highest standards and achieve the best possible value for public money.

If your concern is about the use of public money you may raise your concern directly with Audit Scotland.

Audit Scotland can be contacted on 0131 625 1500.

Visit the Audit Scotland website.

Whistleblowing advice and information

In addition, the confidential, independent Whistleblowing advice and information line is also available to support employees who are unsure about whether or how to raise a concern. It can also offer support to managers who are handling whistleblowing concerns.

Find out more about the Whistleblowing advice and information line.

You can contact INWO team on Freephone 0800 008 6112 or Email INWO@spso.gov.scot.

Water System Risk Assessment

NHS Greater Glasgow & Clyde

Queen Elizabeth University Hospital And Royal Hospital for Children

Report Issue Date: July 2023 (Draft)
Latest Recommended Review Date: July 2025

LEGIONELLA RISK ASSESSMENT

	DMA Canyon Ltd
Address	14 Canyon Road Netherton Wishaw ML2 0EG
Telephone No.	01698 536790
Fax No.	01698 360211
e-mail	office@dmacanyon.co.uk
Website	www.dmacanyon.co.uk
DMA Contacts	Mike Kinghorn Director [redacted] David Watson Director [redacted] Graeme McCullie Director [redacted]

Dates of Assessment (On Site)	June & July 2023
Draft Submission for Review	July 2023
Final Submission	TBC
Risk Assessors	Fraser Murray Assisted by; David Watson Craig Guyer & Mark Rawlinson (Site & System Knowledge)

Risk Assessor assisted on site by (Site Representative)	No Assistance Provided
Position	N/A
Knowledge of systems being surveyed	N/A

N.B. The findings and recommendations presented in this report have been based on information made available and inspection of areas made accessible by site staff during the survey. DMA are only able to assess areas/systems, which they have been given access to and using information supplied by site personnel. This survey was undertaken only on pipe work/areas that were accessible and visible, and it is possible that some sections remained hidden during the survey. Schematic drawings, where produced, and how services link up, have been assumed to run as indicated using basic engineering principles and our experience. However, no responsibility can be accepted for systems and/or areas, which DMA have not been provided access to, or as a result of incorrect, misleading information supplied or information not provided. No guarantees as to the completeness of the information within this report are provided.

WATER SYSTEM RISK ASSESSMENT

DMA Staff Training and Competency

All DMA staff attending site are fully trained and deemed competent by DMA management for the tasks they have been allocated to carryout.

DMA training records are held centrally by DMA Canyon Ltd.

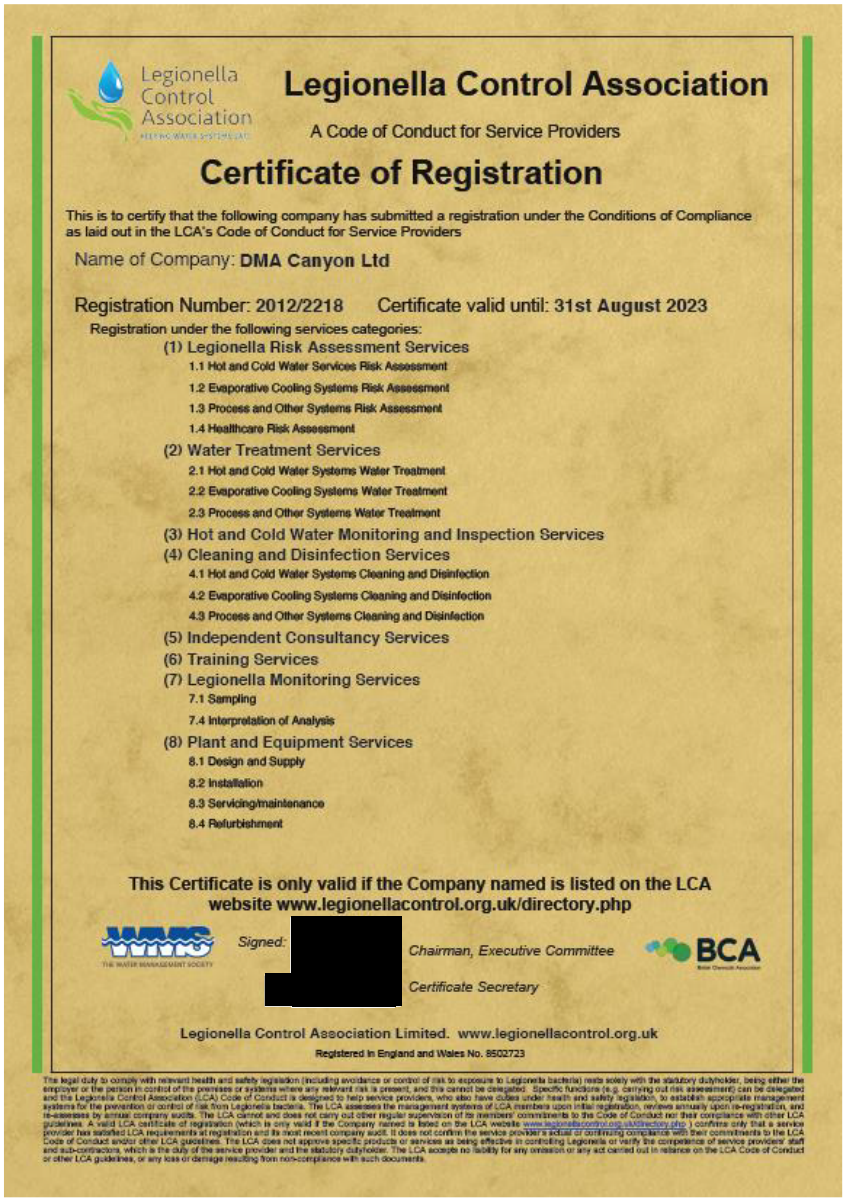
Copies of the relevant personnel training certificates can be supplied upon request.

Training and competency records for site/client/other staff involved in Legionella control should also be held.

DMA will only offer Legionella control services for which we have LCA accreditation.

An up to date copy of our LCA certificate and accreditation details can be found at www.dmacanyon.co.uk

For information on the LCA code of conduct for service providers and other information on the LCA requirements please refer to http://www.legionellacontrol.org.uk/



Legionella Control Association

Legionella Control Association

A Code of Conduct for Service Providers

Certificate of Registration

This is to certify that the following company has submitted a registration under the Conditions of Compliance as laid out in the LCA's Code of Conduct for Service Providers

Name of Company: **DMA Canyon Ltd**

Registration Number: 2012/2218 Certificate valid until: **31st August 2023**

Registration under the following services categories:

(1) Legionella Risk Assessment Services
- 1.1 Hot and Cold Water Services Risk Assessment
- 1.2 Evaporative Cooling Systems Risk Assessment
- 1.3 Process and Other Systems Risk Assessment
- 1.4 Healthcare Risk Assessment

(2) Water Treatment Services
- 2.1 Hot and Cold Water Systems Water Treatment
- 2.2 Evaporative Cooling Systems Water Treatment
- 2.3 Process and Other Systems Water Treatment

(3) Hot and Cold Water Monitoring and Inspection Services

(4) Cleaning and Disinfection Services
- 4.1 Hot and Cold Water Systems Cleaning and Disinfection
- 4.2 Evaporative Cooling Systems Cleaning and Disinfection
- 4.3 Process and Other Systems Cleaning and Disinfection

(5) Independent Consultancy Services

(6) Training Services

(7) Legionella Monitoring Services
- 7.1 Sampling
- 7.4 Interpretation of Analysis

(8) Plant and Equipment Services
- 8.1 Design and Supply
- 8.2 Installation
- 8.3 Servicing/maintenance
- 8.4 Refurbishment

This Certificate is only valid if the Company named is listed on the LCA website www.legionellacontrol.org.uk/directory.php

WWC THE WATER MANAGEMENT SOCIETY

Signed: [redacted] *Chairman, Executive Committee*

Certificate Secretary

BCA British Chemicals Association

Legionella Control Association Limited. www.legionellacontrol.org.uk

Registered in England and Wales No. 8502723

The legal duty to comply with relevant health and safety legislation (including avoidance or control of risk to exposure to Legionella bacteria) rests solely with the statutory dutyholder, being either the employer or the person in control of the premises or systems where any relevant risk is present, and this cannot be delegated. Specific functions (e.g. carrying out risk assessment) can be delegated and the Legionella Control Association (LCA) Code of Conduct is designed to help service providers, who also have duties under health and safety legislation, to establish appropriate management systems for the prevention or control of risk from Legionella bacteria. The LCA assesses the management systems of LCA members upon initial registration, reviews annually upon re-registration, and re-assesses by annual company audits. The LCA cannot and does not carry out other regular supervision of its members' commitments to the Code of Conduct nor their compliance with other LCA guidelines. A valid LCA certificate of registration (which is only valid if the Company named is listed on the LCA website www.legionellacontrol.org.uk/directory.php) confirms only that a service provider has satisfied LCA requirements at registration and its most recent company audit. It does not confirm the service provider's actual or continuing compliance with their commitments to the LCA Code of Conduct and/or other LCA guidelines. The LCA does not approve specific products or services as being effective in controlling Legionella or verify the competence of service providers' staff and sub-contractors, which is the duty of the service provider and the statutory dutyholder. The LCA accepts no liability for any omission or any act carried out in reliance on the LCA Code of Conduct or other LCA guidelines, or any loss or damage resulting from non-compliance with such documents.

WATER SYSTEM RISK ASSESSMENT

Table of Contents

WATER SYSTEM RISK ASSESSMENT

Section 1

Executive Summary

WATER SYSTEM RISK ASSESSMENT

Executive Summary

Building Overview
(System information below adapted from information provided by Brookfield in 2015 with Water Hygiene Control comments by DMA)

This assessment covers the QEUH (Adult) Hospital and the adjoining Royal Hospital for Children. The Adult Hospital is 14 storeys, including the basement, with approximately 1100 beds and the Children's Hospital is 5 storeys, including the basement, with approximately 250 beds.

This facility has the largest Critical Care complex, one of the largest Emergency Departments in Scotland, offers acute specialist inpatient care, medical day care services and outpatient clinics servicing the local population.

The Children's Hospital provides specialist services to the West of Scotland and the wider population of Scotland in addition to the full range of secondary care services to people of Greater Glasgow and Clyde. Specialist services include cardiology and cardiac surgery, renal and bone marrow transplantation. For a number of these specialised services, the Children's Hospital is recognised as the sole provider in Scotland.

The construction phase ended in January 2015 with phased occupancy of patient areas beginning in April 2015 and full working occupancy achieved in July 2015. There have been departmental changes and small scale works in the intervening period (e.g. ward use changes and the required service alterations) with no significant water system alterations made to the water system, until some upgrade works which were carried out in late 2018/early 2019.

These upgrade works included the addition of a third filtration unit after the Raw Water CWSTs, alterations to the pipework configuration from the Raw Water CWSTs to the Filtration units (to allow all Raw Water CWSTs to supply each of the Filter Units), alterations to the post Filter Units Pipework to allow all three filter units to supply each of the four Post Filter CWSTs.

At this time Chlorine dioxide dosing system were introduced into the Post Filter CWSTs, on the backwash cycle of the Filtration Units, on the post booster pump lines to the various plantroom serving the hospital (PR21 line, PR22/41 line, PR 31 Line and PR32/PR33 Line), on the cold supply as it enters into the various plantrooms (PR21, PR22, PR31 (x2), PR32, PR33 & PR41, with an additional unit in PR31 on line to the Adults Theatres), and on the hot return lines at each of the calorifier locations in PR21 (Cals 21-1/2/3), PR22 (Cals 22-1/2/3), PR31 (Cals 31-1/2/3, Cals 31-4/5/6, Cals 31-7/8/9), PR32 (Cals 32-1/2/3), PR33 (Cals 33-1/2/3) & PR41 (Cals 41-1/2/3).

During the works carried out in late 2018/early 2019 all 24 calorifiers across the Adults hospital & RHC had standard expansion vessels replaced with flow through type vessels, with alterations made to the pipework around the calorifiers to accommodate the new vessels and the required flow to the vessels. At the time of this survey these flow through expansion vessels are again being replaced with Flamco flow through expansion vessels with pipework again being amended to accommodate the new vessels (See Section 06 for details of where the new vessels had been fitted at time of writing).

There are numerous ClO_2 monitoring stations situated through the Adults and RHC Hospitals, with specific units within both Adults and Children's Renal plantrooms, with carbon filters fitted to the lines to remove ClO_2 from the water supply to the Renal Systems.

In early 2018 an issue with regards to Cupriavidus bacteria being detected in the system water was identified in Wards 2A & 2B of the Children's Hospital. Various remedial works were carried out within this ward in order to remedy the situation, including disinfections work, localised ClO_2 dosing to the hot and cold water supplies to these wards(now removed), with the ward eventually being closed, with the Children being decanted to Ward 6A within the Adults hospital, and alterations made to the 2A/2B water system, including the removal of anti-room WHBs and taps within the BMT part of the ward, running hot flow and return services as close as is practical to the outlets, changing the Optitherm and Contour taps to be Markwik 21+ taps and changing WCs to models with no cistern.

A decision was also taken by Infection Control, Clinical Staff and Estates to fit anti-microbial (PALL) filters in "high risk" areas (as identified by ICT/Clinical) throughout the hospital. These filters have remained in place since 2018, with some additional Wards/Departments added to the filtered locations, and some locations where filters have been removed, after a comprehensive sampling regime has demonstrated to the satisfaction of ICT/Clinical that water quality in areas where filters being removed was of a satisfactory standard.

In Mid 2019 Ward 2A/2B was again closed to allow for an extensive upgrade to the ward including upgrade works to the Air Handling Units and Air Filtration, with some additional minor alterations made to the water system.

WATER SYSTEM RISK ASSESSMENT

The ward remined closed until March 2022 where it was reopened and the children were decanted from Adults Ward 6A back to the newly refurbished Schiehallion Ward.

A Minor Injuries Unit (MIU) has been erected adjacent to the Adults A&E department with a cold water supply from this taken from the A&E department, running underground to the MIU where it supplies a water heater and outlets within the MIU. This unit shall be covered under a separate assessment.

Some other minor alterations have been made to the water system since building opening, though these have been localised (e.g. alterations made to dental clinics within the Childrens Clinic Area).

Town Mains

There are 2 separate incoming mains water supplies serving the cold water storage tanks within the basement plantroom of the Adults and Children's hospital building, and a separate dedicated fire main line supplying the fire tanks in the adjacent plantroom.

The incoming mains enter the building in the MTHW/Chilled Plantroom (Govan Road Mains) and basement tank room (Hardgate Road Mains) and run into the tank room to serve four off "Raw" water storage tanks and a single Trades water tank (the second Trades water tank has been isolated, drained and disconnected from the water system(s). These incoming mains both have double check valves and water meters fitted.

The water meters are linked to the BEMS system and allow the user to cross reference the quantity of water used against the quantity indicated on the external meter.

The Hardgate Road (small) mains supply feeds only the main fire sprinkler tanks in the basement fire tank plantroom.

There are various short deadlegs on the domestic water mains which may be used as drain down points, injection points or emergency bypass connection points. Some of these connection points (post filtered CWSTs) are being utilised by Scotmas for testing/sensor points for the chlorine dioxide (ClO_2) background dosing systems. All other drain down/injection points are included within site flushing regime.

The Govan Road supply as described as medium risk due to the long connection to the long (>20 metres) branch to Children's Clinic 12 Hydrotherapy Pool Balance Tank top-up, which is a potential Category 5 backflow risk. **Note:** DMA are due to install a category 5 break tank and booster pump to this line to provide backflow protection from the hydrotherapy pool and top-up tank which when fitted should reduce this mains line to "low risk".

CWSTs and Filtration System

QEUH Adult and Children's Hospital CWSTs

There are 10 domestic water storage tanks in the building which are all situated in the basement tank room.

Raw Water Tanks 1A/1B and 2A/2B are supplied by two town mains (Govan Road and Hardgate Road) to ensure continuity of supply in case of a town mains failure. The Raw Water tanks supply the Filtered Water tanks 1A/1B and 2A/2B via 3 x filtration sets (level of filtration advised by Estates is 0.2µm).

The filtration units fill the Filtered Water Tanks. Filtration sets should be maintained in accordance with manufacturer's instructions and maintenance schedule.

Each of the filtration units have a Scotmas ClO_2 dosing unit installed which operates on the backwash cycle of the filtration unit. These were fitted later than the original ClO_2 units on the domestic water systems to aid with microbiological control of the filters during backwashing. Note: the discharge water from the filtration unit backwash cycles are discharged to separate sumps to prevent stagnation in the sumps and assist with control microbiological growth in the sumps within the plantroom.

Filtered Water Tanks 1A and 1B are linked, with 2A and 2B also linked. All four tanks can be linked together (via valve on the supply lines to the booster pump sets) to supply domestic cold water including drinking water to the building with the exception of the trades system. The link between the tanks 1A/1B and 2A/2B was closed at the time survey with Filtered Tanks 1A/1B supplying the 5.3 Bar pump set (Boosted Pump Set 2) to plantrooms 21/22/41 and the corresponding outlets in these zones with 2A/2B supplying the 7.1 Bar pump set (Boosted Pump Set 1) to plantrooms 31/32/33 and the corresponding outlets in these zones.

WATER SYSTEM RISK ASSESSMENT

In late 2018 and early 2019 a ClO_2 system was installed on the domestic water system. Each of the post filter CWSTs has a ClO_2 dosing system (dosing to 0.4-0.5ppm of ClO_2) utilising water meter controlled proportional dosing (with in-tank reaction chambers) with ClO_2 and Chlorite monitoring stations fitted to the outlet lines prior to the booster pumps.

N.B. It should be noted that there is no separate dedicated supply to the Renal (or other medical) systems, with all being fed from the Filtered Water system. This means that system disinfections would require to be very carefully scheduled or carried out locally as the disinfection procedure/chemical may interfere with the renal/medical systems and impact on patient welfare.

On the Post Filter CWSTs in particular the internal supports/fittings are showing evidence of corrosion, with rust leaching into stored water and settling on tank base. It is recommended that all internal supports/fittings are replaced with suitable WRAS approved equivalents, or CWSTs replaced. Please also refer to Nicholson Plastics report from July 2021 regarding corrosion on support rods and nut/bolts within the CWSTs. DMA have submitted a proposal for replacing the CWSTs if original tank manufacturer/installer is unable to carryout a suitable repair of the corrosion issues.

Raised hatch screened vent on all of the domestic CWSTs appears unsuitable and should have suitably sized screened mesh fitted.

SHTM 04-01 recommends fitting water filled Glass Traps to the overflow and warning screens and Hepa Filtration to the air vents on the post filter CWST lids. If this is to be installed then vents on raised ball chamber would require to be sealed to ensure tanks remain sealed. It may be prudent to review the entire tank set-up to determine if this should be implemented and if any additional Category 5 weir overflows are required on the Raw Water CWSTs.

There are 2 x water booster sets in the water tank room. In the event of failure the outlet pipework from the booster pumps can be configured so that a single booster set could provide all water to the building (though DMA are unaware of this happening at any point during the buildings normal operations).

(Boosted Pump Set 1) – Feeding Plantroom 31, 32 & 33 - 7.1 Bar
(Boosted Pump Set 2) – Feeding Plantroom 21, 22 & 41 – 5.3 Bar

The expansion vessels attached to the CWST booster sets are not of a flow through design and they are not insulated. It appears that small, quarter turn valves have been fitted to both 7.1 Bar booster set and the Trade Water tank booster set. No fitted drain point on 5.0 Bar booster set at time of survey.

Each of the individual risers has a ClO_2 monitoring and top-up station fitted to the riser within the basement tank room which monitors the ClO_2 levels being discharged to the respective area supplied by the riser and is capable of topping up the ClO_2 levels within the line should this be required.

From the 2 No. water booster sets there are 8 domestic water systems:

- Plantroom 21
    - Via a Pressure reducing valve (PRV) the BCWS feed 21 CAL01/02/03
- Plantroom 22
    - Via a Pressure reducing valve (PRV) the BCWS feed 22 CAL01/02/03
- Plantroom 31
    - BCWS feeds 31 CAL01/02/03
- Plantroom 31
    - Via a Pressure reducing valve (PRV) the BCWS feeds 31 CAL07/08/09
- Plantroom 31
    - BCWS feeds 31 CAL04/05/06
- Plantroom 32
    - BCWS feeds 32 CAL01/02/03
- Plantroom 33
    - BCWS feeds 33 CAL01/02/03
- Plantroom 41
    - BCWS feeds 41 CAL01/02/03

WATER SYSTEM RISK ASSESSMENT

On the cold supply into each of the plantrooms there are ClO_2 monitoring and top-up stations fitted to the plantroom supplies which monitors the ClO_2 levels being discharged to the respective area and is capable of topping up the ClO_2 levels within the line should this be required.

Additional ClO_2 units are fitted on the return lines to each of the Calorifiers (8 banks of calorifiers), within monitoring station fitted at various locations throughout the Adult and Children's Hospitals.

All ClO_2 units are maintained and serviced by Scotmas.

The water supply into each plantroom is metered by a CWS flow meter. This allows for monitoring of specific parts of the system for energy purposes.

There are various connection points onto other "non-domestic" outlets such as renal dialysis, endoscopy wash, pressurisation units, and MRI chiller cooling which are connected to the Filtered Water system. Note: the steam humidifier units have been removed completely or cut back as far as practical to source, since previous assessment.

Branch from Booster Set 01 to pool plant room emergency shower. Hot supply removed and flow/return looped in Pool Plant Room A-1 FMB-030, and operational. DCV fitted approx. 4m downstream of branch after water meter in Basement A-1 FMB -024. Bib tap and Pool top up tank within the pool plantroom have been disconnected/removed. Emergency Shower should be included within site flushing regime (Note: No drain within the tank room)

The Trades Water System originally supplied "Non-domestic" outlets such as bib taps in plantrooms, irrigation connections points (DMA understand these are now all disconnected) and the 12th floor heli-pad fire suppression system. One side of the Trades tank was isolated and drained with the make-up to the tank removed. This tank now only supplies the 12th floor heli-pad fire suppression and bib taps on the 12th floor.

Calorifiers (PHE's with Storage Vessels)

The calorifiers are situated in various plant rooms throughout site. Locations are as follows:

- Plantroom 21 (Cals 21-1/2/3)
- Plantroom 22 (Cals 22-1/2/3)
- Plantroom 31 (Cals 31-1/2/3)
- Plantroom 31 (Cals 31-4/5/6)
- Plantroom 31 (Cals 31-7/8/9)
- Plantroom 32 (Cals 32-1/2/3)
- Plantroom 33 (Cals 33-1/2/3)
- Plantroom 41 (Cals 41-1/2/3)

These calorifiers, in turn supply domestic hot water services (DHWS) to designated zones within the hospital building. See Appendix 1 - Calorifier Wards and Areas Supplied and Appendix 2 - Distribution Zone Maps within section 6 of this report for calorifier locations and areas within the hospital fed from each Calorifier set.

Each set of calorifiers is a bank of 3-linked calorifiers fed from the boosted Bulk Water system, with heat source being via a plate heat exchanger on the outside of each calorifier fed from the MTHW system. A circulating pump on each calorifier/plate heat exchanger ensures the water is circulated throughout each vessel to maintain temperature.

Distribution flow temperatures were consistently above 60°C, with return temperatures to calorifiers consistently above 55°C on all calorifiers as recommended within L8/HSG 274 Part 2 and SHTM 04-01. All base temperature appeared satisfactory at time of survey also.

During the water system upgrade works during late 2018 and early 2019 each calorifier had the standard expansion vessel installed at construction phase removed and replaced with a flow through vessel, with appropriate pipework modifications to maintain flow to the system etc.

During the period of this survey all expansion vessels installed in 2018-19 were being replaced with new vessels.

Generally water flushed from drain on calorifiers and expansion vessels ran clear either instantly or after only a very short period of time (typically <10 seconds).

WATER SYSTEM RISK ASSESSMENT

Each calorifier set share a linked return which supplies all three calorifiers.

WATER SYSTEM RISK ASSESSMENT

Hot and Cold Water Systems

The domestic cold water system within the hospital is fed from the Bulk Water tanks located in the basement tank room of the hospital. There are no outlets fed directly from Town Mains within the building.

"Non-domestic" outlets such as bib taps in plantrooms, irrigation connections points (now removed) and the 12th floor heli-pad fire suppression system are fed from the Trades Water tanks. Please refer to the section 5 for information and supporting data relating to the CWSTs.

There are however some connection points onto other "non-domestic" outlets such as renal dialysis (both plant and individual 'emergency' points), endoscopy wash, pressurisation units, steam humidifier units and MRI chiller cooling which are connected to the Bulk Water system.

N.B. NHS Estates have fitted 'Emergency Dialysis' points on cold water system since the initial installation. NHS should confirm location of all Emergency Dialysis Points and ensure System Drawings and Asset Lists (not produced as part of this assessment) are updated to reflect this. Additional filtration and testing procedures should be incorporated into the use of these emergency points in light of the chlorine dioxide background dosing systems being installed on the domestic water system.

There are also numerous connection points and drain points on the domestic water system within plantrooms and risers (which DMA have assumed were installed for flushing purposes and bypasses) which are creating deadlegs on the system. It is advised that these be removed wherever practicable. Larger deadleg/flushing points are included within the site flushing regime.

The domestic hot water systems are fed from a series of Calorifiers located on the 2nd and 3rd floors in the adult hospital and on the 4th floor of the children's hospital. These calorifiers feed different areas/zones within the Hospital. Please refer to section 6 for information and supporting data relating to the calorifiers.

Cold water temperatures recorded by DMA vary with some indicating heat gain on the cold water system. Investigations should be carried out as to the reasons for this with appropriate remedial actions taken and ensuring that all oultets are in regular use, particularly where patients are bedbound/have low mobility and therefore less likely to use the water services within en-suite rooms.

Flushing valves are installed at a number of points on the domestic cold water system in the lower floors of the Adult and Children's Hospitals, however DMA have not been provided a list of locations of all valves. The operating conditions for the valves (e.g. temperature controlled/timed) should be reviewed to ensure these are suitable for the intended purpose.

The hot water temperatures recorded at outlets were generally satisfactory though some areas there appears to be issues with the localised hot flow and return system. We would advise this is investigated and the flow and return (re-)commissioned as appropriate.

The majority of the pipework runs at high level within the wards/departments with no local flow and returns dropping to the WHBs, sinks showers etc. (with the exception of Ward 2A/2B in the RHC).

It was generally noted that hot temperatures rose quickly when outlet temperatures were being recorded throughout the building and the flow and return circuits appear to be circulating hot water in most areas (please refer to section 7 for supporting data and exceptions). Note: Only sentinel and selected other outlets were checked during this assessment and 100% of outlets was not requested (or was practical) to review as part of this assessment).

Domestic water pipework runs above ceilings throughout the building. Access for ongoing monitoring of flow and return loops is problematic as ceiling tiles cannot be easily removed within the hospital environment and alternative methods of monitoring should be considered should current BEMS monitoring points not be sufficient for the hot flow and return system (e.g. additional BEMS monitoring points installed).

The vast majority of Thermostatic mixing valves (TMVs) installed are TMV taps, (Horne Optitherm in clinical areas and Armitage Shanks Contours in non-clinical areas, with Ward 2A/2B having Markwik 21+ TMTs) with the only exceptions noted being in non-patient area toilets with infrared taps which have a TMV mounted approximately 0.5m from the outlet.

Showers appear to be a standard design throughout the hospital with no adjustable heads noted during the survey. A quarterly regime of exchanging the shower heads and hoses with recyclable Dupal components is in

WATER SYSTEM RISK ASSESSMENT

place across the hospital.

DMA were advised by Mercury Engineering and Estates in 2015 that all materials fitted during the construction were WRAS approved and therefore do not support bacterial growth. However, subsequently DMA have been advised that some sections of pipework may have been 304 Stainless Steel rather than 316 Stainless Steel and that not all pipework and/or components are WRAS approved (Please also refer to Nicholson Plastics report from July 2021 regarding CWST components and comments within this assessment).

It is advised that should this be the case confirmation should be sought from the manufacturers and/or installers that the pipework/components are of a suitable standard and that this will not contribute to microbial growth, or in any other way impact on the safe operation of the water system(s).

EPDM flexible hoses have been installed in a small number of non-clinical areas (it is understood the majority (if not all of the Janitorial sinks within DSR/Facilities have flexible hoses) with the only patient areas DMA have noted as having flexible hoses being the connection to Arjo baths (both connections to the hot/cold system and internally within the actual bath). Wherever practicable it is recommend all flexi hoses are removed and connections hard piped. Note: at the time of survey DMA are working through list of connections to Arjo baths to replace flexible hoses with hard piped connections. This project will not replace any hoses on the internal sections of the Arjo baths.

Where flexible hoses cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered. In healthcare premises additional guidance on the replacement and use of flexible hoses is provided in the "safety action notice SAN(SC)09/03".

Flexible hoses have also been noted on the boosted bulk water system on pressure reducing valves. If possible, these should be hard piped (stainless steel) or WRAS approved hoses with linings other than EPDM should be considered. Should these not be available for these types of units/connections then a regular inspection and replacement schedule should be implemented for these.

The 12th floor heli-pad fire suppression system and bib taps within the 12th Floor Plantroom are fed from the Trades system with very long pipework runs through the building and plantrooms to the outlets. These are included within site flushing regime. Please also refer to section 8 for information on other risk systems. Note: Bib taps in lower plantrooms and the irrigation systems have all been disconnected form the Trades System.

A single bib tap has been reinstated using a temporary Hep2O connection from the cold supply to PR31 Calorifiers to the roof Garden on level 3 between the Adults hospital and RHC. This connection point s to provide a water supply for works which are due to commence on upgrading the roof garden, with DMA understanding this is to be removed upon completion of works.

It should be noted that the information and recommendations included within these pages relates to the outlets surveyed only though many of the conditions highlighted are likely to be replicated throughout the hospital. Issues and information included should not be taken as a complete data set and should be treated as a representative sample of the system conditions found within the hospital. (NHS records should also be consulted for additional information e.g. temperature excursions)

Other Risk Systems

There are various 'Other Risk Systems' on site which may create a risk from Legionellosis and or other waterborne bacteria. Please refer to Section 8 of this assessment for details of other systems.

WATER SYSTEM RISK ASSESSMENT

Risk Assessment Summary

Site Name	Queen Elizabeth University Hospital (Adults) Royal Hospital for Children	
No of Storeys	14 in Adult Hospital and 5 in Children's Hospital (including basement).	
Date of construction	Completed and handed over to NHS in January 2015 for phased occupation. Full occupancy achieved in July 2015.	
Date water services last upgraded	Original system with modifications as described within the assessment occurring in late 2018/early 2019 and ward 2A/2B upgrade works being completed in 2022.	
Is building used by potentially "at Risk" groups?	Persons with acute medical conditions	As the building is used by persons with acute/underlying medical conditions which increases susceptibly to contracting legionellosis then the requirements for L8, HSG 274 and HTM/SHTM 04-01 compliance is of paramount importance.
Is there a history of legionella colonisation of the water system(s) on site?	Very few instances of positive legionella results being returned, despite extensive sampling carried out across the hospital.	
Is there a history of "other" water borne bacterial colonisation of the water system(s) on site?	There are instances of "other" bacteria being detected as part of the sampling regime(s) implemented across the hospital. These generally take the form of Gram-negative bacteria or yeast/moulds in low counts, with a disinfection, flushing and re-sampling regime implemented when results detected.	
Risk Rating	Due to the increased susceptibility of some system users the water systems would be categorised as: • Potential for system to pose a hazard – Possible *(Mitigated by the control measures implemented in the form of a microbiological sampling regime, ClO_2 dosing and POU filters fitted in clinically designated "high Risk" areas.)* • Condition of system being assessed (deficiencies/non-compliances found) – Major (CWSTs) *(though there is mitigation measures in place as described above).* Therefore the water systems and the control regime would be classified as **Low Risk**	

Section 2

Recommendations

LEGIONELLA RISK ASSESSMENT

Suggested Remedial Action Timescales

Remedial Action Category	Recommended Remedial Action Timescale	Action
1	**Immediately / as soon as reasonably practicable**	**Urgent Significant Investigation & Urgent Remedial Action Required.** Senior Management Action Required. Carryout Review of Control Procedures Recommendations within this category should be carried out immediately/as-soon as-is-reasonably practicable. where appropriate remedial actions to rectify the faults cannot be taken **immediately/as-soon as-is-reasonably practicable** alternative actions to reduce the risk should be carried out, and continue to be carried out, until such times as recommended actions can be completed.
2	**As soon as reasonably practicable**	**Significant Investigation & Remedial Action Required.** Senior Management Action Required. Carryout Review of Control Procedures Recommendations within this category should be carried out **as-soon as-is-reasonably practicable**. Where appropriate remedial actions to rectify the faults cannot be carried out quickly, alternative actions to reduce the risk should be carried out, and continue to be carried out, until such times as recommended actions can be completed.
3	**Within 3 months**	**Investigate/Reduce.** Remedial Actions Required. Management responsibility should be specified. Recommendations within this category should be carried out in a timely manner, though simple and/or inexpensive tasks which would reduce the risk should be carried out as-soon-as-reasonably-practicable (e.g. **Within 3 months**). Additional monitoring/inspection to ensure risk does not increase should be carried out until actions completed.
4	**At first available opportunity**	**Maintain Level** Managed by Routine Planned Preventative Maintenance Procedures Whilst recommendations within this category do not significantly Alter the risk it is still advised that these actions are carried out **at first available opportunity**, typically within a 12 month period of recommendations being made.

For Details of Legionella Management Recommendations please refer to Section 9 of this assessment.

N.B. Prior to any alterations being carried out on fire systems (where recommended) the fire brigade and/or site fire safety consultants should be consulted, and approval of changes received

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Mains Water/Water Source)	Remedial Action Category	Assigned to	Actions Taken	Completed
All plant items & pipework	All plant items, pipework and valves should be labelled for identification purposes.	4			
Govan Road Mains Line	The is a long (>20 metres) branch via DCV and pressure reducer to Children's Clinic 12 Hydrotherapy Pool Balance Tank top-up. DCV on initial branch from incoming mains should be repositioned as close to tee as practical. Note: DMA are due to install a category 5 break tank and booster pump to this line to provide backflow protection from the hydrotherapy pool and top-up tank.	3			
Hardgate Road (Small Mains Line – Fire Tanks)	As this mains line is likely to have a low turnover of water (other than the site flushing regime) it is recommend the NHS confirms that this main is separated from domestic water mains by a double check valve or similar (possibly external to building) to prevent potentially stagnant water from contaminating the domestic mains.	3			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (CWSTs & Basement Tank Room)	Remedial Action Category	Assigned to	Actions Taken	Completed
Raw Water CWSTs 1A, 1B, 2A, 2B Post Filter CWSTs 1A, 1B, 2A, 2B	All tanks have stainless-steel flange supports which may permit water ingress similar to hollow tank lid supports. Hollow tank supports are recommended to be replaced with solid support beams within HSG 274 and SHTM 04-01. Hollow flange supports are a much less common support structure and it is recommended that these supports are checked to ensure that they are not permitting water ingress, and if found that they are, should be removed and replaced with solid alternatives.	2			
Post Filter CWSTs 1A, 1B, 2A, 2B	Internal supports/fittings showing evidence of corrosion, with rust leaching into stored water and settling on tank base. Recommend all internal supports/fittings are replaced with suitable WRAS approved equivalents. Please also refer to Nicholson Plastics report from July 2021 regarding corrosion on support rods and nut/bolts within the CWSTs. DMA have submitted a proposal for replacing the CWSTs if original tank manufacturer/installer is unable to carryout a suitable repair of the corrosion issues.	2			
Raw Water CWSTs 1A, 1B, 2A, 2B Post Filter CWSTs 1A, 1B, 2A, 2B	Additional access hatches on tanks for cleaning/inspection purposes should be considered.	3			
Raw Water CWSTs 1A, 1B, 2A, 2B Post Filter CWSTs 1A, 1B, 2A, 2B	Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted.	3			
Post Filter CWSTs 1A, 1B, 2A, 2B	SHTM 04-01 recommends fitting water filled Glass Traps to the overflow and warning screens and Hepa Filtration to the air vents on the tank lids. If this is to be installed then vents on raised ball chamber would require to be sealed to ensure tanks remain sealed. It may be prudent to review the entire tank set-up to determine if this should be implemented and if any additional category 5 weir overflows are required on the Raw Water CWSTs.	3			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (CWSTs & Basement Tank Room)	Remedial Action Category	Assigned to	Actions Taken	Completed
7.1 Bar Pump Set (Boosted Pump Set 1) 5.3 Bar Pump Set (Boosted Pump Set 2) Trade Water Tank 1	Ideally all expansion vessels should be of flow through type – where this is not practical, they should be fitted vertically on the cold supply, as close to plant items as possible with a fitted drain valve (where compliant with current regulations) to allow regular recorded flushing of the vessel.	**3**			
7.1 Bar Pump Set (Boosted Pump Set 1) 5.3 Bar Pump Set (Boosted Pump Set 2) Trade Water Tank 1	Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable).	**3**			
Trade Water Tank 1	Relocate DCV closer to tee - >2m at present after meter.	**3**			
7.1 Bar Pump Set (Boosted Pump Set 1) 5.3 Bar Pump Set (Boosted Pump Set 2)	There is a link/breach pipe on the outlets of the Filtered/Filter water tanks prior to the pump sets which can be opened to allow all tanks both pump sets. This was closed at time of survey, though DMA have noted this link/breach pipe open on previous visits. This line should be opened and flushed as part of site flushing regime.	**3**			
7.1 Bar Pump Set (Boosted Pump Set 1) 5.3 Bar Pump Set (Boosted Pump Set 2)	There is a link pipe between the 5.3 bar (Boosted Pump Set 2) and 7.1 Bar (Boosted Pump Set 1) pipework systems after the booster sets. DMA advised previously by estates this section is drained and is in place for emergency purposes, should either of the booster sets fail to allow for water services to be maintained to the hospital. Prior to being put into use the link section should be thoroughly flushed and disinfected.	**3**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (CWSTs & Basement Tank Room)	Remedial Action Category	Assigned to	Actions Taken	Completed
Filtration Units	It was noted during the survey of Level -1 Basement Plant Room CWSTs and associated filtration plant that 2 x non-WRAS approved butterfly valve assemblies have been installed on Filtration Unit 3. These valves (Tomoe 700Z) have diecast aluminium bodies and appear to be intended for marine/saltwater applications. Verification has been received from the manufacturer stating that these valves are not deemed suitable for potable use and carry no WRAS approval to date. It should be confirmed that all persons/contractors carrying out works on the domestic water systems on site, use only WRAS approved materials and that any/all materials used are deemed suitable for potable use and carry the required certifications/approvals.	**3**			
Deadlegs (Various) - See Section 5 for details	All deadlegs should be removed wherever practical (All on site flushing regime at present)	**3** **(or Ongoing PPM)**			
All Plant items and Pipework	All associated valves should be correctly labelled for identification purposes.	**4**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Calorifiers & Associated Plantrooms)	Remedial Action Category	Assigned to	Actions Taken	Completed
Calorifier PR22 - 01/02/03	Large deadlegs created on linked pipework to offline calorifier 1 – these should be included in recorded site flushing regime, until such times as reinstated to full daily use.	**2**			
Calorifier PR41 - 01/02/03	Large deadlegs created on linked pipework to offline calorifiers 1 & 2 – these should be included in recorded site flushing regime, until such times as reinstated to full daily use. Checks should be made during upgrade works that hot water to Childrens hospital maintains correct flow and return temperatures.	**2**			
Plantroom 21	There is a deadleg behind the water tank within the Childrens Renal Plantroom. Unable to locate where this branch is fed from. If practical this should be removed. (Note: Line currently included in site flushing regime).	**3 (Or ongoing ppm)**			
All Plantrooms	Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 21. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions.	**3**			
Plantroom 21	15 mm lines branch from same line as supplying the AHUs and run approximately 50m to HTG pressurisation units (at pumps PR21 PU11/12/13 SH), with a separate branch running approximately 10m to CHW pressurisation unit (at pumps PR21 PU03/04/05 SCW). Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted (Note: Lines currently included in site flushing regime). Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted to fast fill connection.	**3**			
Plantroom 21	There is a branch from the Boosted Cold Water Services (BCWS), dropping from high level and measuring approximately 150mm of 54mm pipework. This should be removed if no longer required or included within site flushing regime.	**3 (Or ongoing ppm)**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Calorifiers & Associated Plantrooms)	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 22	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime.	**3**			
Plantroom 22	Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted (Note: lines included within site flushing regime). Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection.	**3**			
Plantroom 31	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime.	**3** **(Or ongoing ppm)**			
Plantroom 31	There is a line branching at high level from the cold supply to Calorifiers 31-04/05/06 with a check valve fitted approximately 1metre from the tee off point which then runs approximately 20 metres to RPZ on supply line to MRI Chillers (emergency cooling supply). Line to MRI Chiller should, if practicable, be switched to trades system (confirm water quality, pressure and flow rates etc. required to chiller prior to amending supply line) (Note: line included within site flushing regime).	**3** **(Or ongoing ppm)**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Calorifiers & Associated Plantrooms)	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 31	Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted (Note: lines included within site flushing regime). Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection.	**3**			
Plantroom 32	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime.	**3** **(Or ongoing ppm)**			
Plantroom 32	Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. (Note: lines included within site flushing regime).	**3**			
Plantroom 33	There is a branch from the Boosted Cold Water Services located at high level (Near entrance to plantroom) which measures approximately 25 metres with 2 x drops of 2 metres in 54mm pipework to capped and valved off connection points and also branching and reducing to 15mm to supply pressurisation units (with no visible check valves) on the line. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted *(**Note**: lines included within site flushing regime)*. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection.	**3**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Calorifiers & Associated Plantrooms)	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 33	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime.	**3** **(Or ongoing ppm)**			
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	Optitherm Servicing and Thermal Disinfection Station (and line for future connection) should be removed fully from use leaving no deadlegs (DMA staff currently flush lines daily).	**3** **(Or ongoing ppm)**			
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	As the TMV/Filter Service Room (DMA site office) is not a clinical area it is advised that insulation is fitted on hot and cold pipework as close as is practical to the outlets. This would aid in minimising heat gain in cold line to this room (though it would appear the majority of the heat gain on the cold lines would occur outwith the office area where pipework runs adjacent to hot water/heating pipework).	**3**			
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	Expansion vessel at Plate heat exchanger should be changed to flow through type, or have suitable drain fitted to line to allow vessel to be flushed.	**3**			
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level near 41AHU03B which runs approximately 10 metres in 15mm pipework to supply a CHW pressurisation unit, with line hard piped into the closed system. This should be disconnected from closed system and line added to the flushing regime (Cat 4/5 backflow risk).	**3**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Calorifiers & Associated Plantrooms)	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level near 41AHU05 which runs approximately 3m to blanked valve before splitting to run to two separate HTG Pressurisation units in 15mm – a 4m line to one unit and a 15 metre line to the other unit. (Note: one line included within site flushing regime). One of the lines is hard piped into the closed system. This should be disconnected from closed system and line added to the flushing regime (Cat 4/5 backflow risk).	**3**			
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level which runs approximately 8 metres and reducing 22mm. This line formerly supplied a pressurisation unit and Condair Humidification units at 41AHU27A, though these has now been disconnected, and then continued on to supply a pressurisation unit and Condair Humidification units at 41AHU27B, which have also been disconnected. This line should be removed if no longer required. (Note: lines included within site flushing regime)	**3** **(Or ongoing ppm)**			
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level above 41AHU24 which measures approximately 20 metres of 15mm pipework to supply CHW pressurisation unit. The line is hard piped into the closed system. This should be disconnected from closed system (Cat 4/5 backflow risk). (Note: line included within site flushing regime).	**3**			
Plantroom 41	There is a 3m deadleg (15mm) to a valve from this line at 41AHU24 – this line should be removed if no longer required (Note: line included within site flushing regime).	**3** **(Or ongoing ppm)**			
Plantroom 41	Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted.	**3**			

WATER SYSTEM RISK ASSESSMENT

Location/Plant Item	Recommendations (Calorifiers & Associated Plantrooms)	Remedial Action Category	Assigned to	Actions Taken	Completed
Plantroom 41	54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime.	**3** **(Or ongoing ppm)**			
All Calorifiers	Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime.	**3**			
All Calorifiers	Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel.	**3**			
All Calorifiers	Ensure all temperature gauges are calibrated correctly and/or replaced where required.	**3**			
All Plant items and Pipework	All associated valves should be correctly labelled for identification purposes.	**4**			

WATER SYSTEM RISK ASSESSMENT

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Recommendations (Risers)	Remedial Action Category	Assigned to	Actions Taken	Completed
Children's 4th Floor CC4-021	M39 (RHC)	PR 41 01/02/03	Cold temperature too high with lever valve in half open position - investigate and correct.	2			
Children's Ground Floor CC0-008	M38 (RHC)	PR 41 01/02/03	Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime.	2			
Adults 4th Floor Ward A RENW-278	T12 (Adult)	PR32 01/02/03	Investigate steady leak on hot flow pipework, replacing any/all pipework and fittings required in area. Fully replace all damaged pipework insulation in riser.	2			
Children's Ground Floor CC0-021	M39 (RHC)	PR 41 01/02/03	Investigate visible leak under hot return line, taking any required remedial actions to correct.	2			
Children's 1st Floor CC1-021	M39 (RHC)	PR 41 01/02/03	Small cold temperature too high - investigate and correct.	2			
Adults 11th Floor Ward A GENW21-068	T12 (Adult)	PR32 01/02/03	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly and not creating a column of stagnant water.	2			
Adults 11th Floor Ward C GENW23-068	T5 (Adult)	PR31 07/08/09	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly and not creating a column of stagnant water.	2			
Adults 11th Floor Ward B GENW24-068	T4 (Adult)	PR31 04/05/06	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly, not creating a column of stagnant water.	2			
Adults 11th Floor Ward D GENW22-068	T13 (Adult)	PR33 01/02/03	There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly, not holding stagnant water.	2			
Adults 9th Floor Ward B GENW16-068	T4 (Adult)	PR31 04/05/06	Visible leak from isolated deadleg branch on hot flow with corrosion visible on lever valve - further investigation required to establish if all pipework, fittings and connections are water tight.	2			

WATER SYSTEM RISK ASSESSMENT

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Recommendations (Risers)	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 3rd Floor Plantroom 31 at 31AHU29	M7 (Adult)	PR31 01/02/03	15mm line to open end (Valved off) - this should be removed if no longer required (or retained on site flushign regime)	3			
Adults 9th Floor Ward B GENW16-068	T4 (Adult)	PR31 04/05/06	Approximately 0.5 metre of insulation on hot flow missing due to leak damage - confirm all pipework, fittings and connections are water tight and replace insulation.	3			
Children's 1st Floor CC1-008	M38 (RHC)	PR 41 01/02/03	Ensure any leaks are recitified and any damage caused by the leaks is repaired.	3			
Children's 2nd Floor CC2-008	M38 (RHC)	PR 41 01/02/03	Ensure any leaks are recitified and any damage caused by the leaks is repaired.	3			
Children's 3rd Floor CC3-008	M38 (RHC)	PR 41 01/02/03	Ensure any leaks are recitified and any damage caused by the leaks is repaired.	3			
Adults 1st Floor Atrium MDU-052	M21 (Adult)	PR31 01/02/03	Ensure temperature gauges are calibrated correctly.	3			
Adults 2nd Floor Theatres THE-359	M7 (Adult)	PR31 01/02/03	Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.	3			
Adults 9th Floor Ward D GENW14-068	T13 (Adult)	PR33 01/02/03	Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.	3			
Adults 4th Floor Ward C RENW-212	T5 (Adult)	PR31 07/08/09	Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.	3			
Adults 6th Floor Ward C GENW3-068	T5 (Adult)	PR31 07/08/09	Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.	3			
Adults 7th Floor Ward C GENW7-068	T5 (Adult)	PR31 07/08/09	Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.	3			

WATER SYSTEM RISK ASSESSMENT

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Recommendations (Risers)	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 5th Floor Ward C GENWC-068	T5 (Adult)	PR31 07/08/09	Evidence of historic leak damage on insulation and visible leak from both flow and return branch fittings, with corrosion visible on fittings and valves - further investigation required to establish if all pipework, fittings and connections are water tight, replacing where required and repairing/replacing insulation where necessary.	3			
Adults 8th Floor Ward C GENW11-068	T5 (Adult)	PR31 07/08/09	Evidence of historic leak damage on insulation and visible leak from both flow and return branch fittings, with corrosion visible on fittings and valves - further investigation required to establish if all pipework, fittings and connections are water tight, replacing where required and repairing/replacing insulation where necessary.	3			
Adults 9th Floor Ward C GENW15-068	T5 (Adult)	PR31 07/08/09	Evidence of historic leak damage on insulation and water pooling under hot flow branch insulation, with corrosion visible on lever valve - further investigation required to establish if all pipework, fittings and connections are water tight.	3			
Adults 9th Floor Ward A Next to GENW13-068	T12 (Adult)	PR32 01/02/03	Evidence of leak damage under hot flow insulation - further investigation required to establish if all pipework, fittings and connections are water tight.	3			
Adults 7th Floor Ward D GENW6-068	T13 (Adult)	PR33 01/02/03	Gauge on hot return damaged and missing screen - inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.	3			
Childrens 1st Floor Theatre Corridor THE-027	M30 (Adult)	PR22 01/02/03	Hot return temperature gauge missing – this should be replaced.	3			
Childrens Ground Floor X-Ray/Imaging Corridor RCG-008	M30 (Adult)	PR22 01/02/03	Hot return temperature gauge missing – this should be replaced.	3			

WATER SYSTEM RISK ASSESSMENT

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Recommendations (Risers)	Remedial Action Category	Assigned to	Actions Taken	Completed
Childrens 1st Floor Theatre THE-132	M38A (Adult)	PR22 01/02/03	Hot return temperature gauge missing – this should be replaced.	3			
Adults 1st Floor Atrium STW-012	M10 (Adult)	PR31 01/02/03	Hot return temperature gauge missing where hot returns from below – this should be replaced.	3			
Multiple Risers - See Section 7 Riser Surevy for details on locations			Inspect return temperature gauge for accuracy – this should be recalibrated or replaced if required.	3			
Adults 11th Floor Ward C GENW23-068	T5 (Adult)	PR31 07/08/09	Investigate potential leak on hot return line on isolated branch - evidence of leak damage.	3			
Children's 2nd Floor SCH-038	M36 (RHC)	PR 41 01/02/03	Maintain dealegs on flushing regime, or remove if no longer required.	3 (or ongoing ppm)			
Adults 1st Floor Atrium STW-012	M10 (Adult)	PR31 01/02/03	Minimal sections of insulation missing on cold, hot flow and hot return pipework (<1m) as it rises to supply services - this should be refitted.	3			
Adults 1st Floor Corridor (at 1C) STW-012	M7 (Adult)	PR31 01/02/03	Small deadleg on pipework - this should be removed if no longer required, or retained on site flushing regime.	3			
Adults 5th Floor Ward D CA5-014	T2 (Adult)	N/A	There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 6th Floor Ward D CA6-014	T2 (Adult)	N/A	There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 7th Floor Ward D CA7-014	T2 (Adult)	N/A	There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			

WATER SYSTEM RISK ASSESSMENT

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Recommendations (Risers)	Remedial Action Category	Assigned to	Actions Taken	Completed
Adults 8th Floor Ward D CA8-014	T2 (Adult)	N/A	There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 9th Floor Ward D CA9-014	T2 (Adult)	N/A	There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 10th Floor Ward D CA10-014	T2 (Adult)	N/A	There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Adults 11th Floor Ward 11D CA11-014	T2 (Adult)	N/A	There is no access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.	3			
Childrens 1st Floor Theatre THE-143	M27 (Adult)	PR22 01/02/03	All pipework should be correctly labelled for identification purposes.	4			
Children's Ground Floor CC0-021	M39 (RHC)	PR 41 01/02/03	BCWS line directional labelling appears incorrect - investigate and correct as required.	4			
Adults 7th Floor Ward C GENW7-068	T5 (Adult)	PR31 07/08/09	Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.	4			
Children's 4th Floor CC4-008	M38 (RHC)	PR 41 01/02/03	Hot flow and return pipework labelled incorrectly (wrong way round) - labelling should be corrected.	4			
Adults 4th Floor Ward D RENW-270	T13 (Adult)	PR33 01/02/03	Label all pipework within riser correctly for identification purposes.	4			
Adults 4th Floor Ward C RENW-212	T5 (Adult)	PR31 07/08/09	Label all pipework within riser correctly for identification purposes.	4			

WATER SYSTEM RISK ASSESSMENT

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Recommendations (Risers)	Remedial Action Category	Assigned to	Actions Taken	Completed
Childrens 1st Floor Theatre Corridor THE-027	M30 (Adult)	PR22 01/02/03	Pipework unlabelled - All pipework should be correctly labelled for identification purposes.	**4**			
Multiple Risers - See Section 7 Riser Surevy for details on locations			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)	**Ongoing Monitoring**			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
0	Adults	A&E	EMC-037	Disabled Toilet	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
0	Adults	Acute Assess	AAW-193	Toilet	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
0	Adults	Acute Assess	AAW-208	Dirty Utility	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
0	Adults	Orthotics	ORT-045	Toilet	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
0	Adults	A&E	EMC-086	Facilties	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
0	Adults	A&E	EMC-111	Female Change	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
0	Adults	A&E	EMC-135	Store	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
10	Adults	Ward 10D	GENW18-028	Bed 15	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
9	Adults	Ward 9B	GENWD-036	Room 97 (en-suite)	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
7	Adults	Ward 7B	GENW6-036	Bed 97 (en-suite)	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
7	Adults	Ward 7D	GENW6-028	Bed 44 (en-suite)	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.	2			
1	Adults	Critical Care	CCW-126	Dirty Utility	Hot flow and return not operating correctly in area. Flow and return operates as a constant once through loop. All visible valves in open positions. Optitherms required 10 minutes flushing to achieve recorded temperature - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. (Limited access to pipework in open ward area due to patient care).	2			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
1	Adults	Children's Theatres	THE-069	Lab	Ice flaking machine and associated pre-filter taken from tee on cold supply to area. No visible backflow protection on supply to filter. Ensure any required backflow protection is fitted as close to tee where line branches. Ice should not be allowed to stagnate in an ice-making machine's storage bin, but should be changed frequently. For guidance on infection-control precautions with regard to ice-making machines, see Scottish Health Facilities Note 30: 'Infection control in the built environment'. Maintenance for ice-making machines should be carried out in accordance with the manufacturer's recommendations. Care should be taken to ensure that the water supply to the ice-making machine is not subjected to heat gain.	3			
1	Adults	OPD	OPD1-085	Toilet	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	Children's Theatres	THE-118	Anaesthetics Room 2	Cold temperature high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	Children's Theatres	THE-156	Bed Bay 2	Cold temperature high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
4	Adults	Ward 4A	RENW-028	Bed 14 (En-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
4	Adults	Ward 4C	RENW-156	Room 63 Ensuite	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
6	Adults	Corridor	WS6-019	Toilet	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
6	Adults	Ward 6A	GENW1-034	Bedroom 14 (Ensuite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
6	Adults	Ward 6B	GENW4-032	Bathroom A	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
6	Adults	Ward 6B	GENW4-036	Bed 96 (En-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
7	Adults	Ward 7B	GENW6-036	Bed 97 (en-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
7	Adults	Ward 7B	GENW8-032	Bed 98 (en-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
7	Adults	Ward 7D	GENW6-034	Bed 42 (En-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
8	Adults	Ward 8A	GENWD-029	Room 13 (en-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
8	Adults	Ward 8D	GENW10-058	Room 32 (en-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
9	Adults	Corridor	WS9-019	Toilet	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
9	Adults	Ward 9A	GENW13-034	Bathroom 15	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
9	Adults	Ward 9D	GENW14-034	Bed 42 Ensuite	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
10	Adults	Ward 10A	GENWD-029	Bed 13 (En-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
10	Adults	Ward 10B	GENW20-032	Bed 98 Ensuite	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
11	Adults	Ward 11A	GENWD-029	Bed 13 (En-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	RHC	Children's Theatres	THE-009	WC	Cold temperature high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
2	RHC	Asceptic Unit	ASU-036	Staff Change	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
2	RHC	Ward 2A	SCH-003	Bedroom 25 (En-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
3	RHC	Ward 3C	GW1-048	Staff WC	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
9	Adults	Ward 9B	GENWD-036	Room 97 (en-suite)	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
7	Adults	Ward 7D	GENW6-028	Bed 44 (en-suite)	Cold temperature high, though temperatures in surrounding area acceptable. Investigate and correct.	3			
10	Adults	Ward 10A	GENW17-034	Room 15 (en-suite)	Cold temperature high, though temperatures in surrounding area acceptable. Investigate and correct.	3			
0	RHC	Children's A&E (Next to Courtyard 2)	EMC-018	Childrens Resus	Cold temperature high, though temperatures in surrounding area acceptable. Investigate and correct.	3			
0	Adults	A&E	EMC-111	Female Change	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
0	Adults	Acute Assess	AAW-060	Toilet	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
0	Adults	Acute Assess	AAW-089	Bedroom 85	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
0	Adults	Discharge Lounge	DLO-006	Toilet	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
0	Adults	Radiology	RAG-068	Toilet	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
0	Adults	Radiology	RAG-092	Toilet	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	OPD	OPD1-037	Toilet	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	Radiology	RAF-087	Male Change Room	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	Restaurant	RES-035	Disabled Toilet	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	Stroke	STW-082	Therapies Treatment Room	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
2	Adults	Adult Theatres	THE-079	On Call Room en-suite	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
2	Adults	Adult Theatres	THE-319	Dirty Utility	Cold temperature slightly high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
2	Adults	Dermatology	DMW-031	Bed 6 (En-suite)	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
4	Adults	Ward 4C	RENW-153	Room 62 Ensuite	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
5	Adults	Ward 5A	GENWA-029	Bed 13 Bathroom	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
0	Adults	Acute Assess	AAW-193	Toilet	Cold temperature slightly high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
0	Adults	Radiology	RCG-068	Baby Sleep	Cold temperature slightly high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
1	Adults	OPD	OPD1-063	Dirty Utility	Cold temperature slightly high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
2	Adults	Dermatology	DOPD-025	Technician	Cold temperature slightly high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			
2	Adults	Renal	RENO-064	No name ("Laser in Use" sign next to door)	Cold temperature slightly high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
2	Adults	Renal	RENO-064	No name ("Laser in Use" sign next to door)	Confirm suitable backflow protection fitted at tees to 2 x BCWS branches to Renal Test Points and 3 x isolated undersink connections.	3			
1	Adults	Radiology	RAF-087	Male Cyhange Room	LHS TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	Acute Assess	AAW-208	Dirty Utility	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	Acute Assess	AAW-240	Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	OPD/ Concourse	OPDO-075	Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	Radiology	RAG-103	Store Room	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
1	Adults	Radiology	RNM-018	NO SIGN ON DOOR	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
2	Adults	Dermatology	DMW-025	Bathroom A	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
5	Adults	Ward 5B	GENWD-032	Disabled Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
9	Adults	Corridor	WS9-019	Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	RHC	Clinic 14	CPS-006	Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
4	RHC	DCFP	DCFP-013	Staff Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	Acute Assess	AAW-038	Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
1	Adults	OPD	OPD1-037	Toilet	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	RHC	Children's A&E (Next to Courtyard 2)	EMC-018	Childrens Resus	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
2	Adults	Adult Theatres	THE-319	Dirty Utility	TMT out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	Acute Assess	AAW-060	Toilet	TMT slightly out of specification and requires reset and/or fully serviced or replaced if required.	3			
0	Adults	Acute Assess	AAW-193	Toilet	TMT slightly out of specification and requires reset and/or fully serviced or replaced if required.	3			

WATER SYSTEM RISK ASSESSMENT

Level	Adults / RHC	Department / Ward	Door Code	Room Name	Recommendations (Hot and Cold Outlets)	Remedial Action Category	Assigned to	Actions Taken	Completed
9	Adults	Ward 9B	GENWD-036	Room 97 (en-suite)	Uninsulated hot & cold pipework in direct contact with each other, causing heat transfer - Investigate and correct.	3			
0	Adults	Discharge Lounge	DLO-006	Toilet	Water Hammer and pulsing through solenoid/TMV - Investigate and correct.	3			
		All DSR/Facilities		All DSR/Facilities	Janitorial Sinks have EPDM flexible hoses installed within the sink unit. These should be replaced with hard piped serviced (if practical) or replaced with suitable alternative flecixible hoses e.g. PEX)	3			

Section 3

Site/Client Details

WATER SYSTEMS RISK ASSESSMENT

Site/Client Details

Client	GG&C QEUH
Client address Client contact Telephone No. E-mail Mobile No.	Queen Elizabeth University Hospital 1345 Govan Road Glasgow Kerr Clarkson [redacted] kerr.clarkson[redacted] [redacted]
Wards Being Assessed	Queen Elizabeth University Hospital (Adults) Royal Hospital for Children (RHC)

Method of Submission	Electronic

WATER SYSTEMS RISK ASSESSMENT

General Site Details

Site	Queen Elizabeth University Hospital (Adults) and Royal Hospital for Children
Age of building	Opened in 2015 (Building and Commissioning 2011-2015)
Years since upgrade/renovation of water services	Original system with modifications as described within the assessment occurring in late 2018/early 2019 and ward 2A/2B upgrade works being completed in 2022.
Purpose/use of building	Hospital
Operational cycle of the water system being assessed?	Continuous
Potentially affected population	Staff, Contractors, Visitors, Patients, General public
Is the building used by "at risk" or "particularly vulnerable" persons	Yes - Acute medical conditions, with the likelihood that some may be more susceptible to legionellosis and or other water borne pathogens.
Total number of people usually in building (including staff/sub-contractors visitors/pupils etc.)	Variable depending on occupancy levels etc. (Approx. 1350 Beds, plus outpatient's departments etc.)
Applicable Legionella standard(s)	ACoP L8 (HSG-274), SHTM 04-01

WATER SYSTEMS RISK ASSESSMENT

Identification of Systems and Scope of Assessment

Domestic Water System		Present on Site Included in Assessment
Evaporative cooling tower or condenser systems (and associated water system)		N/A
Fountains and water features		N/A
Hydrotherapy Pool		Present on site Covered under separate assessment
Whirlpool/Arjo Baths		Present on site (Non Whirlpool variety)
Dental equipment		Present on site
Vehicle wash systems (inc. Trolley Wash & Power Washing Plant)		N/A
Emergency showers		Present on site (A&E Decontamination unit)
Irrigation systems		N/A Disconnected/No longer present on site
Sprinkler/Wet fire-fighting systems		Present on site Not covered under this assessment
Water softeners		None identified to DMA
Industrial process water systems		N/A
Machine coolants		N/A
Air washers, wet scrubbers, particle and trivial gas scrubbers		N/A
Spray humidifiers		N/A Disconnected/No longer present on site
Ultrasonic humidifiers/foggers and water misting systems		N/A
Recycled Water Systems		N/A
Closed heating water systems (MTHW)		Present on site
Closed chilled water systems		Present on site
Other 'at-risk' systems	Renal Dialysis Plant (Adults & Childrens) (Plus other emergency dialysis points within wards)	Present on site
	Endoscopy Wash/Filtration Unit	Present on site
	Medical Gases/Medical Equipment (e.g. Nebulisers, incubators etc.)	Present on site
	Emergency Cooling (MRI Chiller)	Present on site

N.B. Systems assessed in this document as per client specification.

WATER SYSTEMS RISK ASSESSMENT

Legionella Control Measures Currently Used on Site

What is the primary control method for legionella control for the domestic water systems currently used on site and are there any supplementary or replacement control systems on site?#	
	Control measure
Temperature controlled	Primary
Chlorine dioxide	Secondary
Hydrogen peroxide/silver ion	Not used
Silver/copper ion	Not used
Ultraviolet	Not used
Other (0.2µm filters between Raw and Bulk Tanks)	Secondary
Point of Use (Pall) Filters on Outlets	Secondary (Fitted in clinically designated "High Risk" areas)

Section 4

Water Source

WATER SYSTEM RISK ASSESSMENT

Summary of Risk Potential

Town mains water is generally not expected to present a significant risk for the contamination of a system with legionella, though it may be assumed that legionella in low concentrations could be present in the mains water on occasion. Therefore it must be assumed that it is not practical to prevent legionella entering the water system at some point.

There are, in addition, other bacteria, contaminants and physical factors that can create a risk to mains water users in the building.

Where the water source to the site is from a natural source, e.g. River, lake, spring or private water supply then the potential for legionella contamination increases.

N.B. Unless specifically stated otherwise the incoming mains/water source has been assessed from point of entry to the building. External & underground water services which serve the building and are not visible have not been assessed.

Please refer to water source sheets for specific recommendations and risk ratings.

WATER SYSTEM RISK ASSESSMENT

Id no.		Hardgate Road (Large)	Recommendations and Comments	Assigned to	Completed
Labelled		Mains: Yes Pipework: Yes Valves: No	All plant items, pipework and valves should be labelled for identification purposes. **Comments:** No access to point where incoming mains enters the building. Access only available up to point where it enters into high level passageway before entering basement tank room. Deadlegs (drain points/injection points) on the incoming mains on are incorporated into site flushing regime.		
Access		Good			
Type		Town Mains			
Supply company		Scottish Water			
Services supplied		Raw Water CWSTs 1A & 2A			
Location		-1 Basement CWST Plant Room			
Size		150mm			
Material		MDPE, Stainless steel			
Double check valve fitted		Yes			
Drain/injection point		None visible			
Temperature (ºc)		9.4			
Pipework insulated		Yes			
Incoming Water	pH	7.4			
	Residual free chlorine	0.43			
Isolation valve		Yes			
Deadlegs		See comments			
Non WRAS materials		None visible			
Level of Risk		**Low**			

WATER SYSTEM RISK ASSESSMENT

Id no.		Govan Road	Recommendations and Comments	Assigned to	Completed
Labelled		Mains: Yes Pipework: Yes Valves: No	All plant items, pipework and valves should be labelled for identification purposes. The is a long (>20 metres) branch via DCV and pressure reducer to Children's Clinic 12 Hydrotherapy Pool Balance Tank top-up. DCV on initial branch from incoming mains should be repositioned as close to tee as practical. **Note:** DMA are due to install a category 5 break tank and booster pump to this line to provide backflow protection from the hydrotherapy pool and top-up tank. **Comments:** Water meter and check valve in main tank room after connection to trades water tank. Deadlegs (drain points/injection points) on the incoming mains within the tank room on are currently incorporated into site flushing regime. 22mm-15mm branch supplying LTHW pressurisation unit within room where mains enters the building are currently incorporated into site flushing regime.		
Access		Good			
Type		Town mains			
Supply company		Scottish Water			
Services supplied		Raw Water CWSTs 1B & 2B LTHW Pressurisation Unit (A-1 FMB-006) Hydrotherapy Pool Balance Tank Top-Up Trade Water CWST 1			
Location		-1 Basement CWST Plant Room (A-1 FMB-006)			
Size		150mm			
Material		MDPE, Stainless steel			
Double check valve fitted		Yes			
Drain/injection point		Yes			
Temperature (ºc)		9.2			
Pipework insulated		Yes			
Incoming Water	pH	7.4			
	Residual free Chlorine	0.48			
Isolation valve		Yes			
Deadlegs		See comments			
Non WRAS materials		None visible			
Level of Risk		**Medium**			

WATER SYSTEM RISK ASSESSMENT

Id no.		Hardgate Road (Small – Fire Tanks)	Recommendations and Comments	Assigned to	Completed
Labelled		Mains: Yes Pipework: Yes Valves: No	As this mains line is likely to have a low turnover of water (other than the site flushing regime) it is recommend the NHS confirms that this main is separated from domestic water mains by a double check valve or similar (possibly external to building) to prevent potentially stagnant water from contaminating the domestic mains. All plant items, pipework and valves should be labelled for identification purposes. **Comment:** The 2 basement Fire Tanks (within basement Fire Tank Room) are included within the site flushing regime with the tanks being flushed for a period of up to 30 minutes to flush fresh water into the tanks and to flush the mains make-up line to the tanks.		
Access		Good			
Type		Town mains			
Supply company		Scottish Water			
Services supplied		Fire tanks			
Location		-1 Basement CWST Plant Room			
Size		54mm			
Material		MDPE, Stainless steel			
Double check valve fitted		Yes			
Drain/injection point		Yes			
Temperature (ºc)		Not Run			
Pipework insulated		Yes			
Incoming Water	pH	-			
	Residual free Chlorine	-			
Isolation valve		Yes			
Deadlegs		None visible			

WATER SYSTEM RISK ASSESSMENT

Non WRAS materials	None visible			
Level of Risk	**Low** Only connected into fire fighting system (and included within site flushing regime)			

Section 5

Cold Water Storage Tanks

WATER SYSTEM RISK ASSESSMENT

CWSTs and Filters

QEUH Adult and Children's Hospital CWSTs

There are 10 domestic water storage tanks in the building which are all situated in the basement tank room.

Raw Water Tanks 1A/1B and 2A/2B are supplied by two town mains (Govan Road and Hardgate Road) to ensure continuity of supply in case of a town mains failure. The Raw Water tanks supply the Filtered Water tanks 1A/1B and 2A/2B via 3 x filtration sets (level of filtration advised by Estates is 0.2µm).

The filtration units fill the Filtered Water Tanks. Filtration sets should be maintained in accordance with manufacturer's instructions and maintenance schedule.

Each of the filtration units have a Scotmas ClO_2 dosing unit installed which operates on the backwash cycle of the filtration unit. These were fitted later than the original ClO_2 units on the domestic water systems to aid with microbiological control of the filters during backwashing. Note: the discharge water from the filtration unit backwash cycles are discharged to separate sumps to prevent stagnation in the sumps and assist with control microbiological growth in the sumps within the plantroom.

Filtered Water Tanks 1A and 1B are linked, with 2A and 2B also linked. All four tanks can be linked together (via valve on the supply lines to the booster pump sets) to supply domestic cold water including drinking water to the building with the exception of the trades system. The link between the tanks 1A/1B and 2A/2B was closed at the time survey with Filtered Tanks 1A/1B supplying the 5.3 Bar pump set (Boosted Pump Set 2) to plantrooms 21/22/41 and the corresponding outlets in these zones with 2A/2B supplying the 7.1 Bar pump set (Boosted Pump Set 1) to plantrooms 31/32/33 and the corresponding outlets in these zones.

All tanks have stainless-steel flange supports which may permit water ingress similar to hollow tank lid supports. Hollow tank supports are recommended to be replaced with solid support beams within HSG 274 and SHTM 04-01. Hollow flange supports are a much less common support structure and it is recommended that these supports are checked to ensure that they are not permitting water ingress, and if found that they are, should be removed and replaced with solid alternatives.

In late 2018 and early 2019 a ClO_2 system was installed on the domestic water system. Each of the post filter CWSTs has a ClO_2 dosing system (dosing to 0.4-0.5ppm of ClO_2) utilising water meter controlled proportional dosing (with in-tank reaction chambers) with ClO_2 and Chlorite monitoring stations fitted to the outlet lines prior to the booster pumps.

N.B. It should be noted that there is no separate dedicated supply to the Renal (or other medical) systems, with all being fed from the Filtered Water system. This means that system disinfections would require to be very carefully scheduled or carried out locally as the disinfection procedure/chemical may interfere with the renal/medical systems and impact on patient welfare.

There are 2 x water booster sets in the water tank room. In the event of failure the outlet pipework from the booster pumps can be configured so that a single booster set could provide all water to the building (though DMA are unaware of this happening at any point during the buildings normal operations).

(Boosted Pump Set 1) – Feeding Plantroom 31, 32 & 33 - 7.1 Bar
(Boosted Pump Set 2) – Feeding Plantroom 21, 22 & 41 – 5.3 Bar

The expansion vessels attached to the CWST booster sets are not of a flow through design and they are not insulated. It appears that small, quarter turn valves have been fitted to both 7.1 Bar booster set and the Trade Water tank booster set. No fitted drain point on 5.0 Bar booster set at time of survey.

Each of the individual risers has a ClO_2 monitoring and top-up station fitted to the riser within the basement tank room which monitors the ClO_2 levels being discharged to the respective area supplied by the riser and is capable of topping up the ClO_2 levels within the line should this be required.

From the 2 No. water booster sets there are 8 domestic water systems:

- Plantroom 21
    - Via a Pressure reducing valve (PRV) the BCWS feed 21 CAL01/02/03

WATER SYSTEM RISK ASSESSMENT

- Plantroom 22
    - Via a Pressure reducing valve (PRV) the BCWS feed 22 CAL01/02/03
- Plantroom 31
    - BCWS feeds 31 CAL01/02/03
- Plantroom 31
    - Via a Pressure reducing valve (PRV) the BCWS feeds 31 CAL07/08/09
- Plantroom 31
    - BCWS feeds 31 CAL04/05/06
- Plantroom 32
    - BCWS feeds 32 CAL01/02/03
- Plantroom 33
    - BCWS feeds 33 CAL01/02/03
- Plantroom 41
    - BCWS feeds 41 CAL01/02/03

On the cold supply into each of the plantrooms there are ClO_2 monitoring and top-up stations fitted to the plantroom supplies which monitors the ClO_2 levels being discharged to the respective area and is capable of topping up the ClO_2 levels within the line should this be required.

Additional ClO_2 units are fitted on the return lines to each of the Calorifiers (8 banks of calorifiers), within monitoring station fitted at various locations throughout the Adult and Children's Hospitals.

All ClO_2 units are maintained and serviced by Scotmas.

The water supply into each plantroom is metered by a CWS flow meter. This allows for monitoring of specific parts of the system for energy purposes.

There are various connection points onto other "non-domestic" outlets such as renal dialysis, endoscopy wash, pressurisation units, and MRI chiller cooling which are connected to the Filtered Water system. Note: the steam humidifier units have been removed completely or cut back as far as practical to source, since previous assessment.

Branch from Booster Set 01 to pool plant room emergency shower. Hot supply removed and flow/return looped in Pool Plant Room A-1 FMB-030, and operational. DCV fitted approx. 4m downstream of branch after water meter in Basement A-1 FMB -024. Bib tap and Pool top up tank within the pool plantroom have been disconnected/removed. Emergency Shower should be included within site flushing regime (Note: No drain within the tank room)

The Trades Water System originally supplied "Non-domestic" outlets such as bib taps in plantrooms, irrigation connections points (DMA understand these are now all disconnected) and the 12th floor heli-pad fire suppression system. One side of the Trades tank was isolated and drained with the make-up to the tank removed. This tank now only supplies the 12th floor heli-pad fire suppression and bib taps on the 12th floor.

Additional Comments/Recommendations:

It was noted during the survey of Level -1 Basement Plant Room CWSTs and associated filtration plant that 2 x non-WRAS approved butterfly valve assemblies have been installed on Filtration Unit 3.

These valves (Tomoe 700Z) have diecast aluminium bodies and appear to be intended for marine/saltwater applications. Verification has been received from the manufacturer stating that these valves are not deemed suitable for potable use and carry no WRAS approval to date.

It should be confirmed that all persons/contractors carrying out works on the domestic water systems on site, use only WRAS approved materials and that any/all materials used are deemed suitable for potable use and carry the required certifications/approvals.

WATER SYSTEM RISK ASSESSMENT

					Recommendations	Assigned to	Completed
Name/number of CWST		Raw Water Tank 1A			Risk Rating – **Low Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. **Comments** Deadleg to the tank drain valve is included within the site recorded flushing regime. A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples. Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5.0 x 5.0 x 2.0					
Volume (litres)		50,000 Nominal – Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Raw Water 1B					
M/U opposite draw off		Diagonal					
Make up source		Town Mains (Hardgate Road)					
Services supplied		Filtered Water CWSTs 1A - 2B (via filtration units 1-3)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		Not Running	9.3	13.6			
Internal condition	Internal	Good					
	Waterline	Light Marking					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Filtered Water Tanks***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Raw Water Tank 1B			Risk Rating – **Low Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. **Comments** Deadleg to the tank drain valve is included within the site recorded flushing regime. A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples. Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5.0 x 5.0 x 2.0					
Volume (litres)		50,000 Nominal – Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Raw Water 1A					
M/U opposite draw off		Diagonal					
Make up source		Town mains (Govan Road)					
Services supplied		Filtered Water CWSTs 1A - 2B (via filtration units 1-3) ***See Raw Water Tank 1A Comments***					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		Not Running	9.4	13.6			
Internal condition	Internal	Good					
	Waterline	Light Marking					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Filtered Water Tanks***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Raw Water Tank 2A			Risk Rating – **Low Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. **Comments** Deadleg to the tank drain valve is included within the site recorded flushing regime. A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples. Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5.0 x 5.0 x 2.0					
Volume (litres)		50,000 Nominal – Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Raw Water 2B					
M/U opposite draw off		Diagonal					
Make up source		Town Mains (Hardgate Road)					
Services supplied		Filtered Water CWSTs 1A - 2B (via filtration units 1-3) ***See Raw Water Tank 1A Comments***					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		8.7	8.7	13.6			
Internal condition	Internal	Good					
	Waterline	Light Marking					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Filtered Water Tanks***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Raw Water Tank 2B			Risk Rating – **Low Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. **Comments** Deadleg to the tank drain valve is included within the site recorded flushing regime. A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples. Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		5.0 x 5.0 x 2.0					
Volume (litres)		50,000 Nominal – Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Raw Water 2A					
M/U opposite draw off		Diagonal					
Make up source		Town Mains (Govan Road)					
Services supplied		Filtered Water CWSTs 1A - 2B (via filtration units 1-3) ***See Raw Water Tank 1A Comments***					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		Not Running	8.9	13.6			
Internal condition	Internal	Good					
	Waterline	Light Marking					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Filtered Water Tanks***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Filtered Water Tank 1A			Risk Rating – **High Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Internal supports/fittings showing evidence of corrosion, with rust leaching into stored water and settling on tank base. Recommend all internal supports/fittings are replaced with suitable WRAS approved equivalents. Please also refer to Nicholson Plastics report from July 2021 regarding corrosion on support rods and nut/bolts within the CWSTs. DMA have submitted a proposal for replacing the CWSTs if original tank manufacturer/installer is unable to carryout a suitable repair of the corrosion issues. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. SHTM 04-01 recommends fitting water filled Glass Traps to the overflow and warning screens and Hepa Filtration to the air vents on the tank lids. If this is to be installed then vents on raised ball chamber would require to be sealed to ensure tanks remain sealed. It may be prudent to review the entire tank set-up to determine if this should be implemented and if any additional category 5 weir overflows are required on the Raw Water CWSTs. **Comments:** Deadleg to the tank drain valve is included within the site recorded flushing regime A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples (though less often in the post filter CWSTs thanin the Raw Water CWSTs). Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		13.5 x 5.0 x 2.0					
Volume (litres)		135,000 Nominal - Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Filtered Water CWST 1B					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs 1A, 1B, 2A & 2B					
Services supplied		See information within page 2 above - Pump Set 1 (5.3)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		Not Running	9.5	13.6			
Internal condition	Internal	Corroded Internal Supports/Fittings					
	Waterline	Light Marking					
	Dirt & silt	Evidence of Rust Leaching/Settling on Base					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Booster Pump Information***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

A49585984

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Filtered Water Tank 1B			Risk Rating – **High Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Internal supports/fittings showing evidence of corrosion, with rust leaching into stored water and settling on tank base. Recommend all internal supports/fittings are replaced with suitable WRAS approved equivalents. Please also refer to Nicholson Plastics report from July 2021 regarding corrosion on support rods and nut/bolts within the CWSTs. DMA have submitted a proposal for replacing the CWSTs if original tank manufacturer/installer is unable to carryout a suitable repair of the corrosion issues. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. SHTM 04-01 recommends fitting water filled Glass Traps to the overflow and warning screens and Hepa Filtration to the air vents on the tank lids. If this is to be installed then vents on raised ball chamber would require to be sealed to ensure tanks remain sealed. It may be prudent to review the entire tank set-up to determine if this should be implemented and if any additional category 5 weir overflows are required on the Raw Water CWSTs. **Comments:** Deadleg to the tank drain valve is included within the site recorded flushing regime A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples (though less often in the post filter CWSTs thanin the Raw Water CWSTs). Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		14.0 x 5.0 x 2.0					
Volume (litres)		140,000 Nominal – Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Filtered Water CWST 1A					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs 1A, 1B, 2A & 2B					
Services supplied		See information within page 2 above - Pump Set 1 (5.3)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		Not Running	9.5	13.6			
Internal condition	Internal	Corroded Internal Supports/Fittings					
	Waterline	Light Marking					
	Dirt & silt	Evidence of Rust Leaching/Settling on Base					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Booster Pump Information***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Filtered Water Tank 2A			Risk Rating – **High Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Internal supports/fittings showing evidence of corrosion, with rust leaching into stored water and settling on tank base. Recommend all internal supports/fittings are replaced with suitable WRAS approved equivalents. Please also refer to Nicholson Plastics report from July 2021 regarding corrosion on support rods and nut/bolts within the CWSTs. DMA have submitted a proposal for replacing the CWSTs if original tank manufacturer/installer is unable to carryout a suitable repair of the corrosion issues. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. SHTM 04-01 recommends fitting water filled Glass Traps to the overflow and warning screens and Hepa Filtration to the air vents on the tank lids. If this is to be installed then vents on raised ball chamber would require to be sealed to ensure tanks remain sealed. It may be prudent to review the entire tank set-up to determine if this should be implemented and if any additional category 5 weir overflows are required on the Raw Water CWSTs. **Comments:** Deadleg to the tank drain valve is included within the site recorded flushing regime A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples (though less often in the post filter CWSTs thanin the Raw Water CWSTs). Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		13.5 x 5.0 x 2.0					
Volume (litres)		135,000 Nominal - Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Filtered Water CWST 2B					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs 1A, 1B, 2A & 2B					
Services supplied		See information within page 2 above - Pump Set 2 (7.1)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		10.4	9.4	13.6			
Internal condition	Internal	Corroded Internal Supports/Fittings					
	Waterline	Light Marking					
	Dirt & silt	Evidence of Rust Leaching/Settling on Base					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Booster Pump Information***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Filtered Water Tank 2B			Risk Rating – **High Risk** Additional access hatches on tanks for cleaning/inspection purposes should be considered. Internal supports/fittings showing evidence of corrosion, with rust leaching into stored water and settling on tank base. Recommend all internal supports/fittings are replaced with suitable WRAS approved equivalents. Please also refer to Nicholson Plastics report from July 2021 regarding corrosion on support rods and nut/bolts within the CWSTs. DMA have submitted a proposal for replacing the CWSTs if original tank manufacturer/installer is unable to carryout a suitable repair of the corrosion issues. Raised hatch screened vent appears unsuitable and should have suitably sized screened mesh fitted. SHTM 04-01 recommends fitting water filled Glass Traps to the overflow and warning screens and Hepa Filtration to the air vents on the tank lids. If this is to be installed then vents on raised ball chamber would require to be sealed to ensure tanks remain sealed. It may be prudent to review the entire tank set-up to determine if this should be implemented and if any additional category 5 weir overflows are required on the Raw Water CWSTs. **Comments:** Deadleg to the tank drain valve is included within the site recorded flushing regime A regular sampling regime is carried out on the CWSTs, which periodically highlight "out-of-Specification" results for GNB and Yeast/Moulds, particularly from drain point samples (though less often in the post filter CWSTs thanin the Raw Water CWSTs). Tank drains are included within the site flushing regime, with additional disinfection/flushing carried out in as/when "out-of-Specification" results returned.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		14.0 x 5.0 x 2.0					
Volume (litres)		140,000 Nominal - Actual volume of stored water variable depending on set point on BMS					
Linked/single		Linked to Filtered Water CWST 2A					
M/U opposite draw off		Diagonal					
Make up source		Raw Water CWSTs 1A, 1B, 2A & 2B					
Services supplied		See information within page 2 above - Pump Set 2 (7.1)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom**			
		10.4	9.6	13.6			
Internal condition	Internal	Corroded Internal Supports/Fittings					
	Waterline	Light Marking					
	Dirt & silt	Evidence of Rust Leaching/Settling on Base					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		See details of deadlegs, connection and flushing points within basement plantroom					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted – End of Line					
Overflow Screen		Fitted - Integral					
Insulation		Yes - Integral					
Access		Good – Fixed Ladder					
Vents returning to CWST		No					
Is drain present?		Yes – Creating Deadleg (Flushing Regime)					
Booster pumps	Fitted	***See Booster Pump Information***					
	Vibration Couplings						
	Expansion Vessel						
	Drain on Vessel?						

WATER SYSTEM RISK ASSESSMENT

Filtered Water Booster Pump Information

Name/number of Booster Pumps	7.1 Bar Pump Set (Boosted Pump Set 1)	**Recommendations and Comments**	**Assigned to**	**Completed**
Location	-1 Basement Tank Plant Room	Ideally all expansion vessels should be of flow through type – where this is not practical, they should be fitted vertically on the cold supply, as close to plant items as possible with a fitted drain valve (where compliant with current regulations) to allow regular recorded flushing of the vessel. Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable). **Comment:** Reflex anti-legionella valves fitted to Booster pump hydraulic accumulators (8 litres) – drain points fitted.		
No. Of Pumps	5			
Vibration Couplings	No Vibration Couplings Visible No Flexible Hoses Visible			
Expansion Vessel	Yes 2 x Hydraulic Accumulator (8 litre) Vessel Mounted Vertically, Directly onto Pump Manifold 1 x 500 litre Upright Vessel (not flow through) Located Adjacent to Pump Set (no evidence of heat gain on expansion vessels)			
Drain on Vessel?	Fitted Drain Point on 500 Litre Vessel Reflex Anti-Legionella Valve fitted to Hydraulic Accumulator with Associated Drain Point			
Services Supplied	Filtered Water Tanks 1A & 1B supply the 7.1 Bar Pump Set Which in Turn Supplies Plant Rooms 31, 32 & 33.			

Name/number of Booster Pumps	5.3 Bar Pump Set (Boosted Pump Set 2)	**Recommendations and Comments**	**Assigned to**	**Completed**
Location	-1 Basement Tank Plant Room	Ideally all expansion vessels should be of flow through type – where this is not practical, they should be fitted vertically on the cold supply, as close to plant items as possible with a fitted drain valve (where compliant with current regulations) to allow regular recorded flushing of the vessel. Drain points should be fitted to pump manifolds to allow end of lines to be flushed (if practicable). **Comment:** Reflex anti-legionella valves fitted to Booster pump hydraulic accumulators (8 litres) – drain points fitted.		
No. Of Pumps	5			
Vibration Couplings	No Vibration Couplings Visible No Flexible Hoses Visible			
Expansion Vessel	Yes 2 x Hydraulic Accumulator (8 litre) Vessel Mounted Vertically, Directly onto Pump Manifold 1 x 500 litre Upright Vessel (not flow through) Located Adjacent to Pump Set (no evidence of heat gain on expansion vessels)			
Drain on Vessel?	Fitted Drain Point on 500 Litre Vessel Reflex Anti-Legionella Valve fitted to Hydraulic Accumulator with Associated Drain Point			
Services Supplied	Filtered Water Tanks 2A & 2B supply the 5.3 Bar Pump Set Which in Turn Supplies Plant Rooms 21, 22 & 41.			

WATER SYSTEM RISK ASSESSMENT

					Recommendations and Comments	Assigned to	Completed
Name/number of CWST		Trade Water Tank 1			Risk Rating – **Medium Risk** Ideally all expansion vessels should be of flow through type – where this is not practical, they should be fitted vertically on the cold supply, as close to plant items as possible with a fitted drain valve (where compliant with current regulations) to allow regular recorded flushing of the vessel. Ideally a drain should be fitted to pump manifold to allow end of lines to be flushed (if practicable). Relocate DCV closer to tee - >2m at present after meter. **Note:** Trades CWST 2 has been completely disconnected from CWST 1 with no inlet or take-off connected into the live systems.		
Location of CWST		-1 Basement Tank Plant Room					
Labelled		**CWST**	**Pipework**	**Valves**			
		Yes	Yes	Yes			
Type		Sectional					
Materials		GRP					
Lined		No					
Dimensions (m)		2.0 x 1.0 x 1.0					
Volume (litres)		2000 Nominal - 1400 Actual					
Linked/single		Single (Trade Water Tank 2 completely isolated)					
M/U opposite draw off		Outlet on Base					
Make up source		Town Mains (Govan Road)					
Services supplied		Designated "Non-Domestic" Outlets (i.e. irrigation, 12th floor Heli-Pad Fire Suppression and Plant Room Bib Taps on 12th floor)					
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**			
				13.6			
Internal condition	Internal	Good					
	Waterline	None					
	Dirt & silt	Clean					
Water condition		Clear					
Stagnation		None Evident					
Deadlegs around CWST		None Visible					
Close fitting lid/screened vent		Yes	Fitted – TBC Suitable				
Warning Pipe Screen		Fitted					
Overflow Screen		Fitted					
Insulation		Integral					
Access		Good					
Vents returning to CWST		No					
Is drain present?		Yes					
Booster pumps	Fitted	Yes x 3					
	Vibration Couplings	None Visible					
	Expansion Vessel	Yes (500 Litre) – Not Flow Through					
	Drain on Vessel?	Yes					

WATER SYSTEM RISK ASSESSMENT

Location	Recommendations and Comments	Assigned to	Completed
Basement Plantroom	There is a link/breach pipe on the outlets of the Filtered/Filter water tanks prior to the pump sets which can be opened to allow all tanks both pump sets. This was closed at time of survey, though DMA have noted this link/breach pipe open on previous visits. This line should be opened and flushed as part of site flushing regime. There is a link pipe between the 5.3 bar (Boosted Pump Set 2) and 7.1 Bar (Boosted Pump Set 1) pipework systems after the booster sets. DMA advised previously by estates this section is drained and is in place for emergency purposes, should either of the booster sets fail to allow for water services to be maintained to the hospital. Prior to being put into use the link section should be thoroughly flushed and disinfected. On the Govan Road mains line to CWSTs there are two short 22mm deadlegs (one upturned, one downwards) and a 54mm connection point (upturned) prior to tank isolation valves – these are included within site flushing regime. On the Hardgate Road mains line to CWSTs there is a 54mm connection point (upturned) prior to tank isolation valves – – these are included within site flushing regime. There is a deadleg to the tank drain valve (on all Raw and Filtered/Filtered water tanks), measuring 0.7 – 1.0 metres of 54mm pipework, created due to the lever valve unable to close due to proximity to support beams – these are included within site flushing regime. There are connection points/deadlegs (28mm) at low level on both of the supply lines to the filtration units form the Raw Water tanks just prior to the filtration units – these are included within site flushing regime. On the riser to Plantrooms 41/22 there is a connection point (54mm) immediately after isolation valve (DMA understand this was used to fill system directly from mains during construction phase, bypassing the filtration units) – – these are included within site flushing regime. All tank drains (including Trades Water Tank) are included within the site flushing regime. **Comments:** There are connection points/deadlegs (54mm) at low level on both of the supply lines to the pump sets form the Filtered/Filtered Water tanks just prior to the pump sets – these have been utilised as drain points to run into the ClO_2 monitoring probe stations. During the upgrade works in late 2018/early 2019 to incorporate ClO_2 dosing into the domestic water system an additional filtration unit was installed (Filter Unit 3) and the pipework to/from the filtration units was amended so that all of the Raw water CWST outlets were linked and supply all 3 filter units, and all pipework from the filter units were linked and supply all post filter CWSTs. ClO_2 dosing was incorporated into the backwash cycle of each of the filtration units (monitored and maintained by Scotmas)		

Section 6

Calorifiers & Associated Plantrooms

WATER SYSTEM RISK ASSESSMENT

Calorifiers (PHE's with Storage Vessels)

The calorifiers are situated in various plant rooms throughout site. Locations are as follows:

- Plantroom 21 (Cals 21-1/2/3)
- Plantroom 22 (Cals 22-1/2/3)
- Plantroom 31 (Cals 31-1/2/3)
- Plantroom 31 (Cals 31-4/5/6)
- Plantroom 31 (Cals 31-7/8/9)
- Plantroom 32 (Cals 32-1/2/3)
- Plantroom 33 (Cals 33-1/2/3)
- Plantroom 41 (Cals 41-1/2/3)

These calorifiers, in turn supply domestic hot water services (DHWS) to designated zones within the hospital building. See Appendix 1 - Calorifier Wards and Areas Supplied and Appendix 2 - Distribution Zone Maps below for calorifier locations and areas within the hospital fed from each Calorifier set.

Each set of calorifiers is a bank of 3-linked calorifiers fed from the boosted Filtered Water system, with heat source being via a packaged plate heat exchanger on the outside of each calorifier fed from the MTHW system. A circulating pump on each calorifier/plate heat exchanger ensures the water is circulated throughout each vessel to maintain temperature.

Distribution flow temperatures were consistently above 60°C, with return temperatures to calorifiers consistently above 55°C on all calorifiers as recommended within L8/HSG 274 Part 2 and SHTM 04-01. All base temperature appeared satisfactory at time of survey also.

During the water system upgrade works during late 2018 and early 2019 each calorifier had the standard expansion vessel installed at construction phase removed and replaced with a flow through vessel, with appropriate pipework modifications to maintain flow to the system etc.

During the period of this survey all expansion vessels installed in 2018-19 were being replaced with new vessels.

Generally water flushed from drain on calorifiers and expansion vessels ran clear either instantly or after only a very short period of time (typically <10 seconds).

Each calorifier set share a linked return which supplies all three calorifiers.

ID No./Name		P21 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 21						All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). New expansion vessels fitted on all 3 Water heaters at the time of survey.		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 1A & 1B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Size (m)		2.2 x 1.0 ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (500 litres)								
	Vessel able to be Flushed	N/A								
Insulation		Fitted								
Inspection Hatch (mm)		380mm approx								
Deadlegs around Calorifier		None visible								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	61.5		62.3		62.4				
	Flow Gauge	65.0		60.0		60.0				
	Return(Linked)	59.0								
	Base/Drain	61.3		62.0		61.8				
	Base Gauge	70.0		62.0		64.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 21	There is a branch from the Boosted Cold Water Services (BCWS), dropping from high level and measuring approximately 150mm of 54mm pipework. This should be removed if no longer required or included within site flushing regime. 15 mm lines branch from same line as supplying the AHUs and run approximately 50m to HTG pressurisation units (at pumps PR21 PU11/12/13 SH), with a separate branch running approximately 10m to CHW pressurisation unit (at pumps PR21 PU03/04/05 SCW). Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted *(**Note:** Lines currently included in site flushing regime).* Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted to fast fill connection. Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 21. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions. There is a deadleg behind the water tank within the Childrens Renal Plantroom. Unable to locate where this branch is fed from. If practical this should be removed. *(**Note:** Line currently included in site flushing regime).* **Comments:** A ClO_2 monitoring and top point was installed on the cold supply line as it enters Plantroom 21 (monitored by Scotmas). Connection to Children's renal system is fed from the cold supply line within plantroom 21 – Carbon filters and ClO_2 monitoring station fitted within Children's Renal Plantroom to prevent ClO_2 being drawn into the Renal system. This is monitored by Renal Technicians and Scotmas. Line to humidifiers at 21AHU23 & 21AHU32 has been disconnected.		

ID No./Name		P22 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 22						All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Large deadlegs created on linked pipework to offline calorifier 1 – these should be included in recorded site flushing regime, until such times as reinstated to full daily use. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). Corroded hard stands and fittings in poor condition. New expansion vessels have not been fitted to these calorifiers at time of survey. Ones fitted date from 2018-2019 upgrade works.		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 1A & 1B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Size (m)		2 x 1.0 ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (500 litres)								
	Vessel able to be Flushed	N/A								
Insulation		None visible								
Inspection Hatch (mm)		380mm approx								
Deadlegs around Calorifier		Offline Calorifier 1								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01 (Middle)		02 (RHS)		03 (LHS)				
	Flow	**Offline**		63.1		62.8				
	Flow Gauge			30.0		60.0				
	Return(Linked)	59.0								
	Base/Drain			63.0		62.5				
	Base Gauge			62.0		60.0				
Drain	Water Quality			Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 22	There is a branch from the Boosted Cold Water Services located at high level which measures approximately 10 metres of 54mm pipework before 1st tee off and a further 8 metres to HTG pressurisation unit. The BCWS also branches in 54mm and runs a further 8 metres before reducing to 15mm to supply CHW pressurisation unit *(**Note:** lines included within site flushing regime)*. The BCWS branches also from cold supply at high level prior to the calorifiers and runs for approximately 40 metres through adjoining plant room areas to a fitted RPZ valve at 22AHU19 with no visible check valve fitted at tee off point. *(**Note:** lines included within site flushing regime)*. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted *(**Note:** lines included within site flushing regime)*. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 22. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions. **Comments:** A ClO_2 monitoring and top point was installed on the cold supply line as it enters Plantroom 22 (monitored by Scotmas).		

ID No./Name		P31 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 31								
Labelled		Cal	Yes	Pipes	Yes	Valves	No	All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). Pump at cold draw off to calorifier 3 Plate heat exchanger vibrating and a leak was noted from the plate heat exchanger. New expansion vessels fitted on all 3 Water heaters at the time of survey.		
Type		Indirect – Vertical (Buffer)								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 2A & 2B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of This Section								
Size (m)		2.0 x 0.8ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (300 litres)								
	Vessel able to be Flushed	N/A								
Insulation		Fitted Jacket								
Inspection Hatch (mm)		300mm Approx								
Deadlegs around Calorifier		None Visible								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	63.4		64.1		62.9				
	Flow Gauge	62.0		65.0		61.0				
	Return(Linked)	59.7								
	Base/Drain	61.0		62.5		63.0				
	Base Gauge	60.0		60.0		60.0				
Drain	Water Quality	Clear		Clear		Clear				

ID No./Name		P31 - 04/05/06					
Location		Plantroom 31					
Labelled		Cal	Yes	Pipes	Yes	Valves	No
Type		Indirect – Vertical (Buffer)					
Materials		Stainless steel					
Access		Good					
Linked/single		Linked					
Heat source		MTHW via Packaged PHX					
Make up source		CWSTs 2A & 2B (Filtered)					
Services supplied (area)		See Appendix 1 & 2 of this section					
Size (m)		2.2 x 1.0 ø					
Cold feed location		Base					
Vent or pressure relief		Pressure relief					
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		None visible	
Destrat pump	Fitted	None visible					
Pumps	Vibration couplings	None visible					
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (500 litres)					
	Vessel able to be Flushed	N/A					
Insulation		Fitted Jacket					
Inspection Hatch (mm)		300mm Approx					
Deadlegs around Calorifier		Offline Calorifier 05					
Non WRAS materials		None visible					
Temperatures (°c)	Calorifier	04		05		06	
	Flow	65.1		**Offline**		63.0	
	Flow Gauge	70.0				62.0	
	Return(Linked)	60.1					
	Base/Drain	62.0				63.0	
	Base Gauge	63.0				63.0	
Drain	Water Quality	Clear				Clear	

Recommendations and Comments	Assigned to	Completed
All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Large deadlegs created on linked pipework to offline calorifier 1 – these should be included in recorded site flushing regime, until such times as reinstated to full daily use. **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas) – Note: this was off at time of survey awaiting repair. Line to standard expansion vessel removed and short deadleg remaining now incorporated into site flushing regime. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. New expansion vessels fitted on all 3 Water heaters at the time of survey.		

ID No./Name		P31 - 07/08/09						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 31						All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). New expansion vessels have not been fitted to these calorifiers at time of survey. Ones fitted date from 2018-2019 upgrade works.		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Indirect – Vertical (Buffer)								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 2A & 2B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Size (m)		2.5 x 1.0 ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (700 litres)								
	Vessel able to be Flushed	N/A								
Insulation		Fitted Jacket								
Inspection Hatch (mm)		300mm Approx								
Deadlegs around Calorifier		None Visible								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	07		08		09				
	Flow	62.3		60.0		62.4				
	Flow Gauge	70.0		60.0		40.0				
	Return(Linked)	60.1								
	Base/Drain	62.3		61.0		61.2				
	Base Gauge	65.0		60.0		Off Scale - Low				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 31	There is a branch from the Boosted Cold Water Services located at high level above Calorifiers 31-01/02/03 which measures approximately 25 metres of 54mm pipework before 1st tee off and a further 10 metres before reducing to 15mm to supply HTG pressurisation unit at pumps PR31 PU11/12/13/14 SH. The BCWS also branches and runs for approximately 15m in 54mm and runs a further 15 metres before reducing to 15mm to supply CHW pressurisation unit at pumps 31 PU 01/02/03/04 SCW. *(**Note:** line included within site flushing regime)*. 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. There is a line branching at high level from the cold supply to Calorifiers 31-04/05/06 with a check valve fitted approximately 1metre from the tee off point which then runs approximately 20 metres to RPZ on supply line to MRI Chillers (emergency cooling supply). Line to MRI Chiller should, if practicable, be switched to trades system (confirm water quality, pressure and flow rates etc. required to chiller prior to amending supply line) *(**Note:** line included within site flushing regime)*. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted *(**Note:** lines included within site flushing regime**)***. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. Flexible hoses were noted on the pressure reducing valves on the cold supply into Plantroom 31. These should be checked to determine if these are EPDM. Should these be EPDM they should be replaced with a suitable alternative material (e.g. hard piped in stainless steel or PEX) if practicable or hoses inspected and replaced regularly (e.g. annually and/or as determined by periodic inspection) or as per manufacturer's instructions. **Comments:** A ClO_2 monitoring and top point was installed on the cold supply line as it enters Plantroom 31 at the Arran side (Adjacent to Calorifiers 4/5/6 and at the Bute site immediately as you enter the plantroom. There is also an additional unit installed on the line to supply the Theatres running through Plantroom 31 at Arran side (all units monitored by Scotmas). Cold supply line to Calorifiers 31-04/05/06 branches as it enters Plantroom 31 at high level, through pressure reducing valves (with flexible hoses – see recommendation above) with a 54mm line running to supply the Endoscopy Wash unit (no backflow protection noted on line to Endoscopy Wash plant) and then continuing on to riser M12 where it appears to supply cold water services within the Adults Theatre area (hot services in this riser fed from Calorifiers 31-01/02/03) (**Note:** ClO_2 dosing unit installed on this line to the Theatres).		

Location		Assigned to	Completed
Plantroom 31 Optitherm Servicing and Thermal Disinfection Station	A cold water line branches from the cold supply to calorifier 31/09. This line then splits to supply a plate heat exchanger behind the calorifiers and off in the other direction to supply a dishwasher spray wash outlet and a Horne Optitherm in the TMV/Filter Service Room (DMA site office). The Plate Heat Exchanger (PHE) heats the cold water and then circulates via a small pump through the PHE and around a flow and return circuit in the TMV/Filter Service Room(DMA site office). There are hot outlets off this line to the dishwasher spray wash outlet and the Horne Optitherm, in addition to a connection (via a switched solenoid) to the Optitherm Servicing and Thermal Disinfection Station. There is also a line for a future additional station (also connected via a switched solenoid) – though the line to this is isolated. There is an 8 litre expansion vessel fitted on the cold/hot return line, with the line to the vessel being approx. 1.5m long. The vessel does not have a drain on it to permit flushing of the vessel and the vessel is not of a flow-through design. There are check valves fitted on the cold line and the hot return line to the plate heat exchanger to prevent backflow. The Optitherm Servicing and Thermal Disinfection Station is not operational, and hasn't been in use since it was installed. This in effect is creating 2 deadlegs (one to the installed service station and one designated for future installation) of approximately 150mm (though these are flushed daily by DMA staff). The dishwasher spray wash outlet and Horne Optitherm are in regular use by DMA, who utilise this area as their site office. Hot flow and return temperatures in excess of 60°C were measured at points along the flow and return circuit. Significant heat gain has been noted at the cold outlets in the TMV/Filter Service Room (DMA site office) (at times up to 28°C) and cold temperatures can take up to 3 – 4 minutes to drop to temperatures consistent with other cold outlets in the building. Hot and cold lines are insulted in plantroom and above ceiling of the TMV/Filter Service Room (DMA site office), but no insulation in the actual room. **Recommendations** Optitherm Servicing and Thermal Disinfection Station (and line for future connection) should be removed fully from use leaving no deadlegs (DMA staff currently flush lines daily). As the TMV/Filter Service Room (DMA site office) is not a clinical area it is advised that insulation is fitted on hot and cold pipework as close as is practical to the outlets. This would aid in minimising heat gain in cold line to this room (though it would appear the majority of the heat gain on the cold lines would occur outwith the office area where pipework runs adjacent to hot water/heating pipework). Expansion vessel at Plate heat exchanger should be changed to flow through type, or have suitable drain fitted to line to allow vessel to be flushed.		

ID No./Name		P32 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 32								
Labelled		Cal	Yes	Pipes	Yes	Valves	Yes	All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. (2) **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). New expansion vessels have not been fitted to these calorifiers at time of survey. Ones fitted date from 2018-2019 upgrade works.		
Type		Indirect – Vertical (Buffer)								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 2A & 2B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Size (m)		2.3 x 1.0 ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (500 litres)								
	Vessel able to be Flushed	N/A								
Insulation		Fitted Jacket								
Inspection Hatch (mm)		380mm Approx								
Deadlegs around Calorifier		None Visible								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow(Linked)	64.0								
	Flow Gauge	No Reasonable Access								
	Return(Linked)	59.0								
	Base/Drain	61.5		60.9		64.1				
	Base Gauge	62.0		60.0		70.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 32	There is a branch from the Boosted Cold Water Services located at high level at which measures approximately 2 metres of 54mm pipework reducing to 15mm, running for 10 metres, supplying a pressurisation unit. *(**Note**: lines included within site flushing regime)*. 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted and lines incorporated into site flushing regime. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. *(**Note:** lines included within site flushing regime)*. **Comments:** A ClO_2 monitoring and top point was installed on the cold supply line as it enters Plantroom 32 (monitored by Scotmas). Connection to Adult's renal system is fed from the cold supply line within plantroom 32 – Carbon filters and ClO_2 monitoring station fitted within Adult's Renal Plantroom to prevent ClO_2 being drawn into the Renal system. This is monitored by Renal Technicians and Scotmas.		

ID No./Name		P33 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 33						All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). New expansion vessels have not been fitted to these calorifiers at time of survey. Ones fitted date from 2018-2019 upgrade works.		
Labelled		Cal	Yes	Pipes	Yes	Valves	No			
Type		Plate Heat Exchanger								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 2A & 2B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Size (m)		2.3 1.0 ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		1		Yes				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes - upright								
	Vessel able to be Flushed	Yes – Aquapresso Flow Through (700 litres)								
Insulation		None visible								
Inspection Hatch (mm)		380mm approx								
Deadlegs around Calorifier		Yes								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	62.9		61.9		61.4				
	Flow Gauge	60.0		62.0		62.0				
	Return(Linked)	58.5								
	Base/Drain	64.0		62.7		63.0				
	Base Gauge	70.0		62.0		62.0				
Drain	Water Quality	Clear		Clear		Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 33	There is a branch from the Boosted Cold Water Services located at high level (Near entrance to plantroom) which measures approximately 25 metres with 2 x drops of 2 metres in 54mm pipework to capped and valved off connection points and also branching and reducing to 15mm to supply pressurisation units (with no visible check valves) on the line. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted *(**Note**: lines included within site flushing regime)*. Fast fill connections should be disconnected and have suitable backflow protection (e.g. RPZ) fitted fast fill connection. 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. **Comments:** A ClO_2 monitoring and top point was installed on the cold supply line as it enters Plantroom 33 (monitored by Scotmas).		

ID No./Name		P41 - 01/02/03						Recommendations and Comments	Assigned to	Completed
Location		Plantroom 41						All associated valves should be correctly labelled for identification purposes. Ensure all temperature gauges are calibrated correctly and/or replaced where required. Suitable insulated jackets should be fitted to calorifier inspection hatch, to prevent heat loss from vessel. Large deadlegs created on linked pipework to offline calorifiers 1 & 2 – these should be included in recorded site flushing regime, until such times as reinstated to full daily use. Checks should be made during upgrade works that hot water to Childrens hospital maintains correct flow and return temperatures. Short lines (≈200mm) to calorifier and expansion vessel drains – these should be incorporated into site flushing regime. **Comments:** There is a ClO_2 monitoring and top-up station installed on the return line to the calorifiers (monitored by Scotmas). Open face on safety valve. New expansion vessels in the process of being fitted on all 2 Water heaters at the time of survey, with 1 water heater (3) still having expansion vessel which was fitted date from 2018-2019 upgrade works. (Note: temps taken from Calorifier 1 prior to expansion vessel works commencing).		
Labelled		Cal	Yes	Pipes	Yes	Valves	Yes			
Type		Indirect – Vertical (Buffer)								
Materials		Stainless steel								
Access		Good								
Linked/single		Linked								
Heat source		MTHW via Packaged PHX								
Make up source		CWSTs 1A & 1B (Filtered)								
Services supplied (area)		See Appendix 1 & 2 of this section								
Size (m)		2.0 x 1.0 ø								
Cold feed location		Base								
Vent or pressure relief		Pressure relief								
Circulation pump	Fitted / No. / Check Valve	Yes		x 1 Linked Return		None visible				
Destrat pump	Fitted	None visible								
Pumps	Vibration couplings	None visible								
Expansion / buffer vessel	Fitted?	Yes – Aquapresso Flow Through (300 litres)								
	Vessel able to be Flushed	N/A								
Insulation		Fitted Jacket								
Inspection Hatch (mm)		300mm Approx								
Deadlegs around Calorifier		Offline Calorifier 02								
Non WRAS materials		None visible								
Temperatures (°c)	Calorifier	01		02		03				
	Flow	64.0		**Offline at time of survey**		64.0				
	Flow Gauge	60.0				60.0				
	Return(Linked)	59.5				59.5				
	Base/Drain	61.5				61.9				
	Base Gauge	60.0				60.0				
Drain	Water Quality	Clear				Clear				

Location	Recommendations and Comments	Assigned to	Completed
Plantroom 41	There is a branch from the Boosted Cold Water Services located at high level near 41AHU03B which runs approximately 10 metres in 15mm pipework to supply a CHW pressurisation unit, with line hard piped into the closed system. This should be disconnected from closed system and line added to the flushing regime (Cat 4/5 backflow risk). There is a branch from the Boosted Cold Water Services located at high level near 41AHU05 which runs approximately 3m to blanked valve before splitting to run to two separate HTG Pressurisation units in 15mm – a 4m line to one unit and a 15 metre line to the other unit. *(**Note:** one line included within site flushing regime)*. One of the lines is hard piped into the closed system. This should be disconnected from closed system and line added to the flushing regime (Cat 4/5 backflow risk). There is a branch from the Boosted Cold Water Services located at high level which runs approximately 8 metres and reducing 22mm. This line formerly supplied a pressurisation unit and Condair Humidification units at 41AHU27A, though these has now been disconnected, and then continued on to supply a pressurisation unit and Condair Humidification units at 41AHU27B, which have also been disconnected. This line should be removed if no longer required. *(**Note:** lines included within site flushing regime)*. There is a branch from the Boosted Cold Water Services located at high level above 41AHU24 which measures approximately 20 metres of 15mm pipework to supply CHW pressurisation unit. The line is hard piped into the closed system. This should be disconnected from closed system (Cat 4/5 backflow risk). *(**Note:** line included within site flushing regime)*. There is also a 3m deadleg (15mm) to a valve from this line at 41AHU24 – this line should be removed if no longer required *(**Note:** line included within site flushing regime)*. Lines to pressurisation units should, if practicable, be switched to trades system, or suitable backflow protection fitted. 54mm line(s) to connection points would appear to have been installed during the construction phase and are likely to have been used for chemical cleaning/flushing of the HTG and CHW systems. The 54mm line(s) should be completely removed and piped through on main line as no longer routinely required, though Estates have advised the connection(s) may be required should the HTG or CHW systems require to be refilled at any point. Should connections require to be retained then lines should be cut back as far as is reasonably practicable with the resultant short connection point incorporated into the site flushing regime. **Comments:** A ClO_2 monitoring and top point was installed on the cold supply line as it enters Plantroom 41 at entrance through the DCFP Ward (monitored by Scotmas). Note: this was off at time of survey awaiting repair. 2 x new pressurisation units were installed within plantroom 41 as part of the Ward 2A/2B upgrade works completed in March 22 near the Plantroom entrance at DCFP side (BMT PU1 & BMU PU2) *(**Note:** lines included within site flushing regime)*.		

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

Calorifier Wards and Areas Supplied

Plantroom 21

Calorifiers 01, 02 & 03[1]	
Level	**Department**
Level 0	RHSC Emergency Department
Level 0	ADULTS Emergency Department
Level 0	ADULTS Acute Assessment
Level 1	ADULTS CCU
Level 1	ADULTS Critical Care

Plantroom 22

Calorifiers 01, 02 & 03[1]	
Level	**Department**
Level -1	FM and Kithcen
Level 0	ADULTS Discharge Lounge
Level 0	ADULTS OPD
Level 0	ADULTS Rehab and Therapies
Level 0	ADULTS Entrance
Level 0	ADULTS Retail
Level 0	ADULTS Snack Bar
Level 0	ADULTS Radiology
Level 0	ADULTS Pharmacy
Level 0	Medical Illustration
Level 1	ADULTS OPD
Level 1	ADULTS Restaurant Visitors Dining and Coffee Lounge
Level 1	Nuclear Medicine
Level 1	RHSC Theatres
Level 1	RHSC Radiology & Interventional Radiology
Level 2	ADULTS Renal Dialysis OPD
Level 2	ADULTS Renal Dermatology OPD
Level 2	ADULTS Theatres
Level 2	ADULTS Endoscopy
Level 2	Female Change (Core D)

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

Plantroom 31

Calorifiers 01, 02 & 03[1]	
Level	**Department**
Level 0	ADULTS Acute Assessment
Level 1	ADULTS MDU
Level 1	ADULTS Stroke Ward
Level 2	ADULTS Theatres

Calorifiers 04, 05, 06[1]	
Level	**Department**
Level 4	ADULTS Haemo Oncology Ward
Level 4	ADULTS Core C Regen Kitchen
Level 5	ADULTS ENT Ward
Level 5	ADULTS Core C Regen Kitchen
Level 6	ADULTS Generic Ward
Level 6	ADULTS Core C Regen Kitchen
Level 7	ADULTS Generic Ward
Level 7	ADULTS Core C Regen Kitchen
Level 8	ADULTS Generic Ward
Level 8	ADULTS Core C Regen Kitchen
Level 9	ADULTS Generic Ward
Level 9	ADULTS Core C Regen Kitchen
Level 10	ADULTS Generic Ward
Level 10	ADULTS Core C Regen Kitchen
Level 11	ADULTS Generic Ward
Level11	ADULTS Core C Regen Kitchen

Calorifiers 07, 08, 09[1]	
Level	**Department**
Level 4	ADULTS Renal Ward
Level 5	ADULTS ENT Ward
Level 5	ADULTS Core C Regen Kitchen
Level 6	ADULTS Generic Ward
Level 6	ADULTS Core C Regen Kitchen
Level 7	ADULTS Generic Ward
Level 7	ADULTS Core C Regen Kitchen
Level 8	ADULTS Generic Ward
Level 8	ADULTS Core C Regen Kitchen
Level 9	ADULTS Generic Ward
Level 9	ADULTS Core C Regen Kitchen
Level 10	ADULTS Generic Ward
Level 10	ADULTS Core C Regen Kitchen
Level 11	ADULTS Generic Ward
Level11	ADULTS Core C Regen Kitchen

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

Plantroom 32

Calorifiers 01, 02, 03[1]	
Level	**Department**
Level 3	ADULTS Public Health Records
Level 4	ADULTS Higher Acute Renal Ward
Level 4	ADULTS Dirty Core D
Level 5	ADULTS Rheumatology Ward
Level 5	ADULTS Dirty Core D
Level 6	ADULTS General Ward
Level 6	ADULTS Dirty Core D
Level 7	ADULTS General Ward
Level 7	ADULTS Dirty Core D
Level 8	ADULTS General Ward
Level 8	ADULTS Dirty Core D
Level 9	ADULTS General Ward
Level 9	ADULTS Dirty Core D
Level 10	ADULTS General Ward
Level 10	ADULTS Dirty Core D
Level 11	ADULTS General Ward
Level 11	ADULTS Dirty Core D

Plantroom 33

Calorifiers 01, 02, 03[1]	
Level	**Department**
Level 4	ADULTS Renal Ward
Level 5	ADULTS General Ward
Level 6	ADULTS General Ward
Level 7	ADULTS General Ward
Level 8	ADULTS General Ward
Level 9	ADULTS General Ward
Level 10	ADULTS General Ward
Level 11	ADULTS General Ward

WATER SYSTEM RISK ASSESSMENT

Section 6 Appendix 1

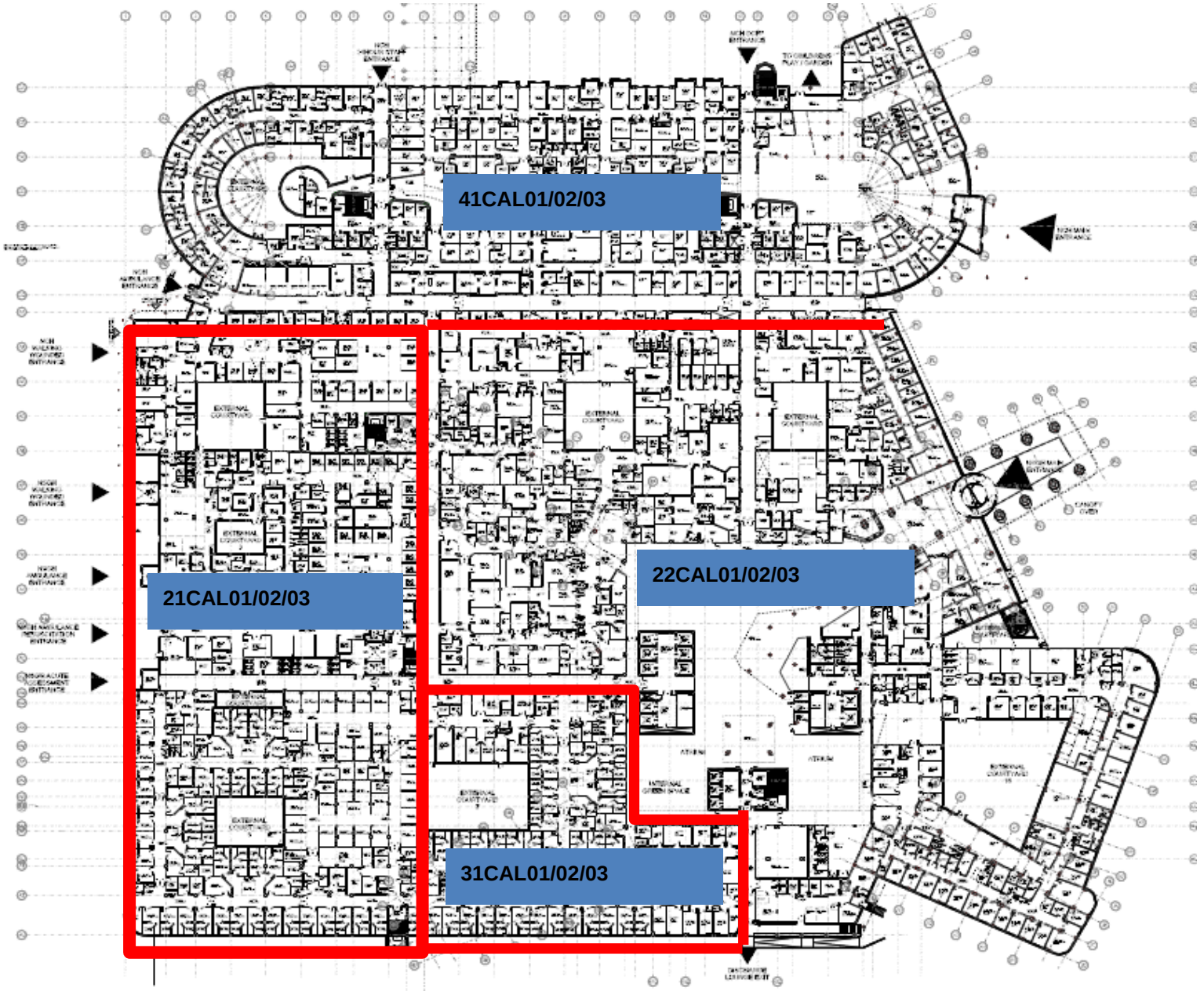
Plantroom 41 (Children's)

Calorifiers 01, 02, 03[1]	
Level	**Department**
Level 0	NSH Public Observation Ward
Level 0	RHSC Sanctuary/Child Protection Unit
Level 0	RHSC OPD
Level 0	RHSC Support
Level 0	Retail Unit and Snack Bar
Level 1	RHSC Critical Care (PICU)
Level 1	RHSC PICU Support
Level 1	RHSC MDU
Level 1	RHSC Theatres
Level 1	RHSC Special Feeds
Level 1	RHSC Cardiology Ward
Level 1	RHSC 23 Hours Unit
Level 2	RHSC Acute Receiving Ward
Level 2	Aseptic Suite
Level 2	RHSC Day Case Unit
Level 2	RHSC Schiehallion Ward
Level 2	RHSC Ward Support
Level 2	RHSC Teenage Cancer Trust
Level 3	RHSC Inpatient Ward
Level 3	RHSC Ward Support
Level 3	RHSC Generic Ward
Level 4	RHSC DCFP

[1] Information as to which zones/wards supplied by each calorifier set is as provided by Mercury/Brookfield and NHS GG&C.

Section 6 Appendix 2 - Distributions Zone Map

Ground Floor



PLantroom 41 Calorifiers 01, 02 & 03

Level	Department
Level 0	RHSC Public Observation Ward
Level 0	RHSC Sanctuary/Child Protection Unit
Level 0	RHSC OPD
Level 0	RHSC Support
Level 0	Retail Unit and Snack Bar

PLantroom 21 Calorifiers 01, 02 & 03

Level	Department
Level 0	RHSC Emergency Department
Level 0	Emergency Department
Level 0	Acute Assessment

PLantroom 22 Calorifiers 01, 02 & 03

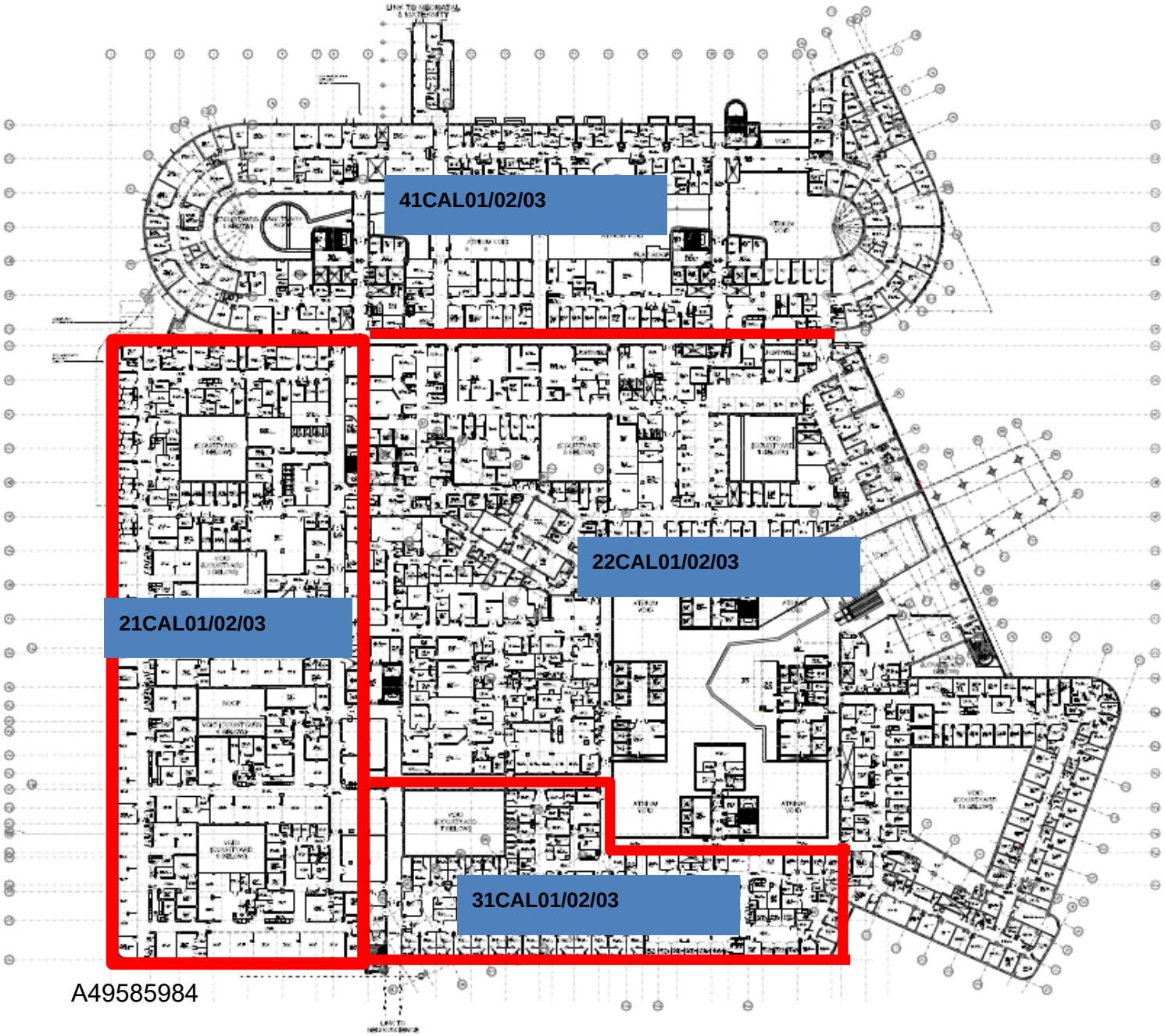
Level	Department
Level -1	FM and Kitchen
Level 0	Discharge Lounge
Level 0	OPD
Level 0	Rehab and Therapies
Level 0	Entrance
Level 0	Retail
Level 0	Snack Bar
Level 0	Radiology
Level 0	Pharmacy
Level 0	Medical Illustration

PLantroom 31 Calorifiers 01, 02 & 03

Level	Department
Level 0	Acute Assessment

Section 6 Appendix 2 - Distributions Zone Map

1st Floor



PLantroom 41 Calorifiers 01, 02 & 03

Level	Department
Level 1	NCH Critical Care (PICU)
Level 1	RHSC PICU Support
Level 1	RHSC MDU
Level 1	RHSC Theatres
Level 1	RHSC Special Feeds
Level 1	RHSC Cardiology Ward

PLantroom 21 Calorifiers 01, 02 & 03

Level	Department
Level 1	CCU
Level 1	Critical Care

PLantroom 22 Calorifiers 01, 02 & 03

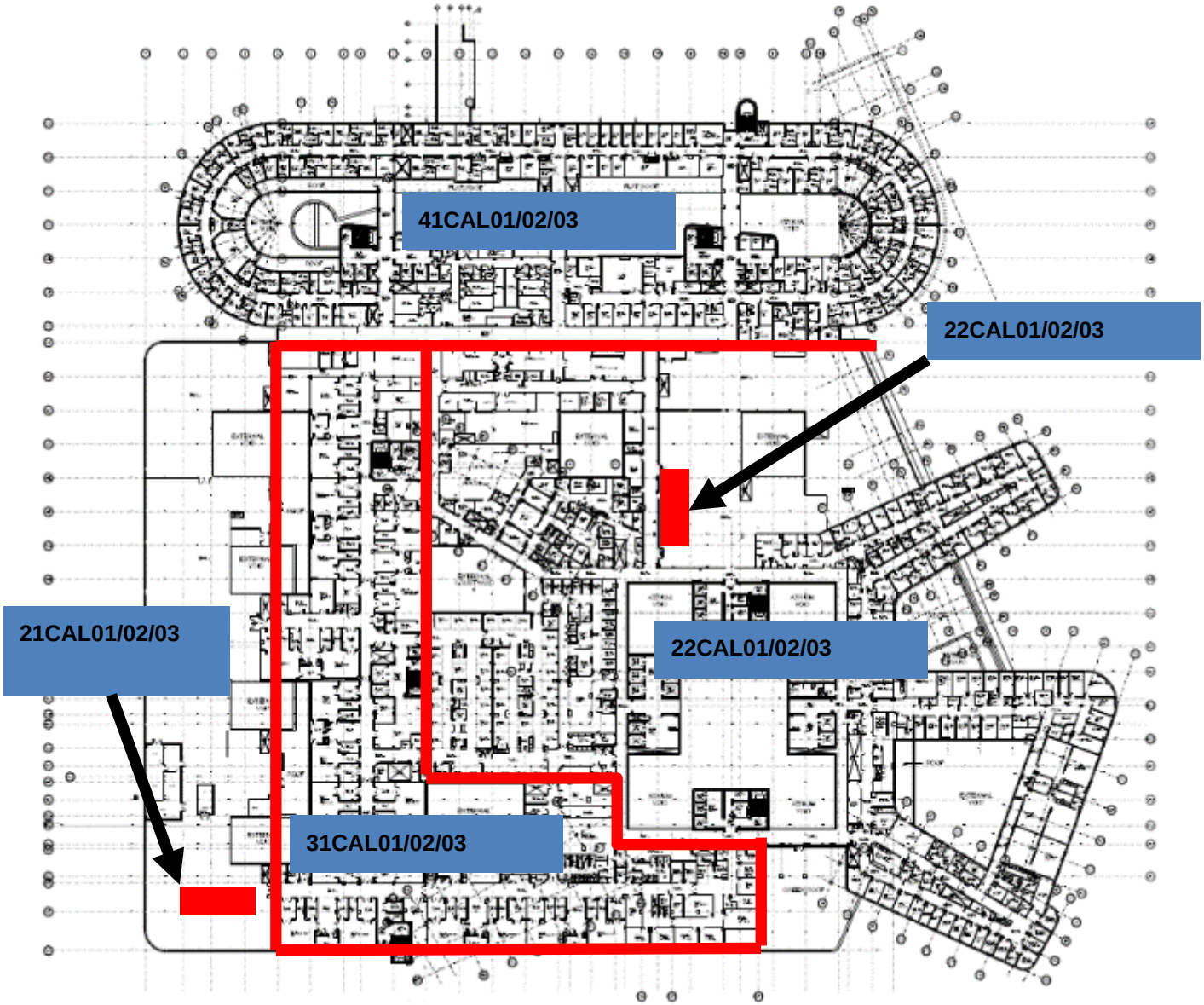
Level	Department
Level 1	OPD
Level 1	Restaurant Visitors Dining and Coffee Lounge
Level 1	Nuclear Medicine
Level 1	RHSC Theatres
Level 1	RHSC Radiology & Interventional Radiology

PLantroom 31 Calorifiers 01, 02 & 03

Level	Department
Level 1	ADULTS MDU
Level 1	ADULTS Stroke Ward

Section 6 Appendix 2 - Distributions Zone Map

2nd Floor



PLantroom 41 Calorifiers 01, 02 & 03

Level	Department
Level 2	RHSC Acute Receiving Ward
Level 2	Aseptic Suite
Level 2	RHSC Day Case Unit
Level 2	RHSC Schiehallion Ward
Level 2	RHSC Ward Support

PLantroom 22 Calorifiers 01, 02 & 03

Level	Department
Level 2	Renal Dialysis OPD
Level 2	Renal Dermatology OPD
Level 2	Theatres
Level 2	Endoscopy
Level 2	Female Change (Core D)

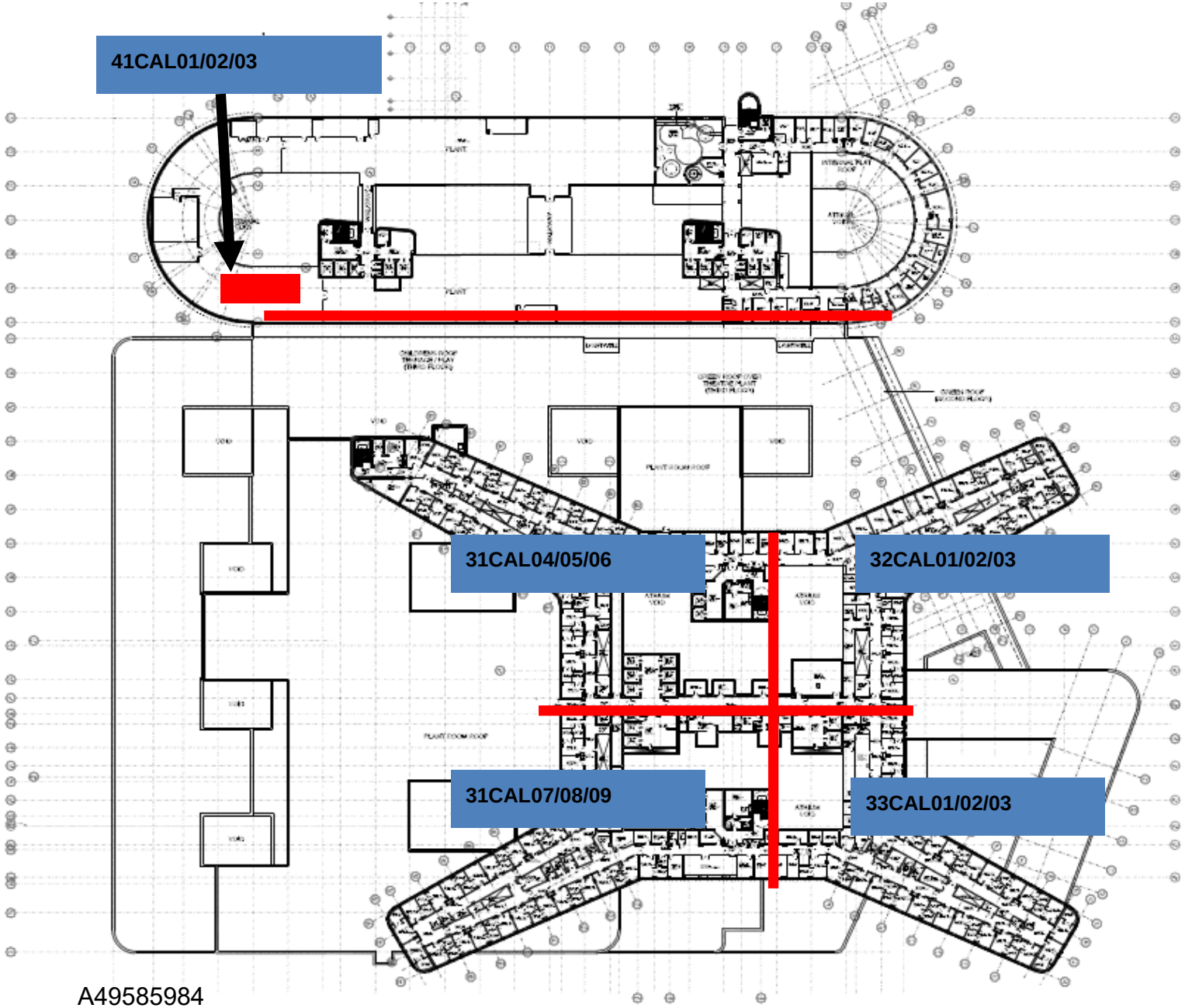
PLantroom 31 Calorifiers 01, 02 & 03

Level	Department
Level 2	ADULTS Theatres

A49585984

Section 6 Appendix 2 - Distributions Zone Map

3rd Floor



PLantroom 41 Calorifiers 01, 02 & 03

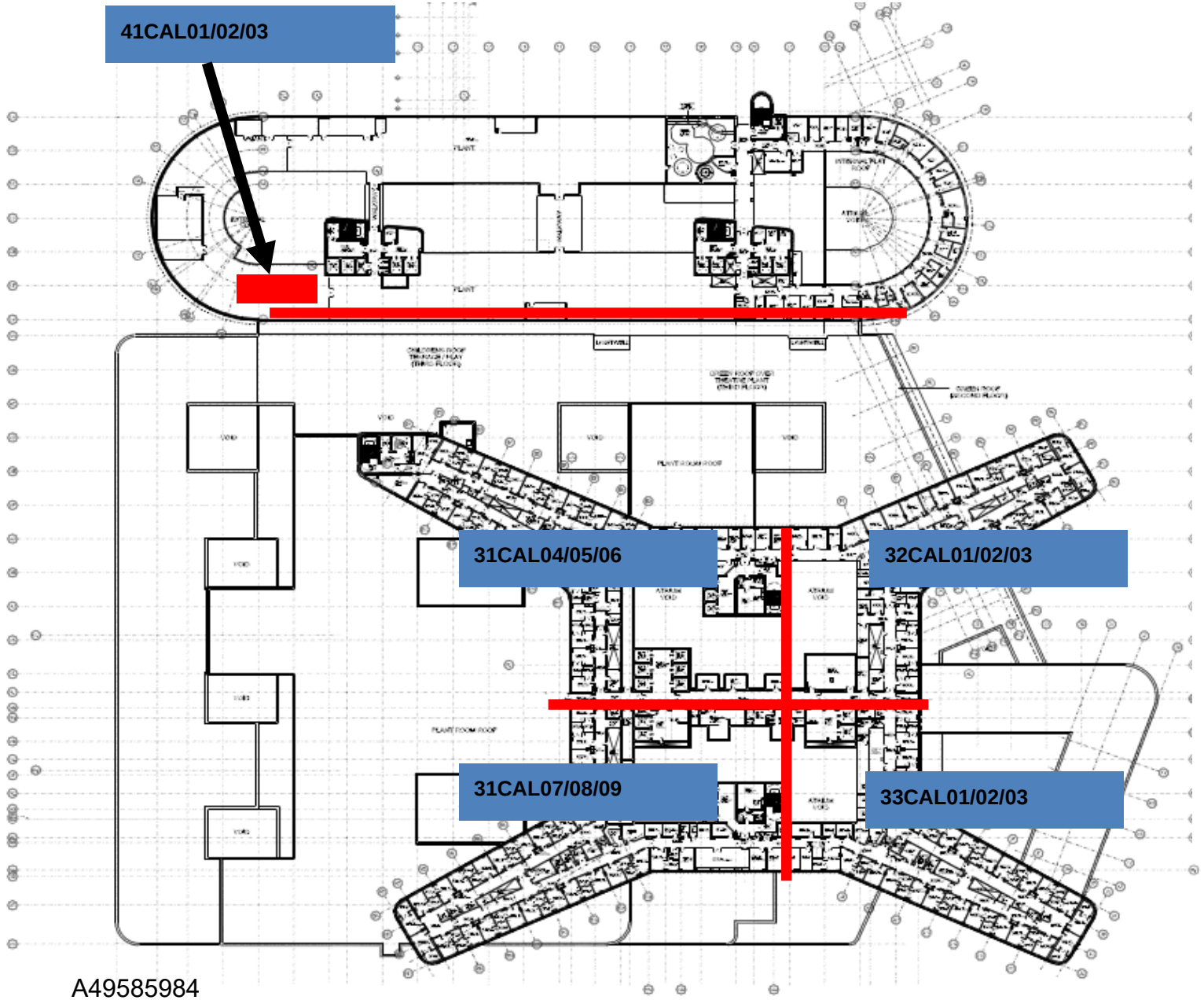
Level	Department
Level 3	RHSC Inpatient Ward
Level 3	RHSC Ward Support
Level 3	RHSC Generic Ward

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 3	Public Health Records

Section 6 Appendix 2 - Distributions Zone Map

4th Floor



A49585984

PLantroom 41 Calorifiers 01, 02 & 03

Level	Department
Level 4	RHSC DCFP

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 4	Higher Acute Renal Ward
Level 4	ADULTS Dirty Core D

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 4	Haemo Oncology Ward
Level 4	ADULTS Core C Regen Kitchen

PLantroom 31 Calorifiers 07, 08 & 09

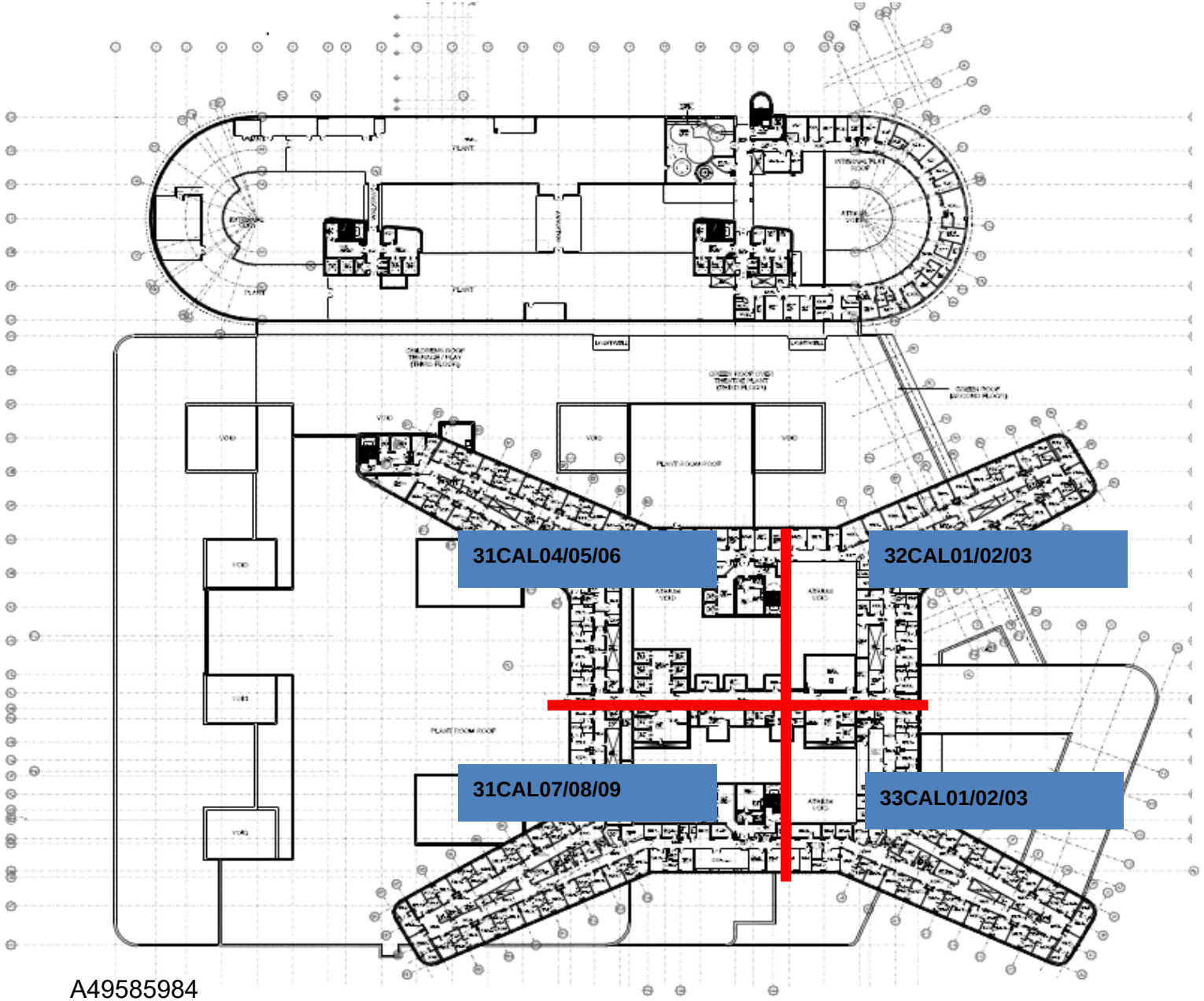
Level	Department
Level 4	Renal Ward

33-CAL 01, 02 & 03

Level	Department
Level 4	Renal Ward

Section 6 Appendix 2 - Distributions Zone Map

5th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 5	Rheumatology Ward
Level 5	Dirty Core D

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 5	ENT Ward
Level 5	Core C Regen Kitchen

PLantroom 31 Calorifiers 07, 08 & 09

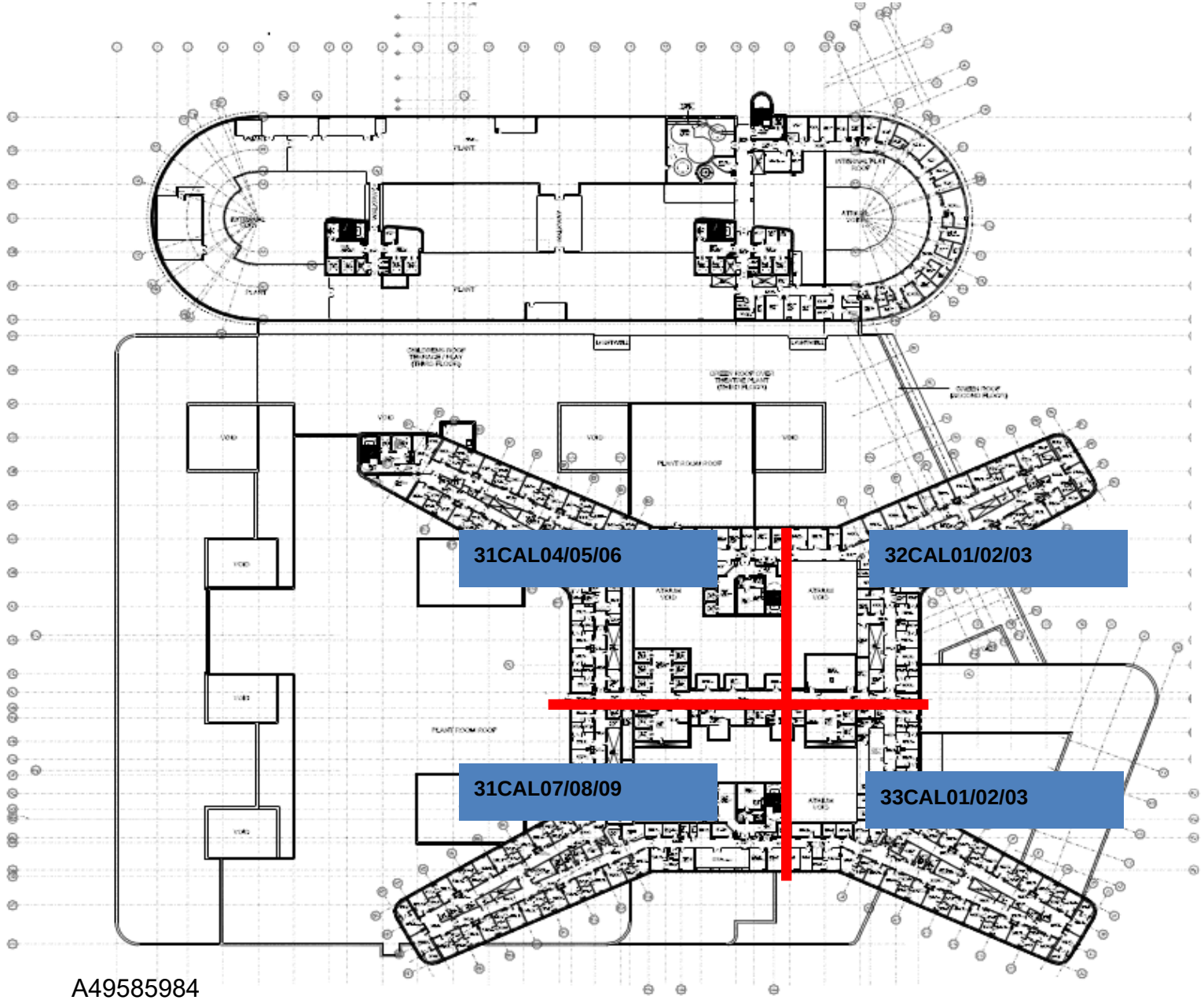
Level	Department
Level 5	ENT Ward
Level 5	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 5	General Ward

Section 6 Appendix 2 - Distributions Zone Map

6th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 6	General Ward
Level 6	Dirty Core D

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 6	Generic Ward
Level 6	Core C Regen Kitchen

PLantroom 31 Calorifiers 07, 08 & 09

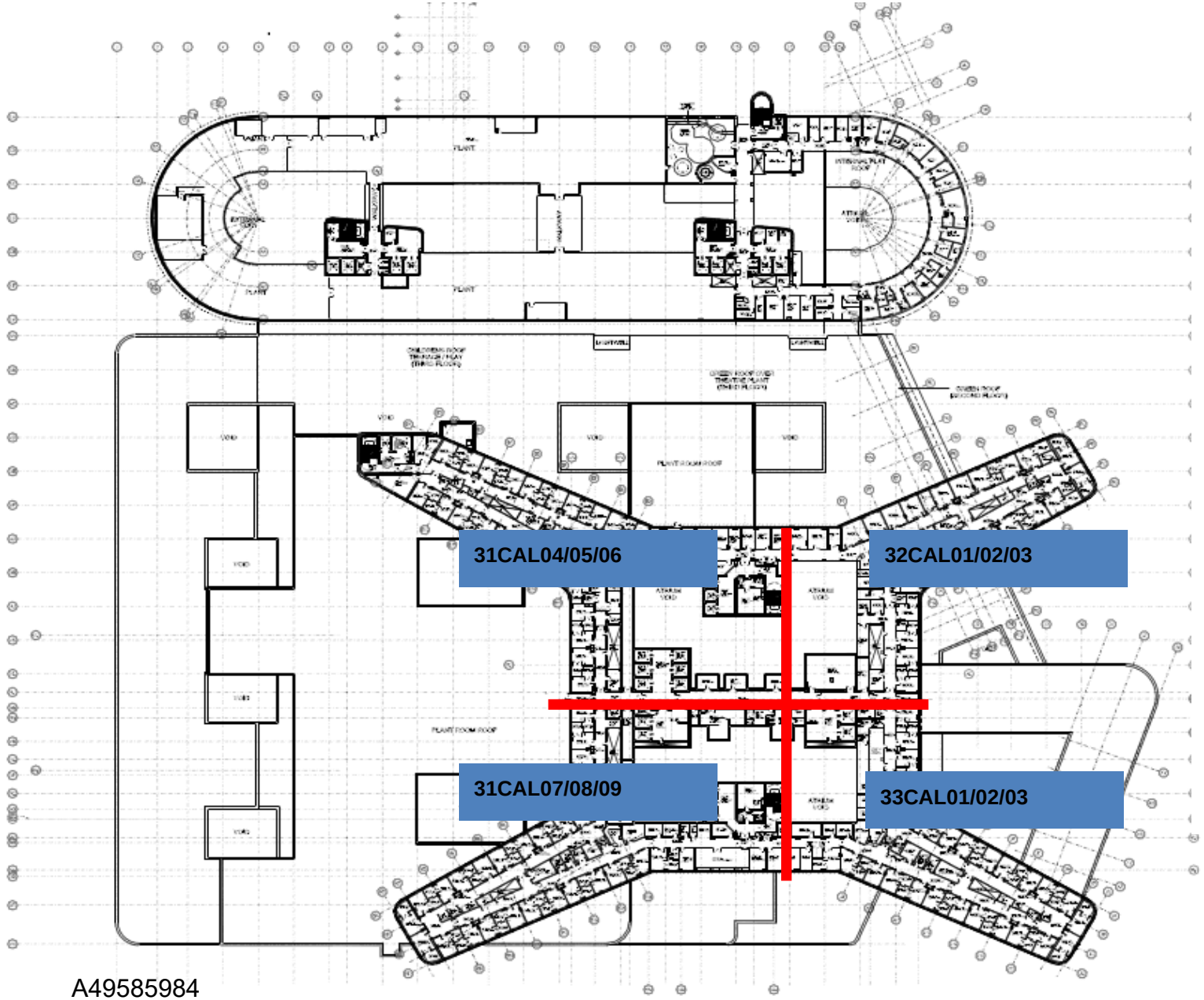
Level	Department
Level 6	Generic Ward
Level 6	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 6	General Ward

Section 6 Appendix 2 - Distributions Zone Map

7th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 7	Generic Ward
Level 7	Core C Regen Kitchen

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 7	General Ward
Level 7	Dirty Core D

PLantroom 31 Calorifiers 07, 08 & 09

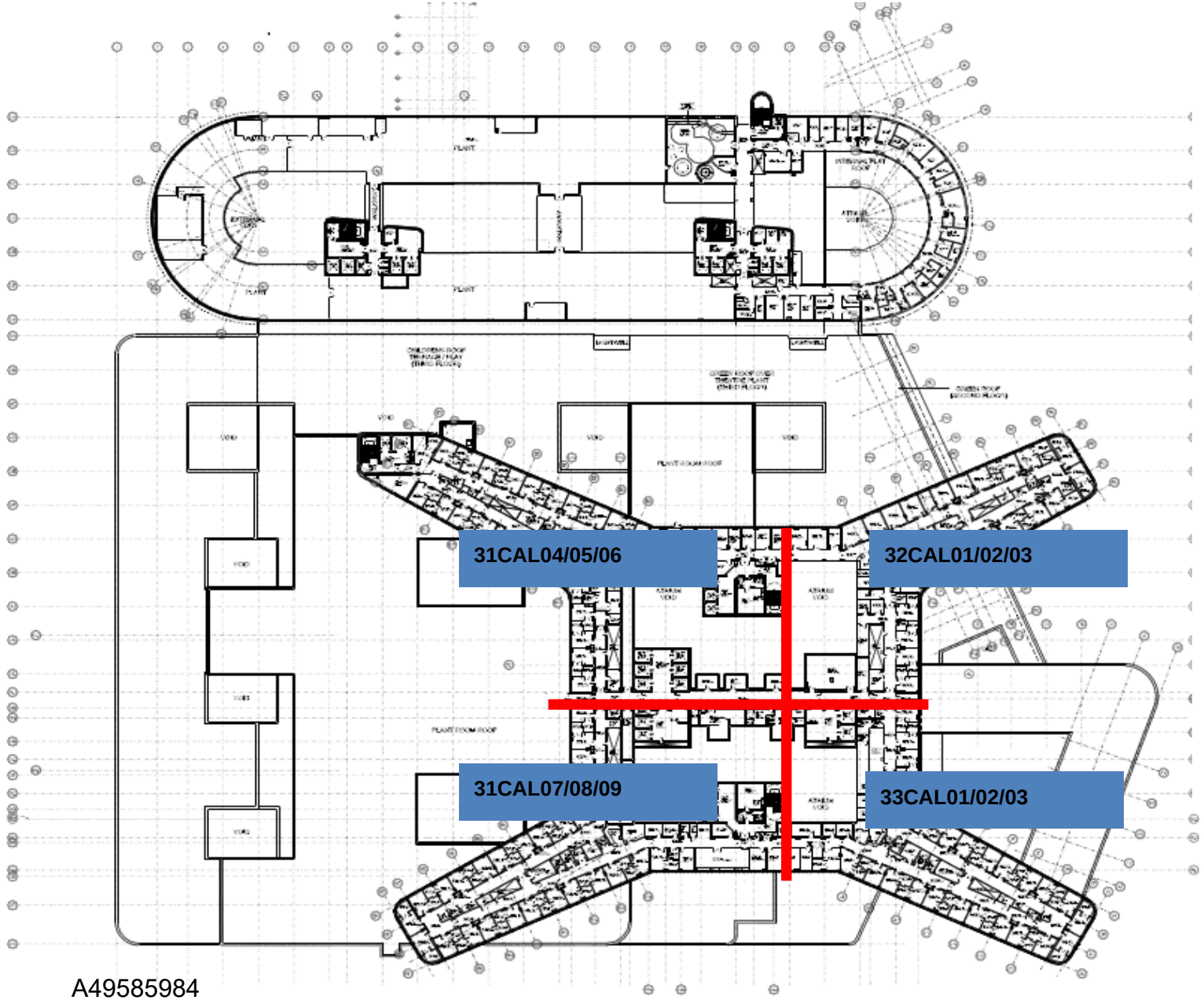
Level	Department
Level 7	Generic Ward
Level 7	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 7	General Ward

Section 6 Appendix 2 - Distributions Zone Map

8th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 8	Generic Ward
Level 8	Core C Regen Kitchen

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 8	General Ward
Level 8	Dirty Core D

PLantroom 31 Calorifiers 07, 08 & 09

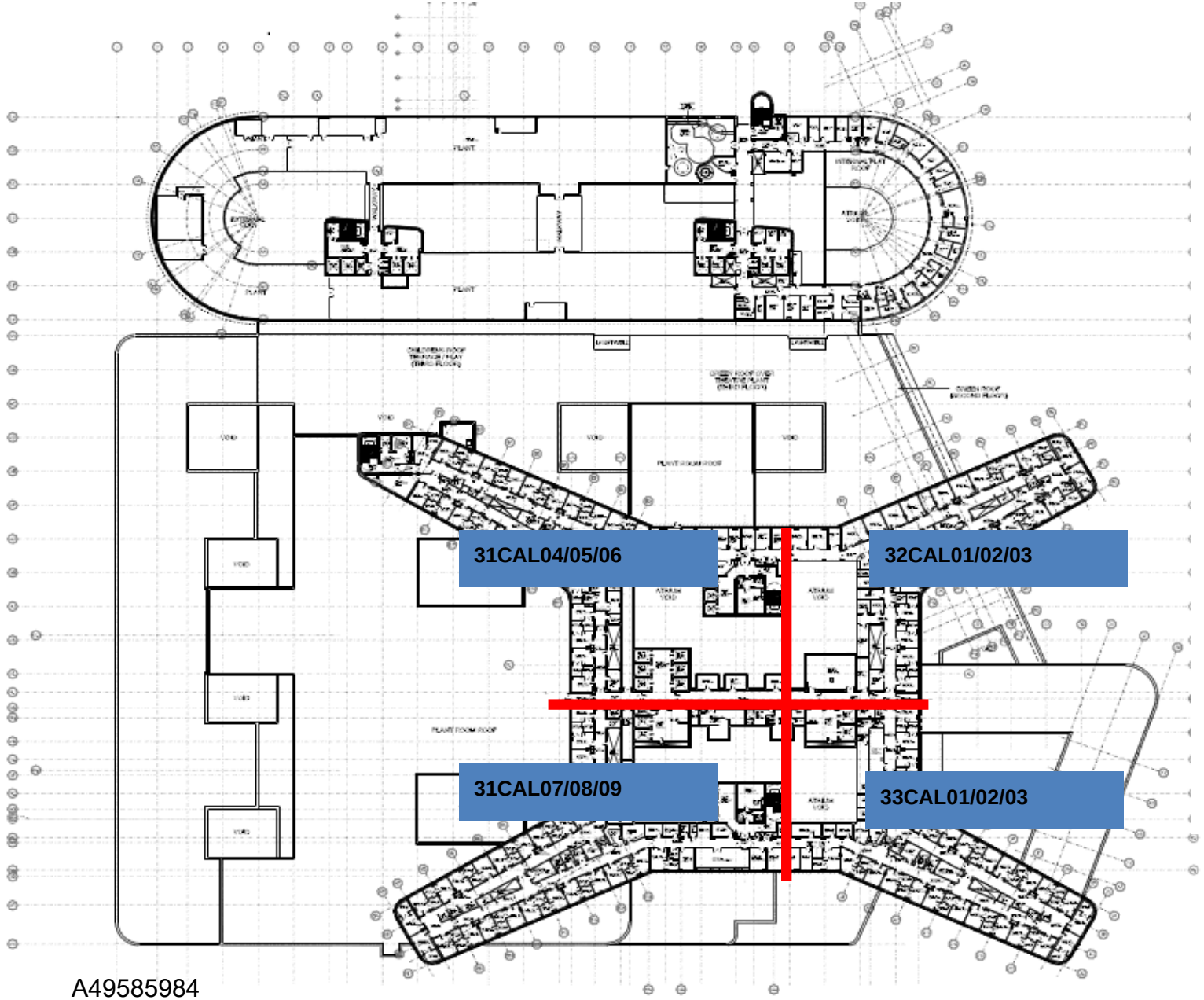
Level	Department
Level 8	Generic Ward
Level 8	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 8	General Ward

Section 6 Appendix 2 - Distributions Zone Map

9th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 9	Generic Ward
Level 9	Core C Regen Kitchen

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 9	General Ward
Level 9	Dirty Core D

PLantroom 31 Calorifiers 07, 08 & 09

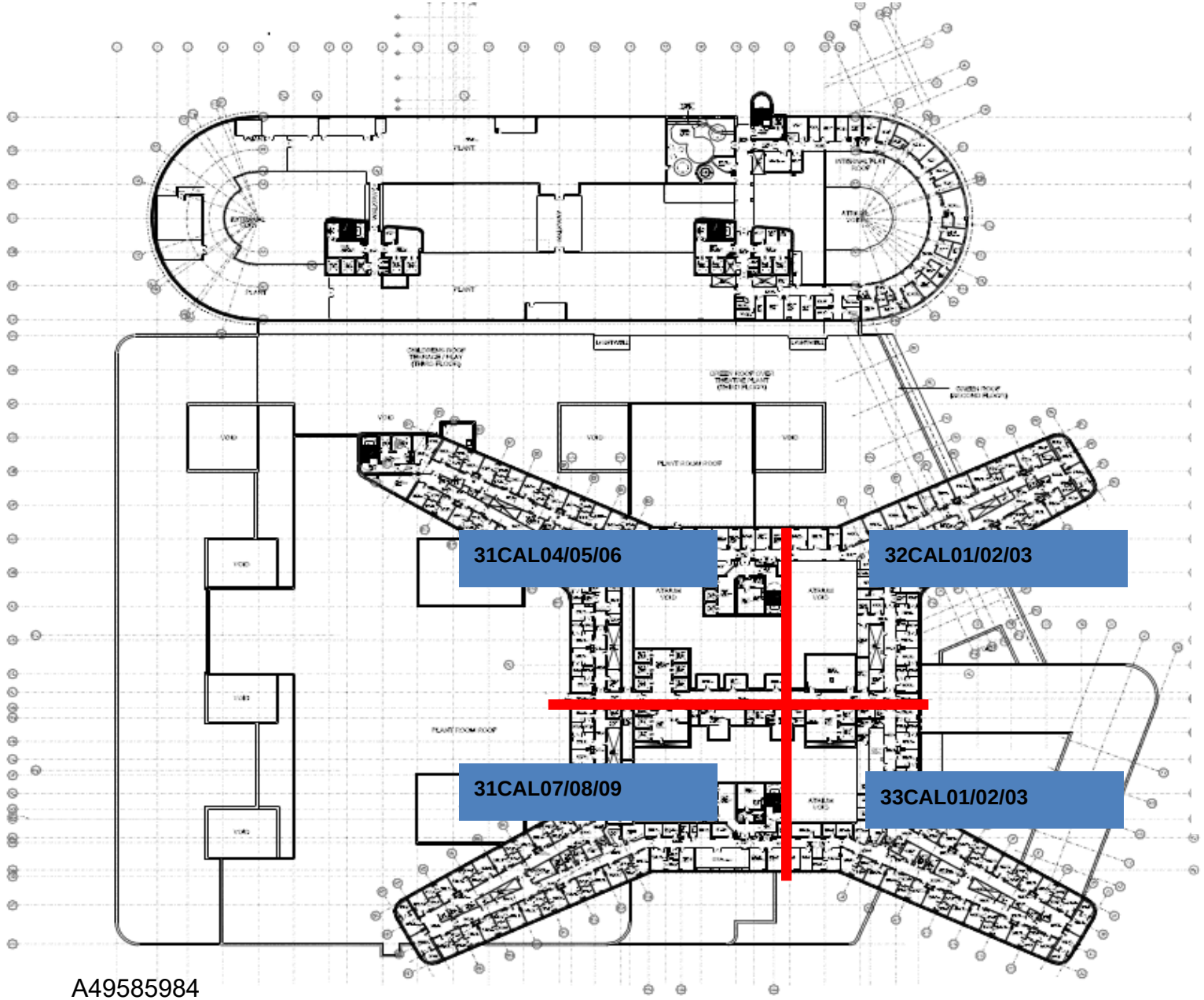
Level	Department
Level 9	Generic Ward
Level 9	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 9	General Ward

Section 6 Appendix 2 - Distributions Zone Map

10th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 10	Generic Ward
Level 10	Core C Regen Kitchen

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 10	General Ward
Level 10	Dirty Core D

PLantroom 31 Calorifiers 07, 08 & 09

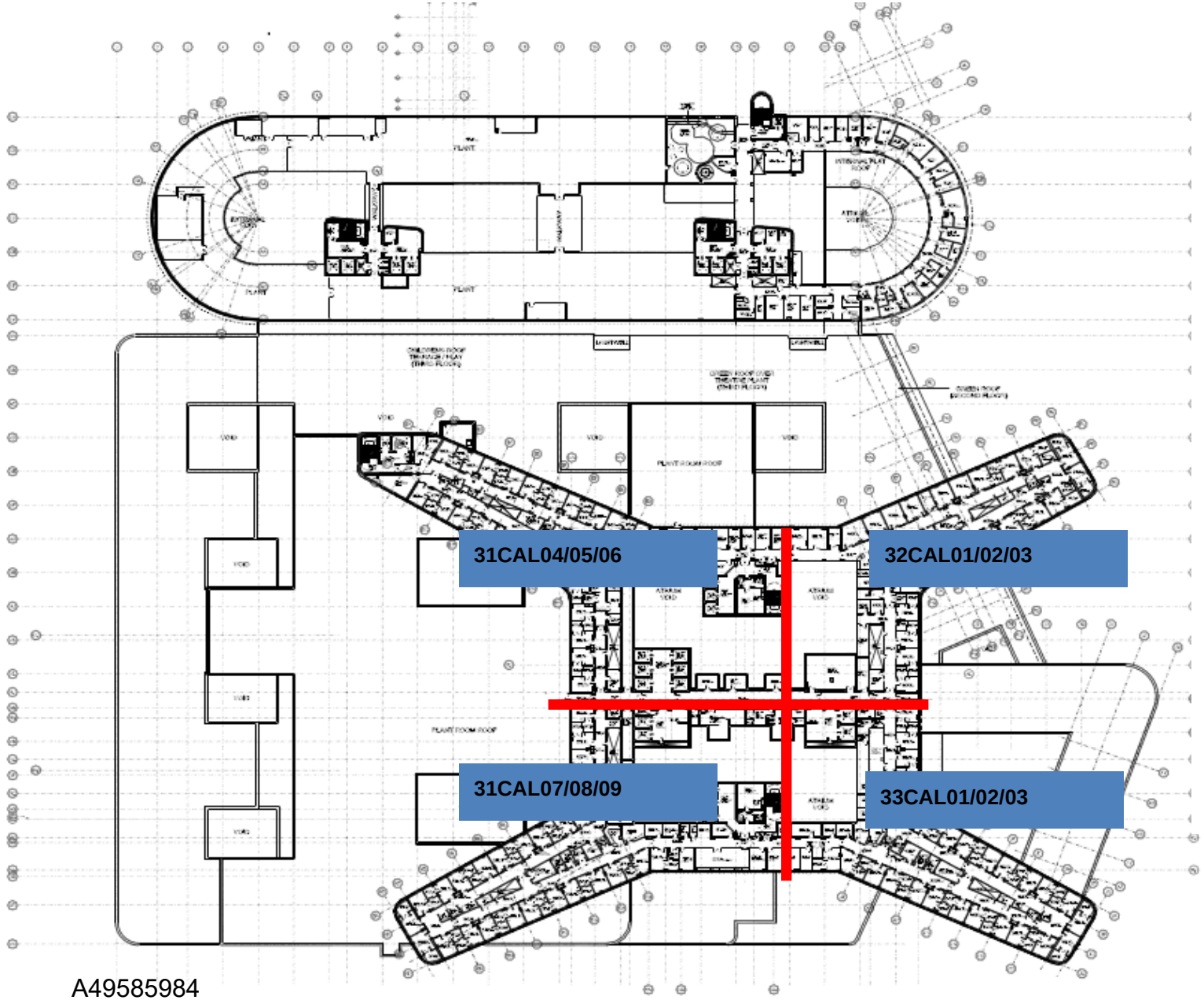
Level	Department
Level 10	Generic Ward
Level 10	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 10	General Ward

Section 6 Appendix 2 - Distributions Zone Map

11th Floor



A49585984

PLantroom 32 Calorifiers 01, 02 & 03

Level	Department
Level 11	Generic Ward
Level 11	Core C Regen Kitchen

PLantroom 31 Calorifiers 04, 05 & 06

Level	Department
Level 11	General Ward
Level 11	Dirty Core D

PLantroom 31 Calorifiers 07, 08 & 09

Level	Department
Level 11	Generic Ward
Level 11	Core C Regen Kitchen

33-CAL 01, 02 & 03

Level	Department
Level 11	General Ward

Section 7

Hot and Cold Water Outlets

LEGIONELLA RISK ASSESSMENT

Showers and other spray outlets

Since showers produce fine water droplets or spray they present a significantly higher risk for the development of Legionnaires ' disease than other types of hot and cold outlets.

Water temperature, system design/installation, showerhead design, frequency of use and cleanliness of the outlet are the most significant factors in determining the risk potential.

Hot and cold water outlets

Hot and cold-water outlets do not normally present a risk for the development of Legionnaires' disease unless the outlets create fine droplets or spray. Outlets that do create sprays/droplets significantly increase the risk.

Water temperature, system design/installation, frequency of use, tap design and cleanliness of the outlet are the most significant factors in determining the risk potential.

Basic principles being looked at in this section are the physical condition, and the design of the water services pipework and outlets, and the temperature profile of the water being distributed to the outlets. There should be no unused outlets or deadlegs (blank ends) on any parts of the systems. Hot water should be delivered to all outlets at a minimum of 50°C (55°C within healthcare premises) within 1 minute of outlet being run and cold water below 20°C within 2 minutes of being run. Cold water should be no more than 2°C higher at the outlet then the water source for this outlet (e.g. CWST). This section also incorporates details of spray outlets/aerosol generators (showers etc.), low use outlets and unused outlets.

Please refer to outlet sheets for specific recommendations & risk ratings.

Risk factors incorporated within this section of the document are classified as "additional localised risk rating". This refers only to the condition of the localised pipework distribution and services and the risk rating applied is in addition to risk rating of the plant items feeding the services.

All outlets fed from CWSTs or calorifiers etc. Inherently carry the risk associated to these plant items, and these risk factors must be taken into account in determining the actual risk posed by the system as a whole.

Please refer to appropriate sections on legionella management, CWSTs, calorifiers and water source to determine the inherent risk factors of water being supplied to the outlets being assessed in this section.

LEGIONELLA RISK ASSESSMENT

Hot and Cold Water Outlet Notes

1. Thermostatic mixing valves (TMVs) should be serviced and have fail safe tests carried out routinely (every 6 months) and strainers should be cleaned on a regular basis as per manufacturer's recommendations. Ideally TMVs should feed single outlets and be situated as close as possible to the outlet (preferably TMV Taps should be fitted).

2. All flexi hoses connecting taps/outlets should be WRAS approved and should be replaced every 2 years or sooner if damaged or twisted. Wherever possible DMA would recommend all flexi hoses are removed and connections hard piped. Where flexible hoses cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered. In healthcare premises flexible hoses should only be used on essential equipment subject to vibration or articulation and wherever practical alternative lining materials should be considered with hoses be inspected, assessed and replaced at regular intervals. Refer to HTM/SHTM 04-01 for further details.

3. All lead (Pb) pipework should be removed and replaced with copper or other suitable WRAS approved pipework.

4. Wherever possible, DMA would recommend that spray taps are removed and replaced with taps which do not create an aerosol. Tap diffusers should also be removed where possible to minimise aerosol creation and the build-up of dirt/scale etc. On the diffusers wherever possible. In healthcare premises adjustable flow showerheads should not be fitted (replace with non-adjustable showerheads).

5. Drain cocks fitted at the end of pipe runs should be removed if not required for operational reasons or periodically flushed (weekly) and checks carried out to ensure that inserts/washers etc. are WRAS approved.

6. Adequate backflow protection as per Water Regulations Guide & Water Byelaws (Scotland) – section 6, should be incorporated into the water services within the building. Suitable backflow protection should be fitted to all point of use water heaters, multi point water heaters, tea boilers etc., if not fitted inside heater itself, on pressurised systems (e.g. Mains fed or boosted cold water fed). Before fitting any double check valves or other forms of backflow protection ensure that adequate pressure relief valves/expansion vessels are fitted and working in the event of excessive pressure or temperature build up within water heaters.

7. Water coolers and drinks machines should have regular servicing carried out (generally six monthly) as per manufacturers recommendations.

8. Where passive infra-red (PIR) flush controls are fitted on urinals these have batteries fitted. Make sure these batteries are working and all PIR(s) are serviced every two years or as per manufacturers' recommendations otherwise these may become low flow or deadleg areas.

9. All low use outlets, and all associated pipework, should be removed leaving no deadlegs if outlets no longer required, or incorporated into low use flushing regime.

10. All deadlegs should be removed wherever possible. Where deadlegs are unable to be removed provision to allow flushing of the deadlegs weekly as part of the flushing regime should be made. (i.e. Valves fitted at end of deadlegs to allow flushing to be carried out).

11. All plant items, valves. CWSTS, calorifiers etc. Should be clearly labelled to identify what services and areas they serve.

12. All equipment hoses (e.g. Kitchen/laundry appliances) should be WRAS approved and inspected and replaced on a regular basis.

13. Cold water should be delivered to outlets (and cold feed to thermostatic mixing valves) at less than 20°C within 2 minutes of outlet being run, and not more than 2°Cabove outlet water source temperature (e.g. CWST)

14. Hot water should be delivered to outlets (and hot feed to thermostatic mixing valves) at more than 50°C (55°C in healthcare premises), within 1 minute of outlet being run[1]

[1] Hot supply temperatures in healthcare premises varies from non-healthcare premises. Please refer to HSG 274 Part 2 and HTM/SHTM 04/01 for further details.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	A&E	EMC-020	Toilet	1 x Contour	14.8	0.39			41.3	0.17	
0	Adults	A&E	EMC-031	Triage B	1 x Optitherm	13.1	0.36			41.7	0.15	
0	Adults	A&E	EMC-037	Disabled Toilet	1 x Contour	18.2	0.36	56.8		40.3	0.19	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.
0	Adults	A&E	EMC-041	Toilet	1 x Contour	NA	NA			47.9	0.11	TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	Adults	A&E	EMC-059	Bed Bay 5	1 x Optitherm	14.5	0.4			40.1	2.06	
0	Adults	A&E	EMC-060	Bed Bay 6	1 x Optitherm	14.8	0.42			39	0.15	
0	Adults	A&E	EMC-063	Bed Bay 8	1 x Optitherm	17.3	0.39			40.5	0.17	
0	Adults	A&E	EMC-076	Bed Bay No. 8	1 x Optitherm	16.4				40.9	0.09	
0	Adults	A&E	EMC-086	Facilties	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	17.8	0.37	47.8	<0.02	40.2		Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.
0	Adults	A&E	EMC-093	Bed 14	1 x Optitherm	14.4	0.34			41.8	0.15	
0	Adults	A&E	EMC-100	Service	1 x Optitherm 1 x SSS	14.4	0.41			40.2	2.19	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	A&E	EMC-111	Female Change	3 x Contours 2 x Showers	20.3	0.32	52		41.4	0.14	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
0	Adults	A&E	EMC-135	Store	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.2	0.31	46.1	0.02	40.7		Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.
0	Adults	Acute Assess	AAW-007	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	12.1	0.33	61.6	0.02			
0	Adults	Acute Assess	AAW-017	Bed 111	1 x Optitherm	13.6	0.38			40.9	0.17	
0	Adults	Acute Assess	AAW-032	Bedroom 104	1 x Optitherm 1 x Contour 1 x Shower	19.8	0.3	58.2		39.9	0.15	
0	Adults	Acute Assess	AAW-038	Toilet	1 x Contour 1 x WC	19.8	NA	61.8		57.5	0.03	TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	Adults	Acute Assess	AAW-045	Treatment Room	1 x Optitherm	14.6	0.35			40.2	0.14	
0	Adults	Acute Assess	AAW-060	Toilet	1 x Contour	20.5	0.18	59.2		38.2	0.25	TMT slightly out of specification and requires reset and/or fully serviced or replaced if required. Cold temperature slightly high, though taken from surface temp/via a contour and temperatures in surrounding area acceptable. Investigate and correct.
0	Adults	Acute Assess	AAW-089	Bedroom 85 (En suite)	1 x Optitherm 1 x Contour 1 x Shower	20.5	0.3	57.9		40.2	0.15	Cold temperature slightly high, though taken from surface temp/via a contour and temperatures in surrounding area acceptable. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	Acute Assess	AAW-096	Toilet (Room 81)	1 x Contour 2 x Shower	18.2	0.39			41.9	0.2	
0	Adults	Acute Assess	AAW-108	Bedroom 92 Bathroom	1 x Optitherm 1 x Contour 1 x Shower	19	0.33			41.1	0.18	
0	Adults	Acute Assess	AAW-125	Facilities C27501A	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.1	0.37	63.8	<0.02			
0	Adults	Acute Assess	AAW-156	Staff Kitchen	1 x Infrared 1 x SSS	15.1	0.32	59.2	<0.02			
0	Adults	Acute Assess	AAW-173	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.5	0.37	62.5	0.06			
0	Adults	Acute Assess	AAW-174	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.8	0.33			40.2	0.15	
0	Adults	Acute Assess	AAW-193	Toilet	1 x Optitherm	21	0.27	53.8		37.1	2.3	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. TMT slightly out of specification and requires reset and/or fully serviced or replaced if required. Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct.
0	Adults	Acute Assess	AAW-208	Dirty Utility	2 x Optitherm	18.5	0.35	46.8		24	<0.02	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	Adults	Acute Assess	AAW-226	Lab	1 x Optitherm	16.9	0.35			40	0.06	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	Acute Assess	AAW-240	Toilet	1 x Optitherm	19.7	0.29	60.8		47.3	0.13	TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	Adults	Acute Assess	AAW-247	Kitchen	1 x Infrared Contour 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.3	0.28	63.3	?			
0	Adults	Acute Assess	AAW-265	Bedroom 63	1 x Optitherm 1 x Contour 1 x Shower	15.6	0.37			39.5	0.18	
0	Adults	Acute Assess	AAW-313	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.6	0.33	61.6	0.02			
0	Adults	Acute Assess	AAW-375	Bed 73	1 x Optitherm	14.8	0.41			40.9	0.16	
0	Adults	Concourse	ENT-038	Baby Change	1 x Optitherm	15.9	0.38			39.2	0.2	
0	Adults	Concourse	ENT-052	Male Toilet	1 x Contour 1 x Shower					39.7	0.23	
0	Adults	Concourse	ENT-062	Facilities (outside X-Ray)	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14	0.39	62.3	0.02			
0	Adults	De-contamination	DCU-003	Wet Room Treatment		19	0.33			42.7	0.12	
0	Adults	Discharge Lounge	DLO-146	Consulting Room	1 x Optitherm	16.3	0.38			40.8	0.017	
0	Adults	Discharge Lounge	DLO-006	Toilet	1 x Infrared Tap	20.3		58.9		39	0.2	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct. Water Hammer and pulsing thorugh solenoid/TMV - Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	Medical Illustration	MIL-010	Studio	1 x Optitherm	17.1	0.39			39.1	0.23	
0	Adults	OPD	OPD0-146	Consulting Room 5	1 x Optitherm	16.2	0.37			41.6	0.17	
0	Adults	OPD	OPDO-003	Male Changing	1 x Shower							
0	Adults	OPD	OPDO-029	Clean Utility	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.2	0.35	59.2	0.02			
0	Adults	OPD	OPDO-049	Treatment Room 23	1 x Optitherm	18.4	0.38			41.7	0.16	
0	Adults	OPD	OPDO-067	Dirty Utility	2 x Optitherm	18.8	0.31			40.2	0.2	Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct.
0	Adults	OPD/ Concourse	OPDO-073	Toilet	1 x Shower 1 x IR Tap					42.9	0.22	
0	Adults	OPD/ Concourse	OPDO-075	Toilet	1 x Contour	19.8	0.42	59.8		46.5	0.16	TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	Adults	Orthotics	ORT-015-2	Staff Change Toilet	1 x Contour	19.2	0.36			39.5	0.02	
0	Adults	Orthotics	ORT-017	Disabled WC	1 x Contour	17.4	0.39			42.8	0.13	
0	Adults	Orthotics	ORT-027	Treatment Room 33	1 x Optitherm	15.7	0.385			43	0.1	
0	Adults	Orthotics	ORT-045	Toilet	1 x Contour	17.9	0.43	45		39.2	0.23	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.
0	Adults	Pharmacy	NO DOOR CODE (PHA-008)	Clinical Trial Prep	1 x Optitherm	16.2	0.42			40.4	0.18	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	Pharmacy	PHA-002DSR	Facilties	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.2	0.33	62.5	0.02			
0	Adults	Radiology	RAG-004	Dirty Utility	2 x Optitherm	15	0.35			40.3	0.2	
0	Adults	Radiology	RAG-029	X-Ray 6	1 x Optitherm	17.5	0.37			40.4	0.15	
0	Adults	Radiology	RAG-055	Toilet	1 x Contour	17.9	0.39			39	0.21	
0	Adults	Radiology	RAG-068	Toilet	1 x Contour	21.9	0.57	61.3		40.6	0.18	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
0	Adults	Radiology	RAG-079	Dsiabled Toilet	1 x Contour	15.1	0.37			41.6	0.02	
0	Adults	Radiology	RAG-092	Toilet	1 x Infrared Tap	20.8		59.4		39.2	0.2	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
0	Adults	Radiology	RAG-103	Store Room	1 x Optitherm	19.8	0.3			33.8	0.02	TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	Adults	Radiology	RAG-130	Disabled Toilet	1 x Contour	19.4	0.35			39.38	0.24	
0	Adults	Radiology	RCG-022	Male Change	1 x Contour	18.3	0.49			41.1	0.18	
0	Adults	Radiology	RCG-068	Baby Sleep	1 x Optitherm	21.8	0.34			39.4	0.2	Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	Adults	Radiology	RCG087	Dirty Utility	2 x Optitherm	18.6	0.49			39.7	0.21	
0	Adults	Rehab	REH-006	Disabled Toilet	1 x Contour	15.4	0.38			40.3	0.18	
0	Adults	Rehab	REH-013	OT Room	1 x Contour	15.8	0.41			40.9	0.17	
0	Adults	Rehab	REH-026	Toilet	1 x Contour	19.4	0.34	58.5		39.4	0.21	
0	Adults	Rehab	REH-035	Casting	2 x Optitherm	14.1	0.43			40.9	0.19	
0	Adults	Rehab	REH-048	Toilet	1 x Contour	16.9	0.34			41.5	0.17	
1	Adults	Critical Care	CCU-004	Staff Kitchen	1 x Contour 1 x SSS	16.5	0.36	59.2	0.02			
1	Adults	Critical Care	CCU-036	Bedroom 60	1 x Optitherm	18.5	0.38	59.2		40.5	0.02	
1	Adults	Critical Care	CCW-017	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.8	0.38	59	0.03	40.7		
1	Adults	Critical Care	CCW-029	Patient Shower Room	1 x Contour 1 x Shower	19.8	0.02	60.3		41.2	0.14	
1	Adults	Critical Care	CCW-048	Bed Bay 1	1 x Optitherm	14.3	0.32			42.3	0.18	
1	Adults	Critical Care	CCW-087	HAD 4 Bed 37	1 x Optitherm	16.3	0.36			41.1	0.12	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	Adults	Critical Care	CCW-089	HDU 4 Bed Bat	1 x Optitherm	17.6	0.37			40.9	0.18	
1	Adults	Critical Care	CCW-093	Lab	1 x Optitherm	15.6	0.37			42.2	0.14	
1	Adults	Critical Care	CCW-109	HDU 3 Bed Bay 26	1 x Optitherm	16.6	0.39			39.6	0.06	
1	Adults	Critical Care	CCW-113	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.6	0.32	61.2	0.07			
1	Adults	Critical Care	CCW-126	Dirty Utility	2 x Optitherm	17	0.35	40.6		36.8 / 39.3	0.1	Hot flow and return not operating correctly in area. Flow and return operates as a constant once through loop. All visible valves in open positions. Optitherms required 10 minutes flushing to achieve recorded temperature - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. (Limited access to pipework in open ward area due to patient care).
1	Adults	Critical Care	CCW-130	Service	1 x Pillar Tap 1 x Optitherm	17.2	0.33			42.9	0.02	
1	Adults	Critical Care	CCW-131	Pharmacy Support	1 x Optitherm	17.5	0.33			39.4	0.19	
1	Adults	Critical Care	CCW-141	Bed 44 (en-suite)	1 x Contour 1 x Shower							
1	Adults	Critical Care	CCW-200	Facilties	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.2	0.33	63.23	0.02			
1	Adults	Critical Care	CCW-202	Shower Room	1 x Contour 1 x Shower	17.5	0.34			41.8	0.16	
1	Adults	Critical Care	CCW-214	Male Change	3 x Contours 3 x Showers	17.9	0.31			40.7	0.15	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	Adults	FM Facilities	FMA1-001	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.6	0.13	60.2	0.02			
1	Adults	Children's Theatres	THE-069	Lab	1 x Optitherm	17.1	0.38	59.9		41.4	0.19	Ice flaking machine and associated pre-filter taken from tee on cold supply to area. No visible backflow protection on supply to filter. Ensure any required backflow protection is fitted as close to tee where line branches. Ice should not be allowed to stagnate in an ice-making machine's storage bin, but should be changed frequently. For guidance on infection-control precautions with regard to ice-making machines, see Scottish Health Facilities Note 30: 'Infection control in the built environment'. Maintenance for ice-making machines should be carried out in accordance with the manufacturer's recommendations. Care should be taken to ensure that the water supply to the ice-making machine is not subjected to heat gain.
1	Adults	Children's Theatres	THE-090	Theatres	Scrub Sink - 3 x Optitherm	19.3	0.285	61		39.8	0.15	
1	Adults	Children's Theatres	THE-102	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	18.8	0.24	63.3	0.02			
1	Adults	Children's Theatres	THE-106	Anaesthesia Room 3	1 x Optitherm	16.8	0.27			40.6	0.13	
1	Adults	Children's Theatres	THE-118	Anaesthetics Room 2	1 x Optitherm	22.1	0.23			42.3	0.14	Cold temperature high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
1	Adults	Children's Theatres	THE-156	Bed Bay 2	1 x Optitherm	24.1	0.2			41.1	0.1	Cold temperature high - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	Adults	Medical Unit	MDU-012	Treatment Room 22	1 x Optitherm	15.3	0.34			41.4	0.12	
1	Adults	Medical Unit	MDU-012	Treatment Room 22	1 x Optitherm	14	0.26			40.6	0.15	
1	Adults	Medical Unit	MDU-020	Blood Test	1 x Optitherm	15.2	0.31			40.4	0.08	
1	Adults	Medical Unit	MDU-046	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	17.2	0.33	58.3	0.02	39.9		
1	Adults	Medical Unit	MDU-048	Dirty Utility	2 x Optitherm	15.4	0.33			42.1	0.16	
1	Adults	Medical Unit	MDU-050	Consulting Room 2	1 x Optitherm	16.8	0.37			40.1	0.2	
1	Adults	Medical Unit	MDU-051	Consulting Room 1	1 x Optitherm	14	0.3			40.5	0.33	
1	Adults	Medical Unit	Medical Unit1-146	Blood Test	1 x Optitherm	16.9	0.42			39.9	0.14	
1	Adults	Medical Unit	Medical Unit1-146	Dirty Utility	2 x Optitherm	17	0.36			41.8	0.14	
1	Adults	Medical Unit	Medical Unit1-146	Clean Utility	2 x Pillar Tap(H+C) 1 x Optitherm	16.9	0.38	63.1	0.04			
1	Adults	OPD	OPD1-006	Public Toilet	1 x Contour	18.3	0.4	58.9		42.8	0.21	
1	Adults	OPD	OPD1-008	Toilet	1 x Infrared Tap					42	0.17	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	Adults	OPD	OPD1-037	Toilet	1 x Contour	21.2	0.22	58.6		46.3	0.14	TMT out of specification and requires reset and/or fully serviced or replaced if required. Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
1	Adults	OPD	OPD1-040	Consulting Room 117	1 x Contour	15.5	0.33	59		39.5	0.15	
1	Adults	OPD	OPD1-046	Measurement Bay 127	1 x Optitherm	15.7	0.53			41.2	0.13	
1	Adults	OPD	OPD1-048	Blood Lab	1 x Optitherm	16.7	0.35			41.1	0.19	
1	Adults	OPD	OPD1-063	Dirty Utility	2 x Optitherm	22.1	0.23			41.3	0.11	Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct.
1	Adults	OPD	OPD1-070	Podiatry Room 120	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.6	0.36			39.9	0.16	
1	Adults	OPD	OPD1-085	Toilet	1 x Contour	26.5	0.3			42.4	0.15	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
1	Adults	OPD	OPD1-113	Measurement Bay	1 x Optitherm	18.7	0.3			42.7	0.12	
1	Adults	OPD	OPD1-146	Dirty Utility	2 x Optitherm	19	0.33			39.6	0.19	
1	Adults	OPD	POA-006	Consulting Room	Unknown							
1	Adults	OPD	POA-014	Consulting Room 57	1 x Optitherm	15.8	0.43			40.8	0.17	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	Adults	OPD	POA-015	Consulting Room	1 x Optitherm	15.7	0.35			40.5	0.15	
1	Adults	OPD	POA-019	Clean Utility	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	15.2	0.32	61	0.02			
1	Adults	Radiology	RAF-003	Disabled WC at Entrance	1 x Contour	14.9	0.35		0.2	39.3		
1	Adults	Radiology	RAF-087	Male Cyhange Room	2 x Contours	22.2	0.31	59.2		46.7	0.17	LHS TMT out of specification and requires reset and/or fully serviced or replaced if required. Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
1	Adults	Radiology	RAF-095	Toilet	1 x Contour	19.5	0.4			41.2	0.15	
1	Adults	Radiology	RAF-115	Toilet	1 x WHB contour 1 x WC	17.9	0.31			41	0.2	
1	Adults	Radiology	RAF-127	Dirty Utility 1357B	2 x Optitherm	14.7	0.38		0.14	40.6	40.6	
1	Adults	Radiology	RNM-018	NO SIGN ON DOOR	1 x WHB 1 x WC 1 x Shower	17.1	0.4			37.7	0.2	TMT out of specification and requires reset and/or fully serviced or replaced if required.
1	Adults	Radiology	RNM-025	Office	No Acc							
1	Adults	Restaurant	RES-015	Male Toilet	2 x Infrared Taps					40	0.19	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	Adults	Restaurant	RES-035	Disabled Toilet	1 x Contour	20.9	0.42	60.3		42.8	0.09	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
1	Adults	Stroke	STW-014	Bed 2	1 x Optitherm	14.8	0.37		0.18	40.9		
1	Adults	Stroke	STW-038	Bed 11	1 x Optitherm	17.6	0.36			40.3	0.15	
1	Adults	Stroke	STW-045	Bed 13 Ensuite	1 x Contour 1 x Shower 1 x Toilet	17.9	0.32			41.3	0.16	
1	Adults	Stroke	STW-070	Bed 25	1 x Optitherm	15.5	0.36			41.2	0.14	
1	Adults	Stroke	STW-082	Therapies Treatment Room	1 x Contour	23.8	0.31		0.17	42.5		Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or
2	Adults	Adult Theatres	THE-026	Toilet	1 x Contour (WHB)	15.5	0.3			41.2	0.14	
2	Adults	Adult Theatres	THE-044	Male Theatre Change Room	3 x Shower 3 x Toilet 3 x Contour	17.7	0.34			40.3	0.14	
2	Adults	Adult Theatres	THE-060	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14	0.41	57.3	0.02			
2	Adults	Adult Theatres	THE-079	On Call Room en-suite	1 Contour (WHB) 1 x Shower 1 x WC	29.8	0.14			40.9	0.14	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
2	Adults	Adult Theatres	THE-091	Dirty Utility 2	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.3	2.33			42.5		

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
2	Adults	Adult Theatres	THE-105	Dirty Utility 4	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.5	0.35	63.7	0.02			
2	Adults	Adult Theatres	THE-106	Scrub Room 4	3 x Optitherm	15.3	0.3			40.2	0.18	
2	Adults	Adult Theatres	THE-117	Scrub Room 5	3 x Optitherm	13.7	0.3			40.3	0.17	
2	Adults	Adult Theatres	THE-280	Disabled Toilet	1 x Toilet 1 x Contour	18.7	0.34			39.3	0.17	
2	Adults	Adult Theatres	THE-287	Theatre Recovery Area	1 x Optitherm	19.6	0.32			39.7	0.17	
2	Adults	Adult Theatres	THE-289	Corri WHB Near Staff Bay A1	1 x Optitherm	17.6	0.35		0.09	40.3		
2	Adults	Adult Theatres	THE-302	Bed Bay A7	1 x Optitherm	17	0.39			39.9	0.07	
2	Adults	Adult Theatres	THE-319	Dirty Utility	2 x Optitherm	22.5	0.31			20.4	0.16	TMT out of specification and requires reset and/or fully serviced or replaced if required. Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct.
2	Adults	Adult Theatres	THE-327	Recovery B4	1 x Optitherm	19.9	0.33		0.15	42.5		
2	Adults	De contamination	DCT-015	Wash Room DSR	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	17.3	0.29	64.2	<0.02			
2	Adults	Dermatology	DMW-004	Photo Therapy Suite	1 x Optitherm	14.7	0.42			41.1	0.17	
2	Adults	Dermatology	DMW-025	Bathroom A	1 x Contour	16.2	0.42	59.3		44.3	0.16	TMT out of specification and requires reset and/or fully serviced or replaced if required.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
2	Adults	Dermatology	DMW-031	Bed 6 (En-suite)	1 x Contour 1 x Shower	20.3	0.46			42.8	0.15	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
2	Adults	Dermatology	DMW-060	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.5	0.35	64.1	<0.02			
2	Adults	Dermatology	DOPD-004	Toilet	1 x IR Tap					42	0.18	
2	Adults	Dermatology	DOPD-025	Technician	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	20.4	0.36	61.8	<0.02	40.5		Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct.
2	Adults	Endoscopy	END-002	Nurses Station	1 x Optitherm	13.1	0.38			42.8	0.16	
2	Adults	Endoscopy	END-013	Facilties	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.2	0.35	64.6	0.02			
2	Adults	Endoscopy	END-029	Bed Bay 4	4 x Optitherm	16.9	0.39			42.2	0.21	
2	Adults	FM Facilities	FMA2-014	Toilet	1 x Toilet 1 x Contour	17.8	0.51			40.5	0.23	
2	Adults	Medical Physics	MP-013	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14	0.34	63.5	0.02			
2	Adults	Medical Physics	MP-020	Devices (Adult)	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.2	0.34			40.6	0.15	
2	Adults	Renal	RENO-003	CAPD Training Room 1	1 x Optitherm	14.3	0.35			40.9	0.17	
2	Adults	Renal	RENO-016	Room 3	1 x Optitherm	18.3	0.33			40.9	0.18	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
2	Adults	Renal	RENO-033	Clean Utility	1 x Optitherm 1 x Direct	19.9	0.39	58.3	<0.02			
2	Adults	Renal	RENO-046	WC (inside change room)	1 x Contour 1 x Shower	19.1	0.33			40.6	0.22	
2	Adults	Renal	RENO-064	No name ("Laser in Use" sign next to door) Disc Code on Dividing Wall in Room. Room Opposite Riser RENO-062	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	23.3	0.43	63	<0.02	39.5		Cold temperature slightly high, though temperatures in surrounding area acceptable. Investigate and correct. Confirm suitable backflow protection fitted at tees to 2 x BCWS branches to Renal Test Points and 3 x isolated undersink connections.
4	Adults	Corridor	WS4-014	Facilities (Regen Kitchen)	1 x IR Tap 1 x Swan Neck 1 x Pillar Tap	17.4	0.4	63	<0.02			
4	Adults	Corridor	WS4-017	Male Change	1 x Contour 1 x Shower 1 x Toilet	17.4	0.3			40	0.49	
4	Adults	Waiting room	WS4-004	Toilet	1 x Toilet 1 x Contour	17.3	0.34			39.3	0.22	
4	Adults	Waiting room	WS4-007 Toilet	Public Toilet	1 x IR Tap					42.6	0.13	
4	Adults	Ward 4A	RENW-007	Toilet	1 x Contour 1 x Shower	15.7	0.36			39.7	0.17	
4	Adults	Ward 4A	RENW-024	Room 12 Ensuite	1 x Contour 1 x Shower 1 x Toilet	19.4	0.4			40.9	0.16	
4	Adults	Ward 4A	RENW-028	Bed 14 (En-suite)	1 x Contour 1 x Shower	22.3	0.27	59.8		40.5	0.16	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
4	Adults	Ward 4A	RENW-055	Bed 23	1 x Optitherm	14.6	0.41			40.8	0.16	
4	Adults	Ward 4C	RENW-127	Consulting Room E	1 x Optitherm	15.8	0.29			40.4	0.19	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
4	Adults	Ward 4C	RENW-153	Room 62 Ensuite	1 x Contour 1 x Shower 1 x Toilet	21.6	0.29	60.3		42.2	0.14	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
4	Adults	Ward 4C	RENW-156	Room 63 Ensuite	1 x Contour 1 x Shower 1 x Toilet	20.2	0.31	59		40.4	0.18	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
4	Adults	Ward 4C	RENW-180	Bed 72	1 x Optitherm	14.3	0.38			41.8	0.19	
4	Adults	Ward 4C	RENW-193	Bed 77	1 x Optitherm	16.3	0.35			41.1	0.14	
4	Adults	Ward 4D	RENW-060	Room 25	1 x Optitherm	16.5	0.34			40.3	0.23	
4	Adults	Ward 4D	RENW-092	Bed 38	1 x Optitherm	14.8	0.34			40.3	0.17	
4	Adults	Ward 4D	RENW-122	Handover Room	1 x Optitherm	16.7	<0.02			41.5	0.21	
5	Adults	Corridor	WS5-021	Male Change		18.8	0.34			40.4	0.12	
5	Adults	Corridor	WS5-027	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	19.6	0.31	61.7	<0.02			
5	Adults	Corridor	WS5-027	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	17.6	0.36	63.5	<0.02			
5	Adults	Waiting Room	WS5-005	Toilet	1 x Contour	16.2	0.36			41.6	0.18	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
5	Adults	Waiting room	WS5-011	Toilet	1 x Contour 1 x Shower	19.7	0.21	59.4		41.2	0.17	
5	Adults	Ward 5A	GENWA-001	Bed 13 Ensuite	1 x Optitherm	16.1	0.44			41.5	0.14	
5	Adults	Ward 5A	GENWA-029	Bed 13 Bathroom	1 x Contour 1 x Shower	23.5	0.2	60.3		40.1	0.16	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
5	Adults	Ward 5A	GENWA-033	Bed 15	1 x Optitherm	14.8	0.36	60.7		40.6	0.23	
5	Adults	Ward 5A	GENWA-065	Bed 28	1 x Optitherm	13.3	0.45			42.1	0.16	
5	Adults	Ward 5A	GENWA-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13	0.35	63.1	0.02			
5	Adults	Ward 5B	GENW-065	Bed 85	1 x Optitherm	13	0.33			39.7	0.16	
5	Adults	Ward 5B	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13	0.32	61.8	0.02			
5	Adults	Ward 5B	GENWD-032	Bed 98 Ensuite	1 x Contour 1 x Shower	21	0.33	60.5		39.7	0.15	Cold temperature slightly high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
5	Adults	Ward 5B	GENWD-035	Bed 97	1 x Optitherm	14.7	0.32			40.6	0.13	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
5	Adults	Ward 5C	GENC-033	Bed 71	1 x Optitherm	13.6	0.31			39.8	0.12	
5	Adults	Ward 5C	GENW-065	Bed 84	1 x Optitherm	13.1	0.33			40.5	0.15	
5	Adults	Ward 5C	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13	0.3	63.7	0.02			
5	Adults	Ward 5C	GENWc-001	Bed 57	1 x Optitherm	16	0.34			39.9	0.13	
5	Adults	Ward 5D	GENW-065	Bed 29	1 x Optitherm	13.2	0.29			40.5	0.18	
5	Adults	Ward 5D	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13	0.36	63.7	0.05			
5	Adults	Ward 5D	GENWB-028	Bed 44 (en-suite)	1 x Optitherm	15.6	0.35	59.8		40.3	0.13	
5	Adults	Ward 5D	GENWB-033	Bed 42	1 x Optitherm	13.5	0.34			40.6	0.19	
5	Adults	Ward 5D	GENWB-057	Bed 32	1 x Optitherm	14.8	0.42			41.7	0.2	
5	Adults	Ward 5D	GENWD-001	Bed 56	1 x Optitherm	13.8	0.3			39.4	0.2	
6	Adults	Corridor	WS6-019	Toilet	1 x Contour	21.7	0.28	60.6		39.8	0.19	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
6	Adults	Corridor	WS6-027	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	18.9	0.33	61.6	<0.02	39.9	0.14	
6	Adults	Waiting Room	WS6-011	Toilet	1 x Contour	17.8	0.41			42.5	0.21	
6	Adults	Ward 6A	GENW1-028	Bed 12 Bathroom	1 x Contour 1 x Shower	19.3	0.38			40.1	0.36	
6	Adults	Ward 6A	GENW1-034	Bedroom 14 (Ensuite)	1 x Contour 1 x Shower	22	0.26	58.8		42	0.11	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
6	Adults	Ward 6A	GENW1-065	Bed 27	1 x Optitherm	16.3	0.35			42	0.15	
6	Adults	Ward 6A	GENW1-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.1	0.47	59.1	0.08			
6	Adults	Ward 6A	GENW4-065	Bed 84	1 x Optitherm	16.4	0.38			41.6	0.21	
6	Adults	Ward 6B	GENW1-001	Procedure Room	1 x Contour 1 x Swan Neck	16.1	0.37	63.5	<0.02			
6	Adults	Ward 6B	GENW4-032	Bathroom A	1 x Contour 1 x Shower	23	0.3	61.8		41.4	0.12	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
6	Adults	Ward 6B	GENW4-036	Bed 96 (En-suite)	1 x Contour 1 x Shower	20.5	0.3	59		41.8	0.15	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
6	Adults	Ward 6B	GENW4-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.6	0.37	65.4	<0.02			
6	Adults	Ward 6C	GENW3-001	Bed 56	1 x Optitherm	18.8	0.32	60.6		40.5	0.13	
6	Adults	Ward 6C	GENW3-028	Bed 68	1 x Optitherm	15.7	0.4			41.7	0.17	
6	Adults	Ward 6C	GENW3-065	Room 83	1 x Optitherm	16.2	0.34			39.9	0.18	
6	Adults	Ward 6C	GENW3-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16	0.34	64.9	<0.02			
6	Adults	Ward 6D	GENW2-001	Bed 55	1 x Optitherm	14.3	0.36			39.2	0.19	
6	Adults	Ward 6D	GENW2-028	Bed 41	1 x Optitherm	16	0.35			40.9	0.12	
6	Adults	Ward 6D	GENW2-034	Bed 41 Ensuite	1 x Contour 1 x Shower 1 x Toilet	29.7 (Cold Temp)	0.27			41.1	0.21	
6	Adults	Ward 6D	GENW2-057	Bed 31	1 x Optitherm	14.4	0.38			39.5	0.19	
6	Adults	Ward 6D	GENW2-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.1	0.34	63.4	0.05			
6	Adults	Ward 6D	GENW2-066	DSR	1 x Optitherm	14.1	0.36			40.9	0.19	
7	Adults	Corridor	WS7-011	Toilet	1 x Infrared Tap	16.7	0.35			42.5	0.13	
7	Adults	Ward 7A	GENW5-033	Bed 15	1 x Optitherm	18.3	0.34			41.5	0.14	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
7	Adults	Ward 7A	GENW5-035	Bed 16	1 x Optitherm	14.8	0.38			39.5	0.2	
7	Adults	Ward 7A	GENW5-065	Bed 28	1 x Optitherm	14.8	0.38			40.4	0.16	
7	Adults	Ward 7A	GENW5-065	Bed 28	1 x Optitherm	16.2	0.32			39.7	0.17	
7	Adults	Ward 7A	GENW5-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink			63	<0.02			
7	Adults	Ward 7B	GENW6-036	Bed 97 (en-suite)	1 x Contour	22.9	0.29	54		41.5	0.17	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
7	Adults	Ward 7B	GENW8-032	Bed 98 (en-suite)	1 x Contour	22.9	0.27	56		39.9	0.12	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
7	Adults	Ward 7B	GENW8-065	Bed 85	1 x Optitherm	16	0.34			39.1	0.17	
7	Adults	Ward 7B	GENW8-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.1	0.36	63.4	<0.02			
7	Adults	Ward 7C	GENW7-001	Bed 57	1 x Optitherm	15.5	0.36			39.9	0.13	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
7	Adults	Ward 7C	GENW7-026	Bed 68	1 x Optitherm	16.1	0.52			41	0.18	
7	Adults	Ward 7C	GENW7-028	Bed 69	3 x Optitherm							
7	Adults	Ward 7C	GENW7-065	Bed 84	1 x Optitherm	19.6	0.39			40.2	0.15	
7	Adults	Ward 7C	GENW7-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.1	0.42	61.8	0.04			
7	Adults	Ward 7D	GENW6-028	Bed 44 (en-suite)	1 x Optitherm	21	0.35	53		39.1	0.18	Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. Cold temperature high, though temperatures in surrounding area acceptable. Investigate and correct.
7	Adults	Ward 7D	GENW6-033	Bed 42	1 x Optitherm	16.7	0.31			40.2	0.18	
7	Adults	Ward 7D	GENW6-034	Bed 42 (En-suite)	1 x Contour 1 x Shower	21.9	0.28	53		40.5	0.16	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
7	Adults	Ward 7D	GENW6-065	Bed 29	1 x Optitherm	16.1	0.32			41.1	0.19	
7	Adults	Ward 7D	GENW6-065	Bed 29	1 x Optitherm	14.5	0.36			40.8	0.19	
7	Adults	Ward 7D	GENW6-066	DSR (SSS)	Swan Neck SSS	14	0.32	63.3	0.11			
8	Adults	Corridor	WS8-005	Diswabled Toilet	1 x Contour	15.5	0.38			40.5	0.14	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
8	Adults	Corridor	WS8-011	Toilet	1 x Contour 1 x Toilet	19.7	0.37	59.2		42.5	0.17	
8	Adults	Corridor	WS8-019	Diswabled Toilet	1 x Contour	16.3	0.36			41.8	0.15	
8	Adults	Corridor	WS8-027	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.4	<0.02	63.3	<0.02			
8	Adults	Ward 8A	GENW9-001	Bed 1	1 x Optitherm	18	0.32			40.9	0.15	
8	Adults	Ward 8A	GENW9-065	Bed 28	1 x Optitherm	13.3	0.38			40.3	0.16	
8	Adults	Ward 8A	GENW9-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.4	0.34	62	0.02			
8	Adults	Ward 8A	GENWA-033	Bed 15	1 x Optitherm	16	0.42			39.4	0.17	
8	Adults	Ward 8A	GENWD-029	Room 13 (en-suite)	1 x Contour 1 x Shower	21.6	0.27	60.2		40.8	0.19	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
8	Adults	Ward 8B	GENW12-032	Bed 98 (En-suite)	1 x Contour 1 x Shower	16.1	0.35	63.5		42.2	0.11	
8	Adults	Ward 8B	GENW12-035	Bed 97	1 x Optitherm	13	0.44			40.1	0.14	
8	Adults	Ward 8B	GENW12-065	Bed 85	1 x Optitherm	13.1	0.55			41.2	0.12	
8	Adults	Ward 8B	GENW12-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.4	0.41	59.1	0.02			

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
8	Adults	Ward 8C	GENW11-033	Bed 71	Optitherm	18.1	0.31			41.8	0.12	
8	Adults	Ward 8C	GENW11-065	Bed 84	Optitherm	16.9	0.28			41.6	0.09	
8	Adults	Ward 8C	GENW11-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.8	0.34	62.5	<0.02			
8	Adults	Ward 8C	GENWD-065	Room 84	1 x Optitherm	15.5	0.02			39.2	0.18	
8	Adults	Ward 8D	GENW-065	Bed 29	1 x Optitherm	13.2	0.3			39.9	0.18	
8	Adults	Ward 8D	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13	0.3	61.2	0.06			
8	Adults	Ward 8D	GENW10-033	Bed 42	1 x Optitherm	14.8	0.32			39.6	0.21	
8	Adults	Ward 8D	GENW11-033	Bed 71	Optitherm	18.1	0.29			41.8	0.12	
8	Adults	Ward 8D	GENWD-028	Room 44	1 x Optitherm	17	0.36			39	0.23	
8	Adults	Ward 8D	GENW10-058	Room 32 (en-suite)	1 x Contour 1 x Shower (no cold)	22	0.23	60.3		40.8	0.23	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
9	Adults	Corridor	WS9-019	Toilet	1 x Contour	21.8	0.38	60.7		58.3	0.02	TMT out of specification and requires reset and/or fully serviced or replaced if required. Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
9	Adults	Corridor	WS9-027	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	18.6	0.35		<0.02			
9	Adults	Waiting Room	WS9-006	Staff Area	1 x Water Contour only	9.9	0.02					
9	Adults	Waiting Room	WS9-011	Disabled WC	1 x Infrared	19		59.2		41.8	0.16	
9	Adults	Ward 9A	GENW13-001	Room 12 Ensuite	1 x Optitherm	16.3	0.32			41.1	0.18	
9	Adults	Ward 9A	GENW13-031	Bed 14	1 x Optitherm	17	0.35			39.7	0.16	
9	Adults	Ward 9A	GENW13-034	Bathroom 15	1 x Contour 1 x Shower	21.5	0.26			39	0.17	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
9	Adults	Ward 9A	GENW13-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.4	0.47	63	0.02			
9	Adults	Ward 9A	GENW13-065	Bed 28	1 x Optitherm	14.6	0.32			39.3	0.14	
9	Adults	Ward 9B	GENW16-032	Bathroom	1 x Contour 1 x Shower	19	0.34			40.1	0.1	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
9	Adults	Ward 9B	GENW16-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.3	0.4	63.9	0.02			
9	Adults	Ward 9B	GENW16-036	Room 97 (en-suite)	1 x Contour 1 x Shower	22	0.31	56.8		41.7	0.17	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct. Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly. Uninsulated hot & cold pipework in direct contact with each other, causing heat transfer - Investigate and correct.
9	Adults	Ward 9B	GENW16-065	Bed 85	1 x Optitherm	14.5	0.32	64.2	0.12	42.5	0.13	
9	Adults	Ward 9C	GENW15-065	Bed 84	1 x Optitherm	13.3	0.32			41.3	0.13	
9	Adults	Ward 9C	GENW15-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.6	0.32	62.7	0.02			
9	Adults	Ward 9C	GENW15-001	Bed 57	1 x Optitherm	14.2	0.38			40.4	0.17	
9	Adults	Ward 9C	GENWD-033	Bed 71	1 x Optitherm	16.8	0.31			41.7	0.11	
9	Adults	Ward 9D	GENW14	Room 29	1 x Optitherm	14.5	0.32			39.7	0.2	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
9	Adults	Ward 9D	GENW14-034	Bed 42 Ensuite	1 x Contour 1 x Shower 1 x Toilet	21.2	0.2	58.8		42.7	0.22	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
9	Adults	Ward 9D	GENWD-001	Room 56	1 x Optitherm	13.8	0.4			41.3	0.2	
9	Adults	Ward 9D	GENWD-028	Bed 44 (En-suite)	1 x Contour 1 x Shower	19.6	0.31			39.2	0.05	
9	Adults	Ward 9D	GENWD-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.5	0.3					
9	Adults	Ward 9D	GENWD-5	Bed 32	1 x Optitherm	17.4	0.33			40.1	0.17	
10	Adults	Central Corridor	WS10-027	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	141.5	0.45	61.1	<0.02			
10	Adults	Corridor	WS10-019	Toilet	1 x Contour	18.5	0.33			41.3	0.15	
10	Adults	Waiting Room	WS10-011	RHS Toilet	1 x Infrared Tap					41.3	0.19	
10	Adults	Ward 10A	GENW17-001	Bed 1	1 x Optitherm	16.5	0.32			39.6	0.18	
10	Adults	Ward 10A	GENW17-034	Room 15 (en-suite)	1 x Optitherm 1 x Contour 1 x Shower	21.5	0.44	59		39.5	0.18	Cold temperature high, though temperatures in surrounding area acceptable. Investigate and correct.
10	Adults	Ward 10A	GENW17-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.4	0.31	63.3	0.02			

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
10	Adults	Ward 10A	GENWD-029	Bed 13 (En-suite)	1 x Contour 1 x Shower	21	0.29	60.9		41.3	0.15	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
10	Adults	Ward 10A	GENWD-065	Bed 26	1 x Optitherm	14.8	0.31			41.5	0.14	
10	Adults	Ward 10B	GENW20-032	Bed 98 Ensuite	1 x Shower 1 x Contour 1 x WC	21.3	0.28	58.8		41.9	0.02	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
10	Adults	Ward 10B	GENW20-036	Room 97 Bathroom	1 x Optitherm	19.7	0.36			41.5	0.16	
10	Adults	Ward 10B	GENW20-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16	0.33	63.7	0.02			
10	Adults	Ward 10B	GENWD-065	Bed 85	1 x Optitherm	14.9	0.49			41.4	0.14	
10	Adults	Ward 10C	GENW19-028	Room 69	1 x Optitherm	14.6	0.39			41.1	0.14	
10	Adults	Ward 10C	GENW19-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.3	0.3	63.6	0.02			
10	Adults	Ward 10C	GENWD-001	Room 57	1 x Optitherm	13.7	0.41			41.6	0.14	
10	Adults	Ward 10C	GENWD-065	Bed 84	1 x Optitherm	16	0.45			40.3	0.14	
10	Adults	Ward 10D	GENW18-006	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	16.8	0.37	60.7	0.06			

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
10	Adults	Ward 10D	GENW18-028	Bed 15	1 x Optitherm	17.9	0.36	43.8		40.1		Hot flow and return not operating correctly in area - further investigation required, to ensure system balanced correctly throughout, with Kemper Multitherm Regulating Valves set correctly.
10	Adults	Ward 10D	GENW18-057	Bed 32	1 x Optitherm	16.8	0.36			41.8	0.05	
10	Adults	Ward 10D	GENW18-065	Bed 29 WHB	1 x Optitherm	17.1	0.34			40.8	0.19	
10	Adults	Ward 10D	GENWD-001	Bed 56	1 x Optitherm	14.5	0.33			41.1	0.16	
10	Adults	Ward 10D	GENWD-034	Bed 42 (Ensuite)	1 x Contour 1 x Shower	19.4	0.29	60.3		41.2	0.23	
11	Adults	Central Corridor	WS11-018	Facilities Regen	1 x SSS 1 x Potwash 1 x Infrared Tap	17.2	0.31	62.1	0.02			
11	Adults	Central Corridor	WS11-019	Toilet	1 x Contour	19.7	0.37			41.9	0.14	
11	Adults	Public Toilets	WS11-011	Toilet	1 x Contour	19.4	0.17	61.3		42.4	0.17	
11	Adults	Ward 11A	GENW-065	Bed 28	1 x Optitherm	13.3	0.31			39.8	0.12	
11	Adults	Ward 11A	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.3	0.29	62.5	0.02			
11	Adults	Ward 11A	GENW21-001	Bed 1	1 x Optitherm	16.4	0.33			39.6	0.16	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
11	Adults	Ward 11A	GENW21-029	Bed 13 (En-suite)	1 x Contour 1 x Shower	21.5	0.34	60.4		41.3	0.15	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
11	Adults	Ward 11A	GENW21-033	Bed 15	1 x Optitherm	15.6	0.33			39.7	0.13	
11	Adults	Ward 11B	GENW-065	Bed 85	1 x Optitherm	13.1	0.37			40.1	0.13	
11	Adults	Ward 11B	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.2	0.28	61.9	0.02			
11	Adults	Ward 11B	GENWD-031	Bed 99	1 x Optitherm	18.1	<0.02	59.2		40.2	0.12	
11	Adults	Ward 11B	GENWD-035	Bed 97	1 x Optitherm	14.6	0.31			40.5	0.1	
11	Adults	Ward 11C	GENW18-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	15.9	0.32	60.8	<0.02			
11	Adults	Ward 11C	GENW23-031	Bed70	1 x Optitherm	17.1	0.29			42.2	0.11	
11	Adults	Ward 11C	GENW23-065	Bed 84	1 x Optitherm	16.7	0.33			40.5	0.17	
11	Adults	Ward 11C	GENWD-001	Bed 57	1 x Optitherm	14.4	0.35			42.1	0.13	
11	Adults	Ward 11D	GENW-065	Bed 29	1 x Optitherm	13.4	0.31			42	0.18	
11	Adults	Ward 11D	GENW-066	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.4	0.31	62.1	0.08			

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
11	Adults	Ward 11D	GENW22-031	Bed 43	1 x Optitherm	16.5	0.32			40.1	0.14	
11	Adults	Ward 11D	GENWD-001	Bed 56	1 x Optitherm	14.1	0.28			40.5	0.19	
11	Adults	Ward 11D	GENWD-033	Bed 42	1 x Optitherm	15.4	0.33			41.3	0.2	
11	Adults	Ward 11D	GENWD-057	Bed 32	1 x Optitherm	15.6	0.34			39.5	0.17	
-1	RHC	Basement	FMB-010	Bed Wash	1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.5	0.39	62.6	0.02			
-1	RHC	Kitchen	KIT-031	Plant Kitchen	1 x Infrared					39.8	0.18	
0	RHC	Children's A&E (Next to Courtyard 2)	EMC-018	Childrens Resus	1 x Infrared 1 x WC	21.9	<0.02	60.2		39.8	<0.02	Cold temperature high, though temperatures in surrounding area acceptable. Investigate and correct.
0	RHC	Clinic 14	CPS-003	Consulting Room	1 x Optitherm	16.2	0.36	59.8		43	0.15	
0	RHC	Clinic 14	CPS-006	Toilet	1 x Contour 1 x Shower 1 x Toilet	16.9	0.35			47.2	0.23	TMT out of specification and requires reset and/or fully serviced or replaced if required.
0	RHC	Concourse	ENT-014	Childrens Club	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	13.8	0.35			40.6	0.15	
0	RHC	Concourse	ENT-036	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.3	0.35	60.9	0.02			
0	RHC	Concourse	ENT-022	N/A	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	19.2	0.35	58.8		42.7	0.13	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
0	RHC	Observation	OBW-014	Bed 6	1 x Optitherm	14.1	0.35			39.9	0.14	
0	RHC	Observation	OBW-030	Bed 14	1 x Optitherm	13.6	0.36			40.2	0.18	
0	RHC	Observation	OBW-034	Faciltities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.4	0.33	63.5	0.02			
0	RHC	OPD	NO CODE	Toilet (and wheelchair symbol)	1 x Contour	15.2	0.45			40.3	0.21	
0	RHC	OPD	OPD-009	WC (plus male and female silhouettes)	1 x Markwick	13.8	0.42			39	0.22	
0	RHC	OPD	OPD-026	Clinic 1 Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	14.5	0.38	64.1	<0.02			
0	RHC	OPD	OPD-060	Toilet	1 x Contour	19.4	0.41			41.2	0.26	
0	RHC	OPD	OPD-073	Plaster Room	2 x Optitherm 2 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.6	0.5			41	0.18	
0	RHC	OPD	OPD-075	Disabled WC (and wheelchair symbol)	1 x Contour	17.9	0.39	60.4		42.8	0.13	
0	RHC	OPD Clinic 2	OPD-175	Consulting Room 6	1 x Optitherm	14.8	0.37			40.9	0.19	
0	RHC	OPD Clinic 3	OPD-120	Toilet (and wheelchair symbol)	1 x Contour	19.4	0.37			40.4	0.13	
0	RHC	OPD Clinic 4	OPD-103	Disabled Toilet	1 x Contour	18.1	0.3			39.8	0.2	
0	RHC	OPD Next to Clinic 14	OPD-125	Female Change	1 x Contour	14	0.37			42.5	0.16	

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	RHC	Cardiology	CAR-036	Room 5	1 x Optitherm	14.1	0.47			41.4	0.16	
1	RHC	Critical Care	CCW-014	Medical Physics Department	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	16.1	0.41	63.4	<0.02			
1	RHC	Critical Care	CCW-021	Toilet	1 x Contour 1 x Shower 1 x Toilet	17.8	0.35			41.5	0.11	
1	RHC	Critical Care	CCW-027	Women's Change	2 x Shower 4 x Contour	15.3	0.41			41.7	<0.02	
1	RHC	Critical Care	CCW-083	PICU Bed Bay 1-4	4 x Optitherm	15.2	0.43			39.9	0.16	
1	RHC	Critical Care	CCW-084	Bed 5	1 x Optitherm	15.4	0.44			41.3	0.13	
1	RHC	Critical Care	CCW-092	Dirty Utility	2 x Optitherm	16.5	0.42			40.8	0.18	
1	RHC	Critical Care	CCW-098	Bed Bay 13-16	4 x Optitherm	19.6	0.4			40	0.17	
1	RHC	Critical Care	CCW-118	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.8	0.38	64.6	<0.02			
1	RHC	Children's Theatres	23HU-041	Toilet	1 x Contour 1 x Shower	17.8	0.4			39.8	0.25	
1	RHC	Children's Theatres	23HU-051	WC	1 x Contour	16.3	0.37			42.7	0.16	
1	RHC	Children's Theatres	THE-009	WC	1 x Contour	20.1	0.33			41.6	0.1	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
1	RHC	Children's Theatres	THE-026	Toilet	1 x Contour 1 x Toilet	17.6	0.4			40.6	0.18	
1	RHC	Children's Theatres	THE-033	Female Change Toilets/Showers	6 x Contour 6 x Toilet 6 x Shower (2nd from right tested)	17.7	0.39			42.1	0.18	
1	RHC	Special Feeds	SPF-007	Special Feeds	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	19.3	<0.02	58	<0.02			
1	RHC	Ward 1C Medical Day Unit	MDU-002	Consulting Room 1	1 x Optitherm	13.6	0.39			40.1	0.14	
1	RHC	Ward 1C Medical Day Unit	MDU-014	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.2	0.35	63.3	0.25			
1	RHC	Ward 1C Medical Day Unit	MDU-015	Dirty Utility 2	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	13.4	0.49			40.5	0.17	
2	RHC	AFD Corridor	AFD-022	Staff Toilet	1 x Contour	16.9	0.38			40.8	0.21	
2	RHC	Asceptic Unit	ASU-036	Staff Change	1 x Contour 1 x Shower	24.6	0.3			42.9	0.15	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.
2	RHC	Asceptic Unit	ASU-042	Corridor	1 x Optitherm	14.6	0.42			42.8	0.19	
2	RHC	Children's Corridor	NO CODE	2C Regen Kitchen	1 X IF Tap 1 x Potwash 1 x SSS	16.3	0.42	56.8	<0.02			
2	RHC	Ward 2A	SCH-003	Bedroom 25 (En-suite)	1 x WHB Contour 1 x WC 1 x Shower	22.5	0.25			43	0.12	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
2	RHC	Ward 2A	SCH-040	WC Staff	1 x Markwick 21+ Mono Tap	15.6	0.39			41.8	0.15	
2	RHC	Ward 2A	SCH-061	Room 16	1 x Markwick	1513.8	0.35			42.4	0.14	
2	RHC	Ward 2A	SCH-063	Prep Room	1 x Markwick 21+	19.8	0.38	61.2		42.9	0.18	
2	RHC	Ward 2A	SCH-087	Store (Facilities)	1 x Swan Neck 1 x Janitorial Sink 1 x Markwick 21+	16.1	0.42	63.1	0.02			
2	RHC	Ward 2A	SCH-093	Staff Room	1 x Swan Neck 1 x Markwick	14.4	0.37	63.5	0.02			
2	RHC	Ward 2B	DCU-005	Toilet	1 x Contour	18	0.46			40.6	0.17	
2	RHC	Ward 2B	DCU-011	Room 13	1 x Markwick	17.5	0.37			42.5	0.22	
2	RHC	Ward 2C	ARU-023	Bed 14	1 x Optitherm	14.5	0.35			39.6	0.7	
2	RHC	Ward 2C	ARU-046	Room 24	1 x Optitherm	14.7	0.36			40	0.19	
2	RHC	Ward 2C	ARU-050	Bed 25	1 x Optitherm	14.8	0.33			40.7	0.15	
2	RHC	Ward 2C	ARU-085	Bed 33	1 x Optitherm	14.1	0.31			40.5	0.14	
2	RHC	Ward 2C	ARU-094	Clean Utility	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	13.8	0.39	63.3	0.02			
3	RHC	3A - 3C Corridor	GWS-004	Staff Kitchen	1 x Swan Neck 1 x Optitherm	16.9	0.43	59.9	0.02			

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
3	RHC	3A - 3C Corridor	GWS-011	Facilities	1 x IR Tap 2 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.6	0.37	64.2	0.02			
3	RHC	3A - 3C Corridor	GWS-014	Renal Staff Only	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps)	14.8	0.41	63.3	<0.02			
3	RHC	3A - 3C Corridor	GWS-033	Toilet	1 x Contour	19.6	0.41	60.3		42.7	0.17	
3	RHC	Ward 3A	GW3-005	Bed 8 Ensuite	1 x Contour 1 x Shower	18.4	0.4			39.1	0.2	
3	RHC	Ward 3A	GW3-043	Play Room	1 x SSS 1 x Optitherm		0.39	62.3	0.16			
3	RHC	Ward 3B	GW2-025	Bed 20	1 x Optitherm	14.4	0.39			41.1	0.18	
3	RHC	Ward 3B	GW2-036	Play Room	2 1 x SSS 1 x Optitherm	16.7	0.38	60.3	0.12			
3	RHC	Ward 3B	GW2-057	Facilities	1 x Optitherm 1 x Stainless Steel Sink (Swan Neck/Pillar Taps) 1 x Janitorial Sink	13.5	0.44	63.5	0.02			
3	RHC	Ward 3B	GW2-058	Bed 4	1 x Optitherm	14.1	0.36			42.3	0.17	
3	RHC	Ward 3B	GWR-037	Beds 11-14	2 x Optitherm	14.6	0.39			39.2	0.17	
3	RHC	Ward 3C	GW1-002	Renal Day Unit	3 x Optitherm (RHS of Door)	14.9	0.38			39.8	0.14	
3	RHC	Ward 3C	GW1-048	Staff WC	1 x Contour	22.6	0.3			42.6	0.13	Cold temperature high (Taken from contour/suface temp which may impact temp recorded) - ensure all outlets are flushed daily to minimise heat gain, particularly in empty rooms or when patients are bedbound/have limited mobility. Investigate and correct.

LEGIONELLA RISK ASSESSMENT

A&C Outlet Locations Tested						After 2 mins		After 60 secs		After 60 secs		
Level	**Adults / RHC**	**Department / Ward**	**Door Code**	**Room Name**	**Outlets in Room**	**Cold Temp (°C)**	**Cold ClO_2 (ppm)**	**Hot Temp (°C)**	**Hot ClO_2 (ppm)**	**Mixed Temp (°C)**	**Mixed ClO_2 (ppm)**	**Comments / Recommendations**
4	RHC	DCFP	DCFP-013	Staff Toilet	1 x Contour	19.8	0.32	59.6		44.5	0.16	TMT out of specification and requires reset and/or fully serviced or replaced if required.

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's 4th Floor CC4-021	M39 (Children's Hospital)	PR 41 01/02/03	26.2	63.0	57.2	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Cold temperature too high with lever valve in half open position - investigate and correct.							
Children's 3rd Floor CC3-021	M39 (Children's Hospital)	PR 41 01/02/03	18.8	62.2	59.0	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62.0	N/A	N/A	N/A		
Recommendations:			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
Children's 2nd Floor CC2-021	M39 (Children's Hospital)	PR 41 01/02/03	18.6	61.8	56.3	N/A	N/A	N/A	Minimal isolated horizontal branch on hot return.	Cold line branches from this riser to supply Plantroom 22. A branch from the line to PR 22 supplies Ward 2B and part of Ward 2A. 2 x ClO2 units in situ but not operational - connections to domestic system currently included in recorded site flushing regime. Additional insulation required on cold & hot pipework.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	59.0	N/A	N/A	N/A		
Recommendations:			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Children's 1st Floor CC1-021	M39 (Children's Hospital)	PR 41 01/02/03	18.3	62.0	56.0	26.0	N/A	N/A	None visible	Additional insulation required on cold & hot pipework. Evidence of leak damage on pipework.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	52.0	N/A	N/A	N/A		
Recommendations:			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
			Small cold temperature too high - investigate and correct.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's Ground Floor CC0-021	M39 (Children's Hospital)	PR 41 01/02/03	18.7	61.8	59.5	N/A	N/A	N/A	Yes - deadlegs/flushing points at bottom of hot flow and hot return lines (Approx. 300mm in length)	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62.0	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
			Investigate visible leak under hot return line, taking any required remedial actions to correct.							
			BCWS line directional labelling appears incorrect - investigate and correct as required.							
			Inspect return temperature gauge for accuracy – this should be recalibrated or replaced if required.							
Children's Basement CCB-021	M39 (Children's Hospital)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Only cold pipework rising through building - main riser supplying Childrens hospital (and branching on level 2 to supply Plantroom 22).
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		Corrosion visible on fitted meter and associated butterfly valves.
Recommendations:										
Children's 4th Floor Across from DCFP-050	M36 (Children's Hospital)	PR 41 01/02/03	17.8	62.5	56.5	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	55.0	N/A	N/A	N/A		
Recommendations:			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
Children's 3rd Floor Across from GWS-035	M36 (Children's Hospital)	PR 41 01/02/03	18.7	61.3	55.0	N/A	N/A	N/A	None visible	Approx 1.0 metre of insulation missing on hot flow.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	55.0	N/A	N/A	N/A		
Recommendations:										
Children's 2nd Floor SCH-038	M36 (Children's Hospital)	PR 41 01/02/03	19.2	62.1	58.0	N/A	N/A	N/A	Multiple isolated branches on hot & cold supplies - included in site recorded flushing regime.	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Maintain dealegs on flushing regime, or remove if no longer required.							
Children's	M36		18.3	61.9	57.9	N/A	N/A	N/A		Pipework drops through floor to ground floor - no corresponding riser on ground floor - assumed pipework turns and runs above

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's 1st Floor CC1-051	M38 (Children's Hospital)	PR 41 01/02/03	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge	Minimal isolated horizontal branch on hot flow & return. Minimal isolated horizontal branch on cold line.	Riser on ground floor - assumed pipework turns and runs above ceiling in ground floor to supply ground floor services. Additional insulation required on cold & hot pipework. Evidence of leak damage on pipework.
			N/A	N/A	50.0	N/A	N/A	N/A		
Recommendations:			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Children's 4th Floor CC4-008	M38 (Children's Hospital)	PR 41 01/02/03	18.8	62.6	59.0	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line.	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
			Hot flow and return pipework labelled incorrectly (wrong way round) - labelling should be corrected.							
Children's 3rd Floor CC3-008	M38 (Children's Hospital)	PR 41 01/02/03	18.6	62.0	58.1	N/A	N/A	N/A	None visible	Evidence of leak damage on hot return pipework.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Ensure any leaks are recitified and any damage caused by the leaks is repaired.							
Children's 2nd Floor CC2-008	M38 (Children's Hospital)	PR 41 01/02/03	18.6	62.2	57.9	N/A	N/A	N/A	None visible	Evidence of leak damage on hot flow & return pipework.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Ensure any leaks are recitified and any damage caused by the leaks is repaired.							
Children's 1st Floor CC1-008	M38 (Children's Hospital)	PR 41 01/02/03	18.6	62.0	58.8	N/A	N/A	N/A	None visible	Evidence of leak damage on hot flow & return pipework/fittings.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	59.0	N/A	N/A	N/A		
Recommendations:			Ensure any leaks are recitified and any damage caused by the leaks is repaired.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Children's Ground Floor CC0-008	M38 (Children's Hospital)	PR 41 01/02/03	18.7	63.5	59.5	N/A	N/A	N/A	Downturned/isolated branch on cold line (Approx. 1m in length) - recorded temperature of 25.2°C on deadleg branch pre-isolation.	No commissioning valves evident on hot flow and return. Hot flow and return looped on drop to riser and operational. No labelling of domestic pipework.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Deadleg on cold line should be removed if no longer required or incorporated into site flushing regime.							
Children's 3rd Floor GWS-013	M18 (Children's Hospital)	PR 41 01/02/03	18.5	62.4	57.6	N/A	N/A	N/A	None visible	No commissioning valves evident on hot flow and return
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Children's 2nd Floor ARU-121	M18 (Children's Hospital)	PR 41 01/02/03	18.3	62.7	58.5	N/A	N/A	N/A	None visible	No commissioning valves evident on hot flow and return. Cold valve not fully open (Approx. 2/3rds open) Approx 1 metre of missing insulation on hot flow to below.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Children's 1st Floor CCW-076	M18 (Children's Hospital)	PR 41 01/02/03	19.4	62.8	59.2	N/A	N/A	N/A	Minimal isolated horizontal branch on hot flow & return. Minimal isolated horizontal branch on cold line.	Evidence of leak damage on hot flow pipework.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 11th Floor Ward A CA11-006	T1 (Adult's Hospital)	N/A	16.3	N/A	N/A	N/A	N/A	N/A	Minimal isolated branches - 1 x horizontal and 1 x capped vertical.	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Adults 10th Floor Ward A CA11-006	T1 (Adult's Hospital)	N/A	16.3	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch.	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Adults 9th Floor Ward A CA9-006	T1 (Adult's Hospital)	N/A	16.8	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch.	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Adults 8th Floor Ward A CA8-006	T1 (Adult's Hospital)	N/A	16.5	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch.	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Adults 7th Floor Ward A CA7-006	T1 (Adult's Hospital)	N/A	17.8	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch.	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward A CA6-006	T1 (Adult's Hospital)	N/A	17.3	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch.	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Adults 5th Floor Ward A CA5-006	T1 (Adult's Hospital)	N/A	17.1	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 4th Floor Ward A CA4-006	T1 (Adult's Hospital)	N/A	19.0	N/A	N/A	N/A	N/A	N/A	2 x Minimal isolated horizontal branches on cold line. 2 x Minimal isolated horizontal branches on hot flow & return lines.	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control.							
Adults 11th Floor Ward A GENW21-068	T12 (Adult's Hospital)	PR32 01/02/03	17.5	63.0	59.0	N/A	62.8	58.3	Minimal isolated horizontal branch and larger capped vertical branch on cold line. Large vertical lines to Flamco Flevent automatic air vents on top of hot flow and hot return lines - confirm suitability for potable use.	25.1°C recorded on vertical cold cap, pre-isolation. Kemper regulation valves with fitted gauges on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0/58.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly and not creating a column of stagnant water.							
Adults 10th Floor Ward A GENW17-068	T12 (Adult's Hospital)	PR32 01/02/03	16.7	63.4	58.5	N/A	62.9	56.4/59.2	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	55.0/60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 9th Floor Ward A Next to GENW13-068	T12 (Adult's Hospital)	PR32 01/02/03	16.8	63.0	59.3	N/A	61.5/62.0	57.5/57.5	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of leakage under hot flow insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	55.0/55.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of leak damage under hot flow insulation - further investigation required to establish if all pipework, fittings and connections are water tight.							
			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
Adults 8th Floor Ward A GENW9-068	T12 (Adult's Hospital)	PR32 01/02/03	16.6	63.4	60.5	N/A	62.5/62.3	58.7/58.9	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	59.0/60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 7th Floor Ward A GENW5-068	T12 (Adult's Hospital)	PR32 01/02/03	17.2	62.6	59.5	N/A	62.1/62.4	58.9/59.0	Minimal isolated horizontal branch on cold line.	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60.0	N/A	N/A	60.0/60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 6th Floor Ward A GENW1-068	T12 (Adult's Hospital)	PR32 01/02/03	19.6	62.7	61.4	N/A	N/A	59.7	None Visible	Different key required for this riser (PG1 rather than standard PG2 plantroom key).
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60.0	N/A	N/A	60.0		
Recommendations:										
Adults 5th Floor Ward A GENWA-068	T12 (Adult's Hospital)	PR32 01/02/03	17.3	63.4	62.2	N/A	62.4/62.2	59.0/59.3	None visible	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0/60.0		
Recommendations:										
Adults	T12		19.0	62.7	60.2	19.2	62.2/62.4	59.6/59.8	2 x Minimal isolated horizontal branches on cold line	

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
4th Floor Ward A RENW-278	T12 (Adult's Hospital)	PR32 01/02/03	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge	2 x Minimal isolated horizontal branches on cold line. 2 x Minimal isolated horizontal branches on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of existing leak and damage to insulation on hot flow.
			N/A	N/A	N/A	N/A	N/A	60/60		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Investigate steady leak on hot flow pipework, replacing any/all pipework and fittings required in area. Fully replace all damaged pipework insulation in riser.							
Adults 11th Floor Ward B GENW24-068	T4 (Adult's Hospital)	PR31 04/05/06	16.6	63.2	59.2	N/A	63.0	59.0	Minimal isolated horizontal branch and isolated capped vertical branch on cold line. Large vertical lines to Flamco Flevent automatic air vents on top of hot flow and hot return lines - confirm suitability for potable use.	Kemper regulation valves with fitted gauges on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly, not creating a column of stagnant water.							
Adults 10th Floor Ward B GENW20-068	T4 (Adult's Hospital)	PR31 04/05/06	16.4	63.0	59.6	N/A	62.3	58.4	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow line.	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	58.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 9th Floor Ward B GENW16-068	T4 (Adult's Hospital)	PR31 04/05/06	16.4	62.9	59.3	N/A	62.0	56.8	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot return line.	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	56.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Approximately 0.5 metre of insulation on hot flow missing due to leak damage - confirm all pipework, fittings and connections are water tight and replace insulation.							
			Visible leak from isolated deadleg branch on hot flow with corrosion visible on lever valve - further investigation required to establish if all pipework, fittings and connections are water tight.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 8th Floor Ward B GENW12-068	T4 (Adult's Hospital)	PR31 04/05/06	16.4	63.0	61.4	N/A	62.0	60.3	None visible	Kemper regulation valve with fitted gauge on hot return. Visible leak onto hot return branch from 9th Floor Ward B GENW16-068 riser above.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	61.0		
Recommendations:			*See 9th Floor Ward B GENW16-068 riser above for linked recommendation (re leaking pipework)*							
Adults 7th Floor Ward B GENW8-068	T4 (Adult's Hospital)	PR31 04/05/06	16.4	61.9	59.3	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60.0	N/A	N/A	N/A		
Recommendations:										
Adults 6th Floor Ward B GENW4-068	T4 (Adult's Hospital)	PR31 04/05/06	17.2	62.8	61.9	N/A	62.8	60.2	None visible	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	59.0		
Recommendations:										
Adults 5th Floor Ward B GENWD-068	T4 (Adult's Hospital)	PR31 04/05/06	17.3	63.2	62.0	N/A	62.6	57.8	None visible	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	58.0		
Recommendations:										
Adults 4th Floor Ward B HOW-207	T4 (Adult's Hospital)	PR31 04/05/06								No Access due to Infection Control.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 11th Floor Ward C GENW23-068	T5 (Adult's Hospital)	PR31 07/08/09	17.1	63.7	59.0	N/A	62.8	58.9	Minimal isolated horizontal branch and isolated capped vertical branches on cold line. Minimal isolated horizontal branch on hot flow & return lines. Large vertical lines to Flamco Flevent automatic air vents on top of hot flow and hot return lines - confirm suitability for potable use.	Kemper regulation valves with fitted gauges on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0/58.0		
			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Recommendations:			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly and not creating a column of stagnant water.							
			Investigate potential leak on hot return line on isolated branch - evidence of leak damage.							
Adults 10th Floor Ward C GENW19-068	T5 (Adult's Hospital)	PR31 07/08/09	16.4	62.9	59.3	N/A	62.9/62.5	59.4/59.7	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0/60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 9th Floor Ward C GENW15-068	T5 (Adult's Hospital)	PR31 07/08/09	16.4	62.9	59.3	N/A	61.7/61.5	58.7/59.0	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60.0	N/A	N/A	60.0/58.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation and water pooling under hot flow branch insulation, with corrosion visible on lever valve - further investigation required to establish if all pipework, fittings and connections are water tight.							
Adults 8th Floor Ward C GENW11-068	T5 (Adult's Hospital)	PR31 07/08/09	16.5	63.2	59.5	N/A	62.4/61.9	60.3/58.3	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58.9	N/A	N/A	60.0/58.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation and visible leak from both flow and return branch fittings, with corrosion visible on fittings and valves - further investigation required to establish if all pipework, fittings and connections are water tight, replacing where required and repairing/replacing insulation where necessary.							
Adults 7th Floor Ward C GENW7-068	T5 (Adult's Hospital)	PR31 07/08/09	19.3	62.5	59.8	N/A	62.1	59.6	Minimal isolated horizontal branch on pipework.	Evidence of damage to insulation and corrosion etc. from leak on 11th Floor.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62.0	N/A	N/A	65/60		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.							
			Hot flow and return pipework appears labelled incorrectly (wrong way round) - labelling should be corrected.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 6th Floor Ward C GENW3-068	T5 (Adult's Hospital)	PR31 07/08/09	17.4	63.8	61.6	N/A	62.8/61.9	60.4/60.2	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	62.0	N/A	N/A	61.0/61.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.							
Adults 5th Floor Ward C GENWC-068	T5 (Adult's Hospital)	PR31 07/08/09	17.2	62.9	59.7	N/A	62.0/61.7	58.5/58.3	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of historic leak damage on insulation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	63.0	N/A	N/A	65.0/65.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation and visible leak from both flow and return branch fittings, with corrosion visible on fittings and valves - further investigation required to establish if all pipework, fittings and connections are water tight, replacing where required and repairing/replacing insulation where necessary.							
			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
Adults 4th Floor Ward C RENW-212	T5 (Adult's Hospital)	PR31 07/08/09	16.9	62.4	59.0	N/A	62.4/62.2	58.5/58.7	2 x Minimal isolated horizontal branches on cold line. 2 x Minimal isolated horizontal branches on hot flow & return lines.	Kemper regulation valves with fitted gauges on hot return. Evidence of historic leak damage on hot flow Hot return not labelled on main branch.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58.0	N/A	N/A	58.0/60		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.							
			Label all pipework within riser correctly for identification purposes.							
Adults 11th Floor Ward D GENW22-068	T13 (Adult's Hospital)	PR33 01/02/03	17.1	62.9	57.5	N/A	N/A	N/A	Minimal isolated horizontal branch and minimal isolated capped vertical branch on cold line. Large vertical lines to Flamco Flevent automatic air vents on top of hot flow and hot return lines - confirm suitability for potable use.	Kemper regulation valve with fitted gauge on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	56.0	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			There are lines to air vents (Approx. 500mm) at top of hot flow and return risers – ensure these are WRAS approved for potable use and operating correctly, not holding stagnant water.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 10th Floor Ward D GENW18-068	T13 (Adult's Hospital)	PR33 01/02/03	16.5	63.4	61.8	N/A	62.9	61.6	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow line.	Kemper regulation valve with fitted gauge on hot return. Approx 0.5 metre missing insulation on hot flow with evidence of historic leak damage.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	62.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 9th Floor Ward D GENW14-068	T13 (Adult's Hospital)	PR33 01/02/03	19.0	62.5	61.3	19.4	62.0	60.4	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Different key required for this riser (PG1 rather than standard PG2 plantroom key).
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.							
Adults 8th Floor Ward D GENW10-068	T13 (Adult's Hospital)	PR33 01/02/03	16.7	63.1	62.8	N/A	62.2	61.6	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valve with fitted gauge on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	62.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 7th Floor Ward D GENW6-068	T13 (Adult's Hospital)	PR33 01/02/03	17.4	63.0	59.0	N/A	N/A	58.5	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valve with fitted gauge on hot return - damaged with missing gauge cover. Evidence of historic leak damage.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	40.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Gauge on hot return damaged and missing screen - inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
Adults 6th Floor Ward D GENW2-068	T13 (Adult's Hospital)	PR33 01/02/03	17.2	63.2	59.5	N/A	N/A	59.7	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	60.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 5th Floor Ward D GENWB-068	T13 (Adult's Hospital)	PR33 01/02/03	17.2	63.2	59.5	N/A	N/A	57.3	None visible	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	57.0		
Recommendations:										
Adults 4th Floor Ward D RENW-270	T13 (Adult's Hospital)	PR33 01/02/03	19.3	62.2	60.8	19.3	62.0	58.7	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Kemper regulation valve with fitted gauge on hot return. Evidence of historic leak damage. Boosted cold not labelled. Hot flow and return directional arrows incorrect and require reversal.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	55.0		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
			Label all pipework within riser correctly for identification purposes.							
Adults 11th Floor Ward 11D CA11-014	T2 (Adult's Hospital)	N/A	**No Suitable Access**	N/A	N/A	N/A	N/A	N/A	Minimal isolated branches - 1 x horizontal and 1 x capped vertical.	No hot water services in this riser.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			There is no access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
Adults 10th Floor Ward D CA10-014	T2 (Adult's Hospital)	N/A	17.0	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser Limited access to pipework in riser due to ducting - surface temperature possible only.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
Adults 9th Floor Ward D CA9-014	T2 (Adult's Hospital)	N/A	16.5	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser Limited access to pipework in riser due to ducting - surface temperature possible only.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
Adults			16.7	N/A	N/A	N/A	N/A	N/A		No hot water services in this riser

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
8th Floor Ward D CA8-014	T2 (Adult's Hospital)	N/A	Gauge	Gauge	Gauge	Gauge	Gauge	Gauge	None visible	No hot water services in this riser Limited access to pipework in riser due to ducting - surface temperature possible only.
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
Adults 7th Floor Ward D CA7-014	T2 (Adult's Hospital)	N/A	17.3	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line.	No hot water services in this riser Limited access to pipework in riser due to ducting - surface temperature possible only.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 6th Floor Ward D CA6-014	T2 (Adult's Hospital)	N/A	17.2	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line.	No hot water services in this riser Limited access to pipework in riser due to ducting - surface temperature possible only.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 5th Floor Ward D CA5-014	T2 (Adult's Hospital)	N/A	17.4	N/A	N/A	N/A	N/A	N/A	None visible	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There is limited access to the pipework in this riser due to ducting in front of it at door into riser cupboard. Access to pipework should be improved if possible.							
Adults 4th Floor Ward D CA4-014	T2 (Adult's Hospital)	N/A	18.9	N/A	N/A	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line.	No hot water services in this riser
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults Basement CAB-037		N/A	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Only cold pipework rising thorugh building
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults Basement CAB-038		N/A	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Only cold pipework rising thorugh building, with a 15mm line coming from above which appears to supply the Estates Workshop (FMB-003 and M&S(?) Store (Locked - no access)
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 2nd Floor Dialysis Centre RENO-086	T13 (Adult's Hospital)	PR22 01/02/03	16.7	60.7	55.4	N/A	N/A	N/A	None visible	No local branches or isolation to outlets.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults Atrium OPD1 OPD1-059	T13 (Adult's Hospital)	PR22 01/02/03	16.8	63.0	55.0	N/A	N/A	N/A	Minimal, low level isolated branches on hot flow/return & cold.	AHU Ducts labelled PR33? Kemper regulation valve with fitted gauge on hot return. Hot return borderline 55.0°C.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	55.0	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 1st Floor Atrium RNM-004	M26 (Adult's Hospital)	PR22 01/02/03	19.4	61.9	58.6	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58.0	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Adults 2nd Floor Atrium END-020	M26 (Adult's Hospital)	PR22 01/02/03	16.3	60.7	59.5	N/A	N/A	N/A	Minimal isolated horizontal branch on line.	Kemper regulation valve with fitted gauge on hot return.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	59.0	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Childrens 1st Floor Theatre Corridor THE-027	M30 (Adult's Hospital)	PR22 01/02/03	19.5	61.9	57.8	N/A	N/A	N/A	None visible	Temp Gauge Missing Bib Tap connected to MDPE in riser - runs to open end outside Riser CC1-021. Confirm usage, removing completely if no longer required - this pipework should not be used to connect to any domestic pipework in the future.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	Missing	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge missing – this should be replaced.							
			Pipework unlabelled - All pipework should be correctly labelled for identification purposes.							
Childrens Ground Floor X-Ray/Imaging Corridor RCG-008	M30 (Adult's Hospital)	PR22 01/02/03	18.9	62.3	59.0	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line.	Temp Gauge Missing
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	Missing	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Hot return temperature gauge missing – this should be replaced.							
Childrens 1st Floor Theatre THE-143	M27 (Adult's Hospital)	PR22 01/02/03	19.3	62.9	60.4	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	65.0	N/A	N/A	N/A		
Recommendations:			All pipework should be correctly labelled for identification purposes.							
			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
Childrens 1st Floor Theatre THE-132	M38A (Adult's Hospital)	PR22 01/02/03	18.8	62.4	59	N/A	N/A	N/A	Minimal isolated horizontal branch on cold line. Minimal isolated horizontal branch on hot flow & return lines.	Temp Gauge Missing
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	Missing	N/A	N/A	N/A		
Recommendations:			There were minimal isolated/capped branches noted throughout the majority of main risers on site - it may be prudent to remove these branches if no longer required or include in site flushing regime if routine monitoring/sampling results show a consistent failure in ClO2 control levels or microbial control. (Note: Elevated cold temperature recorded on vertical capped branch on cold supply)							
			Hot return temperature gauge missing – this should be replaced.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 1st Floor HDU Unit 1 CCW-046	M1 (Adult's Hospital)	PR21 01/02/03				N/A	N/A	N/A	None Visible	No Access as Stored Items Blocking Way
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A		N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor Critical Care Offices CCW-230	M5 (Adult's Hospital)	PR21 01/02/03	19.4	62.1	58.7	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58.0	N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor Coronary Care CCU-069	M6 (Adult's Hospital)	PR21 01/02/03	19.3	62.5	60.4	N/A	N/A	N/A	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	60.0	N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor Atrium STW-012	M10 (Adult's Hospital)	PR31 01/02/03	16.9	63.2	58.3	N/A	N/A	N/A	None visible	Small sections of insulation missing on hot flow/return and cold supplies. 2 x Kemper regulation valves with 1 x fitted gauge missing on hot return from below. Corrosion/leak damage evident on exposed return pipework.
			Gauge	Gauge	58.0	Gauge	Gauge	Gauge		
			N/A	N/A	59.0	N/A	N/A	N/A		
Recommendations:			Hot return temperature gauge missing where hot returns from below – this should be replaced.							
			Minimal sections of insulation missing on cold, hot flow and hot return pipework (<1m) as it rises to supply services - this should be refitted.							
Adults 1st Floor Atrium MDU-052	M21 (Adult's Hospital)	PR31 01/02/03	16.5	63.4	58.6	N/A	N/A	N/A	None Visible	2 x Kemper regulation valves with fitted gauges on hot returns.
			Gauge	Gauge	62.0/60.0	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Ensure temperature gauges are calibrated correctly.							
Adults 2nd Floor Theatres THE-359	M7 (Adult's Hospital)	PR31 01/02/03	17.5	63.0	61.0	N/A	62.2	59.8	None visible	
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	62.0	N/A	N/A	N/A	65.0		

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Recommendations:			Evidence of historic leak damage on insulation - further investigation required to establish if all pipework, fittings and connections are water tight.							
			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 2nd Floor Theatres THE-056	M21 (Adult's Hospital)	PR31 01/02/03	17.1	62.2	58.3	N/A	N/A	N/A	None visible	No local branches or isolation to outlets. Kemper regulation valve with fitted gauge on hot return.
			Gauge	Gauge	59.0	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 2nd Floor Theatres THE-008	M10 (Adult's Hospital)	PR31 01/02/03	16.7	62.2	58.3	N/A	N/A	N/A	None visible	No local branches or isolation to outlets. Corrosion Visible on CHW Fittings
			Gauge	Gauge	59.0	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor Entrance to Neurological Sciences Link Corridor STW-041	M7 (Adult's Hospital)	PR31 01/02/03	17.0	60.8	57.7	N/A	N/A	N/A	None visible	No connection to local services - pipework runs straight through riser with no branches
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 1st Floor Corridor (at 1C) STW-012	M7 (Adult's Hospital)	PR31 01/02/03	N/A	N/A	N/A	N/A	N/A	N/A	Small deadleg.	No connection to local services - pipework runs straight through riser with no branches
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			Small deadleg on pipework - this should be removed if no longer required, or retained on site flushing regime.							
Adults 3rd Floor Plantroom 31 at 31AHU29	M7 (Adult's Hospital)	PR31 01/02/03	18.2	62.8	56.9	N/A	N/A	N/A	None visible	15mm line to open end (Valved off)
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	58.0	N/A	N/A	N/A		
Recommendations:			15mm line to open end (Valved off) - this should be removed if no longer required (or retained on site flushign regime)							

WATER SYSTEM RISK ASSESSMENT
(Draft)

Location / Door Disc No..	Riser No.	Plantroom / Calorifier	Large Cold Temp (°C)	Large Hot Flow Temp (°C)	Large Hot Return Temp (°C)	Small Cold Temp (°C)	Small Hot Flow Temp (°C)	Small Hot Return Temp (°C)	Deadlegs Present	Additonal Info
Adults 2nd Floor Theatres	M12 (Adult's Hospital)	PR31 01/02/03	N/A	N/A	N/A	N/A	N/A	N/A	None visible	Cold supply from calorifier 31 04/05/06 supply line.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										
Adults 3rd Floor Plantroom 31 at 31AHU19		PR31 01/02/03	18.4	62.3	56.4	N/A	N/A	N/A		Appears to supply 3rd Floor Facilites offices and changing rooms
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	50.0	N/A	N/A	N/A		
Recommendations:			Inspect return temperature gauges for accuracy – these should be recalibrated or replaced if required.							
Adults 2nd Floor Staff Core Lifts CA2-037	M25A (Adult's Hospital)	TBC	LHS - 18.4 RHS - 18.6	N/A	N/A	21.7 TBC Trade	N/A	N/A	None Visible	Elevated cold temperature on what appears to be Trade CWST 1 supply to roof. No Domestic Isolation. Isolated Branch from Trade TBC
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:			TBC							
Adults 2nd Floor Staff Core Lifts CA2-038	M25 (Adult's Hospital)	TBC	18.0	N/A	N/A	N/A	N/A	N/A	None Visible	No Domestic Isolation.
			Gauge	Gauge	Gauge	Gauge	Gauge	Gauge		
			N/A	N/A	N/A	N/A	N/A	N/A		
Recommendations:										

Section 8

Other 'At Risk Systems'

WATER SYSTEM RISK ASSESSMENT

Other Risk Systems

All other "at risk" systems should have a suitable L8 risk assessment carried out with an appropriate L8 monitoring regime implemented.

HSG 274 Legionnaire's disease: Technical guidance Part 3: The control of legionella bacteria in other risk systems provides guidance on identification and frequency of inspections for these systems.

Please also refer to outlets (section 7 for information and section 2 for recommendation) relating to supplies from domestic water system to process systems described below.

Other systems identified to DMA as being present on site:

- Children's Hydrotherapy Pool (completed under separate assessment)
- Arjo Baths
- Dental equipment (Clinic 2)
- Emergency showers (A&E – Decontamination Unit)
- Sprinkler/Wet firefighting systems (Main firefighting tanks in basement fire tank room, and helipad fire fighting system in 12th floor plantroom)
- Renal dialysis (x2 systems – One in Adults Hospital (PR 32) and one in RHC (adjacent to PR 21)) with additional 'Emergency Dialysis Points' which are directly supply from domestic cold water system. NHS Estates and/or Renal technicians should confirm location of all Emergency Dialysis Points.
- Endoscopy Wash (2nd floor)
- Medical Gases/Medical Equipment (e.g. Nebulisers, incubators, etc.)
- Emergency Cooling - MRI chiller (3rd Floor Adults Roof between PR 31 and PR 32)
- Closed heating systems
- Closed chilled water systems
- Air Conditioning/Air Handling Units
- No longer part of the water system - Irrigation systems
- No longer part of the water system - Steam Humidification– now disconnected.

This assessment provides a brief description of each system and an initial assessment however we would advise specialists in each field are consulted to confirm this initial assessment is reflective of the function of the system and would present these findings as draft only until this is confirmed.

N.B. DMA were advise no Ice making machines or machines with "open" cooling system (e.g. lathes) are used on site

WATER SYSTEM RISK ASSESSMENT

System	**Hydrotherapy Pool**
Location(s)	Ground floor - Children's Hospital
Responsibility	Estates/Clinical staff
Description	Hydrotherapy pool
Water Source	Domestic Water supplies CWST in basement Hydrotherapy plantroom
Filtration Present	Pool filtration plant in hydrotherapy plantroom in basement
Running Temperature	Typically 35-40°C
Use	Advised daily
Aerosol Created	Potential for some aerosol release
Comments	This has been assessed under separate cover by Brio Group in 2023.
Recommendations	Refer to risk assessment.

System	**Arjo Baths**				
Location(s)	Various locations throughout the hospital (Wards) Note: – Many of the Arjo baths have been removed.				
	Adults Hospital Ward 2A DMW-011 DMW-013	**Childrens Hospital** 4th Floor DCFP-038	**Childrens Hospital** 3rd Floor Ward 3C GW1-068 Ward 3B GW2-039 Ward 3A GW3-059	**Childrens Hospital** 2nd Floor Ward 2C ARU-006	**Childrens Hospital** 1st Floor Ward 1D PICU CCW-051 Ward 1E, CAR-048
Responsibility	Estates/Clinical staff				
Description	Medical bath (Baths seen by DMA do not appear to have any obvious air or water jet facility)				
Water Source	Domestic Water System				
Filtration Present	None				
Running Temperature	Typically 35-45°C				
Use	Clinical staff to advise if not routinely used daily.				
Aerosol Created	Shower attachment				
Comments	Flexible hoses on connection to hot/cold water system in addition to internal flexible connections. Estates unable to confirm maintenance instructions.				
Recommendations	Maintain in accordance with manufacturers/installers instructions. Where flexible hoses (i.e. internal to bath unit) cannot be removed then replacing with alternative WRAS approved hoses with linings other than EPDM should be considered. *Note: at the time of survey DMA are working through list of connections to Arjo baths to replace flexible hoses with hard piped connections. This project will not replace any hoses on the internal sections of the Arjo baths.* If practicable consider shortening shower hoses as it was noted that these can in some areas reach into adjacent WCs and WHBs (though it should be noted that Arjo have advised that the baths contain an integral Category 5 protection system). DMA advised these are maintained by a sub-contractor.				

WATER SYSTEM RISK ASSESSMENT

System	**Dental Equipment**
Location(s)	Ground floor Children's Hospital (Clinics)
Responsibility	Clinical staff
Description	DMA advised that dental chairs now utilise bottled water with Water tank and booster pump now disconnected (Line to this is incorporated into the site flushing regime).
Water Source	Bottled water within chair.
Filtration Present	None
Running Temperature	Variable depending on bottled water refill/storage temperature.
Use	TBC
Aerosol Created	Potential aerosol release from dental tools
Comments	
Recommendations	HSG 274 Part 3 states *"Drain down, clean, flush and disinfect all system components, pipework and bottles twice daily. Disinfectant contact time as recommended by manufacturer. Take microbiological measurements (Refer to Decontamination HTM 01-05)* SHTM 04-01 Part G states *"Drain down and clean at the end of each working day".* HTM 01-05 provides advice and recommendations for on-going maintenance and this should be followed in addition to manufacturers and installers instructions. Clarify governance and maintenance responsibilities within the written scheme.

WATER SYSTEM RISK ASSESSMENT

System	**Emergency Showers**
Location(s)	A&E Decontamination Room (Note: - Shower in Hydrotherapy plantroom now disconnected)
Responsibility	Estates
Description	Emergency drench system
Water Source	Domestic Water
Filtration Present	None
Running Temperature	TBC though 'Domestic water system'
Use	Included in site flushing regime
Aerosol Created	Shower
Comments	
Recommendations	HSG 274 Part 3 recommends minimum six-monthly flushing of emergency/deluge shower, though Risk Control Notice 11/advises "flush through and purge to drain twice per week– source SHTM 04-01 Part G. This is included within site flushing regime.

System	**Renal Dialysis (Adult)**
Location(s)	Plantroom 32 then runs to renal ward areas (Ward 4A)
Responsibility	Estates/Renal Technicians
Description	A constantly circulating purified water system supplying renal dialysis outlets in the Adult hospital
Water Source	Domestic Water
Filtration Present	Various
Running Temperature	TBC though 'Domestic water system'
Use	Daily
Aerosol Created	Unlikely during normal operation
Comments	As supplied by Domestic Water this makes domestic water system disinfections problematic. New line fitted from entrance to plantroom 32 to bypass the chlorine dioxide "top-up" unit installed within this plantroom. Carbon filters and ClO_2 monitoring system installed by Scotmas and test protocols implemented by Renal specialists.
Recommendations	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained (Implemented by Scotmas monitoring system and Renal technicians).

WATER SYSTEM RISK ASSESSMENT

System	**Renal Dialysis (Adult – Emergency Points)**
Location(s)	To be confirmed by NHS Estates
Responsibility	Estates/Renal Technicians
Description	Emergency connection points have been installed in rooms which were not in the proximity of the dedicated renal dialysis systems.
Water Source	Domestic Cold Water System
Filtration Present	On renal dialysis machines
Running Temperature	See section 7 for description of cold water conditions.
Use	Points are for emergency use only and are likely to be creating deadlegs on the system.
Aerosol Created	Typically, Low
Comments	As supplied by Domestic Water this makes domestic water system disinfections problematic. System is now dosed with ClO_2 from the basement supply.
Recommendations	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained
Risk (Legionella)	Low

WATER SYSTEM RISK ASSESSMENT

System	**Renal Dialysis (Children)**
Location(s)	Plantroom 22 then runs to renal ward areas
Responsibility	Estates/Specialist
Description	A constantly circulating purified water system supplying renal dialysis outlets in the Adult hospital
Water Source	Domestic Water
Filtration Present	Various
Running Temperature	TBC though 'Domestic water system'
Use	Daily
Aerosol Created	Typically Low
Comments	As supplied by Domestic Water this makes domestic water system disinfections problematic. New line fitted from entrance to plantroom 21 to bypass the chlorine dioxide "top-up" unit installed within this plantroom. Carbon filters and ClO_2 monitoring system installed by Scotmas and test protocols implemented by Renal specialists.
Recommendations	Maintain in accordance with manufacturers/installers instructions, current NHS (SHTM) protocols and "Clinical Practice Guideline by the UK Renal Association of Renal Technologists". Ensure aerosol creation is minimised during maintenance and testing procedures. Due cognisance of potential for ClO_2 in supply water should be taken and appropriate testing/filtering of water to ensure safe operation of the system is maintained (Implemented by Scotmas monitoring system and Renal technicians).

WATER SYSTEM RISK ASSESSMENT

System	**Endoscopy Wash Filtration Unit**
Location(s)	Plantroom 31
Responsibility	Estates/Specialist
Description	A constantly circulating purified water system supplying endoscopy wash machines in the Adult hospital
Water Source	Domestic Water
Filtration Present	Various
Running Temperature	TBC though 'Domestic water system'
Use	Daily (TBC)
Aerosol Created	Advised aerosol contained within the endoscopy wash units during normal operation.
Comments	DMA advised this is a clinical responsibility with no input from estates.
Recommendations	Maintain in accordance with manufacturers/installers instructions and current NHS (SHTM) protocols. Ensure aerosol creation is minimised during maintenance and testing procedures.

System	**Water Softeners**
Location(s)	Various
Responsibility	Estates/Specialist
Description	Softeners form part of various medical (e.g. Renal/Endoscopy) and other processes (e.g. steam ovens)
Water Source	Domestic Water
Filtration Present	N/A
Running Temperature	TBC though 'Domestic water system'
Use	See relevant process/equipment
Aerosol Created	N/A (Contained systems)
Comments	Estates unable to confirm servicing history or local responsibilities (Estates/Medical Physics/Clinical)
Recommendations	Maintain in accordance with manufacturers/installers instructions (including cleaning and disinfection of resin and brine tanks). Confirm responsibilities. Ensure aerosol creation is minimised during maintenance and testing procedures.

WATER SYSTEM RISK ASSESSMENT

System	**Medical Gases/Medical Equipment** (e.g. Nebulisers, incubators, etc.)
Location(s)	Throughout Hospital
Responsibility	Estates/Clinical Staff/Infection Control/Specialist
Recommendations	Conduct a risk assessment of each system, preferably using an assessment team comprising members knowledgeable in legionella management and control, as well as those familiar with the design and operation of the system and Infection Control/Clinical staff where appropriate. Control procedures within appropriate SHTM (or other relevant guidance) for system being assessed should be taken in to account during assessment(s). Any water softeners or other filtration equipment connected to these systems should be assessed at this time. Devise a control scheme based on the risk assessment.

System	**Emergency Cooling (MRI chiller)**
Location(s)	3rd Floor Roof adjacent to Plantroom 31 at Calorifiers 31-04/05/06.
Responsibility	Estates/Specialist
Description	DMA were advised by NHS Estates that the water supply to these units (via an RPZ valve) is for emergency use in the event the chillers fail. The water would be used in a once through loop flowing through the unit and direct to drain.
Water Source	Domestic Water
Filtration Present	None noted (Fed via RPZ valve)
Running Temperature	TBC though 'Domestic water system'
Use	Emergency use only
Aerosol Created	TBC – DMA have not witnessed this system in use, though likely to be minimal.
Comments	
Recommendations	Connection point to MRI unit(s) included in site flushing regime. A check valve has been fitted approx. 1m from the tee off to the MRI unit, with an RPZ fitted just prior to line running through wall to the units. Ensure aerosol creation minimised when running to drain in emergency use and during flushing.

WATER SYSTEM RISK ASSESSMENT

System	**Closed Heating Systems**
Location(s)	Throughout hospital
Responsibility	Estates
Description	Closed heating systems
Water Source	Top up by Domestic Water system
Filtration Present	None
Running Temperature	70 – 105°C (approx.)
Use	Constantly circulating systems
Aerosol Created	Enclosed system.
Comments	
Recommendations	Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturers/installers instructions.

System	**Closed Chilled Systems**
Location(s)	Throughout hospital
Responsibility	Estates
Description	Closed chilled systems
Water Source	Top up by Domestic Water system
Filtration Present	None
Running Temperature	6 - 20°C (approx.)
Use	Constantly circulating systems
Aerosol Created	Enclosed system.
Comments	
Recommendations	Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturers/installers instructions.

WATER SYSTEM RISK ASSESSMENT

System	**Air Conditioning/Ventilation**
Location(s)	Plantrooms (Air Handling Units)
Responsibility	Estates
Description	Air handling units
Water Source	N/A
Filtration Present	Air filters present.
Running Temperature	N/A
Use	Variable depending on building and department requirements
Aerosol Created	N/A - unless under fault conditions, where water pools in the condensate tray of the unit and does not drain freely away.
Comments	
Recommendations	Maintain in accordance with manufacturers/installers instructions and as required under SHTM 03-01 and SHTM 04-01 Part G.

WATER SYSTEM RISK ASSESSMENT

System	**Decorative Bubble Lamps**
Location(s)	Children's Hospital Atrium
Responsibility	Estates/Contractor (TBC)
Description	Decorative water and air bubble lamps
Water Source	N/A (Sealed System)
Filtration Present	N/A (Sealed System)
Running Temperature	Ambient
Use	Variable (Multiple times daily) - Bubbles released into water tubes at base when button pressed on unit
Aerosol Created	Unit appears to be completely sealed so aerosols would be contained.
Comments	
Recommendations	DMA advised these are sealed units and no further actions required.

Fire Suppression Systems

WATER SYSTEMS RISK ASSESSMENT

12TH FLOOR HELI-PAD FIRE SUPPRESSION SYSTEM

Name/number of CWST		12th Floor Fire Suppression Tank		
Location of CWST		12 Floor Plant Room		
Labelled		**CWST**	**Pipework**	**Valves**
		No	No	No
Type		Sectional		
Materials		GRP		
Lined		No		
Dimensions (m)		3 x 2 x 2		
Volume (litres)		12,000 (actual approx. 9,000)		
Linked/single		Single		
M/U opposite draw off		Diagonal		
Make up source		Trades Water		
Services supplied		Fire Suppression		
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**
		19.6	19.5	19.0
Internal condition	Internal	Clean – Tanks cleaned in June 2023 by DMA		
	Waterline	Clean		
	Dirt & silt	Clean		
Water condition		Clear		
Stagnation		No evidence		
Deadlegs around CWST		On fire system		
Close fitting lid/screened vent		Yes	Yes	
Warning Pipe Screen		No		
Overflow Screen		Weir overflow screened, no screens visible on overflow and warning pipe		
Insulation		Pre-insulated		
Access		Good		
Vents returning to CWST		Recirculating line from system		
Is drain present?		Yes (short)		
Booster pumps	Fitted	2 x Fire System Pumps		
	Vibration Couplings			
	Expansion Vessel			
	Drain on Vessel?			
ClO_2 Dosing		System is dosed with ClO_2 tablets weekly, with a submersible pump circulating water/ClO_2 within the tank and has water drawn off from the base 3 times per week as part of the site flushing regime.		
Comments		During 2021-2022 there was an issue with the pumps overrunning after testing causing the water to heat up within the CWST. On occasion the water could heat up to >50°C within the tank. This issue appears to have been rectified with wate within tank now consistently at ambient temperature.		
Overall risk rating		**High**		

WATER SYSTEMS RISK ASSESSMENT

System	**12th Floor Heli-pad fire suppression system**
Location(s)	12th Floor heli-pad fire tank/suppression system
Responsibility	Estates & Facilities
Water Source	Trades Water via 12m^3 Cold Water Storage Tank in 12th floor Plantroom. Trades system runs approx. 100m from last tee-off in 12th floor before supplying the tank (and last tee-off is itself approx. 50m to a tap which is unlikely to be used)
Filtration Present	None
Running Temperature	Ambient
Use	In order to maintain readiness in case of emergency both cannons are tested for 5 to 10 mins per week, with cannons using 30 litres of water per min. Advised a weekly test using water (no foam) is carried out through all areas of the system with staff wearing appropriate PPE. Thereafter this for Emergency use only. Testing creates a significant quantity of spray and therefore aerosols are expected to the be released in a significant enough volume as to warrant implementation of control measures. As testing is carried out on the roof aerosols may spread over the surrounding as drift from a cooling tower would with the greatest density of aerosol (weather conditions permitting) being disseminated onto users of the immediate areas, which would be users of the Queen Elizabeth University Hospital and local residents.
Aerosol Created	Fire cannon (Droplet size undetermined). As the system is located on the rooftop any aerosol could be dispersed over a larger area (similar to a cooling tower) In addition to direct dissemination there are air conditioning systems located in the Adults and Children's Hospitals and other hospital buildings where aerosols could then be dispersed within buildings.
Comments	Due to the volumes of water used during fire cannon testing it is not anticipated that weekly testing will turn over the full contents of the storage tank until several months of testing has elapsed though this requires confirmation from NHS Estates. DMA were advised that following use, the system drains down naturally which we understand will mean some lower points of the system remain fully wetted and other areas dry. This may create conditions for biofilm formation within the pipework, increasing the likelihood of legionella proliferation. Pipework is constructed from Mild Steel and Galvanised Steel which also may be conducive to Legionella growth. There are 3 x recirculation lines back to the tank which may also return potential contamination from pipework back to the tank. The CWST was cleaned and disinfected in June 2023. Further guidance on this can be found in *"FIA Guidance for the Fire Protection Industry - Guidance on Legionella in Fire Fighting Systems and Equipment"*

WATER SYSTEMS RISK ASSESSMENT

System Description

Fire suppression/sprinkler system (including water cannon).

The 12th floor CWST supplies two fire 'cannons' on the roof top helipad which are required for emergency fire fighting.

In order to maintain readiness in case of emergency both cannons are tested for 5 to 10 mins per week, with cannons using 30 litres of water per min.

Testing creates a significant quantity of spray and therefore aerosols are expected to the be released in a significant enough volume as to warrant implementation of control measures. NHS Estates/Facilities advised a foam suppressant is added to the discharged water when in use for emergency only, during weekly testing only water is used with no foam.

As testing is carried out on the roof, aerosols may spread over the surrounding area (similar to the drift from a cooling tower) with the highest density of aerosol (weather conditions dependant) being disseminated onto persons in the immediate area, i.e. users of the Queen Elizabeth University Hospital and surrounding industrial and residential areas.

In addition to direct dissemination, there are air conditioning systems located in the Adults and Children's Hospitals and other hospital buildings which aerosols could be drawn into and dispersed within buildings.

Estates advised DMA that the system pipework is steel, with short flexible hoses also present, and may be lined internally, though DMA were not provided with any supporting literature to confirm this. It has been noted that there are also what appear to be mild steel/iron valves which are corroding and these should potentially be replaced, if practicable. It appears reasonable to presume therefore that nutrients may be available to aid bacterial growth, including Legionella.

There are various bypasses and drain points on the system which we would normally recommend are removed or included in a site flushing regime (e.g. weekly) though we would advise that the manufacturer or supplier confirms what elements, pipework etc. can be safely flushed and/or removed without potentially affecting the operation of this critical system.

Facilities advised the system remains full and charged with water at all times with no drain down after usage. Therefore, water within the pipework will only be replaced during weekly flushing and will remain at ambient temperature for the majority of that time. This is of particular concern during summer months when ambient temperature is likely to be within the growth range for Legionella. Insulation is likely to be of limited use in maintaining lower temperatures, given the length of time between uses.

As the CWST contains approx. 9,000 litres of water with testing expected to use approximately 500 litres per test, water within the CWST will stagnate, though this is less likely to be an issue as tank now on a 3 x per week flushing regime. Water quality within the CWST was good as the tank was cleaned recently.

As turnover through the supply line and trades system generally is low, stagnation within the system may contribute to poor water quality within the tank, though this should be mitigated by the 3 x per week flushing regime implemented on the tank.

Recommendations

Minimise aerosol creation during maintenance procedures (if practicable). Maintain in accordance with manufacturers/installers instructions.

Ensure all points on the trades system (including inlet to fire tank) are maintained on site flushing regime.

Consider implementing a sampling regime to include the storage tank and points on the system and the supply. This would be particularly important during summer months where ambient temperatures are likely to be higher.

It is advised temperature monitoring and visual inspection should be carried out on the Storage Tank on a weekly basis prior to testing and should the storage temperature exceed 20ºC then additional precautions should be considered (E.g. flush the tank to reduce stored water temperature, manually dose tank with suitable disinfectant chemical if no automated system installed).

WATER SYSTEMS RISK ASSESSMENT

Given the potential control issues described above, but the need for such a system to be in place, it would be prudent to consider a permanent chemical dosing system or process for microbial control, and/or filtration system, for this water system (though it should be confirmed that any chemicals used on this system would not interfere with the foam used for emergencies) with suitable testing and monitoring included.

The fire system supplier should confirm that treatment will not be detrimental to system operation or maintenance or provide suitable alternatives.

Control and management parameters and procedures should be compiled along with procedures for correction of out of specification results and any escalation procedures that may be required.

We would advise a full clean and disinfection is carried out, including through the cannons, if practicable. The manufacturer should be consulted to confirm which disinfectant(s) are suitable.

Increased turnover of the system may be achieved by additional flushing, which may be automated or manual. However, the poor make-up may result in a reduction in the volume of stored water immediately afterwards which may have an impact in emergency situations. Similarly reducing the capacity of stored water may have a detrimental impact in emergency situations.

Rodents screens should be fitted to overflow and warning pipes.

WATER SYSTEMS RISK ASSESSMENT

BASEMENT FIRE TANKS/SPRINKLER SYSTEM

Name/number of CWST		Sprinkler Tanks		
Location of CWST		Basement Sprinkler		
Labelled		**CWST**	**Pipework**	**Valves**
		No	No	No
Type		Sectional		
Materials		GRP		
Lined		No		
Dimensions (m)		2 off (8 x 2.5 x 5)		
Volume (litres)		2 off 100,000		
Linked/single		2 off Linked		
M/U opposite draw off		Yes		
Make up source		Town Mains (Dedicated)		
Services supplied		Sprinkler		
Temperature °C		**Make Up**	**Tank Water**	**Plantroom/Ambient**
		Not run	20.4	20.9
Internal condition	Internal	Difficult to confirm internal condition due to water condition		
	Waterline	Ok		
	Dirt & silt	Heavy		
Water condition		Cloudy/Dirty		
Stagnation		Yes		
Deadlegs around CWST		On fire system		
Close fitting lid/screened vent		Yes	No	
Warning Pipe Screen		No		
Overflow Screen		Weir overflow screened, no screens visible on overflow and warning pipe		
Insulation		Pre-insulated		
Access		Good		
Vents returning to CWST		2 x Recirculating lines returning to each tank		
Is drain present?		Yes (short)		
Booster pumps	Fitted	2 x Fire System Pumps		
	Vibration Couplings			
	Expansion Vessel			
	Drain on Vessel?			
Overall risk rating		**High (Emergency use)**		

WATER SYSTEMS RISK ASSESSMENT

System	**Sprinkler/wet fire-fighting system (Sprinkler System)**
Location(s)	Main fire tanks in basement (Sprinkler system throughout the building)
Responsibility	Estates
Water Source	Fed from dedicated fire main (Hardgate Road – Small) via Dedicated Sprinkler System Storage Tanks in the Basement
Filtration Present	None
Running Temperature	Ambient
Use	NHS Estates were unable to confirm if any manual testing is carried out. Outwith any manual testing, the system is used for emergency use only.
Aerosol Created	High when discharging. (Droplet size undetermined)
Comments	The CWSTs were very dirty internally when inspected and heavily stagnant. Further guidance on this can be found in *"FIA Guidance for the Fire Protection Industry - Guidance on Legionella in Fire Fighting Systems and Equipment"*

System Description

Fire suppression/sprinkler system.

DMA witnessed routine testing of the system by Estates. Estates staff advised the sprinkler system is tested every week by estates. Testing involves running the system pumps with water returning via the small bore return line to the tanks (1 pump returns to each tank). On an annual basis inspection and maintenance is carried out by a contractor with water recirculated to the CWSTs via the large bore pipe (this was not run during DMA survey).

Return lines enter the tank with very small gaps to accommodate the pipe. Returns enter the tank in proximity of the weir overflow which could allow aerosol to reach maintenance personnel involved in testing. However, the weir overflows appeared to remain dry (to the naked eye) during the testing witnessed by DMA and although aerosols are very fine suspensions of water particles we would anticipate larger droplets being created and collected by the mesh.

In addition, there was no evidence of rust or other deposits on the mesh to provide indications of longer term wetting and drying (and no records to advise the mesh had been changed).

Estates advised water is never run off from the system as part of maintenance procedures.

Steel pipework on make up to the LHS tank is unlikely to be WRAS approved.

Recommendations

Consider clean and disinfection of the CWST and then regular inspection as per domestic water tanks with cleaning/disinfection as required by inspection.

Minimise aerosol creation during maintenance procedures. Consider wearing suitable masks to prevent ingestion as recommended by the FIA guidance, and prevent access by unauthorised personnel into test area.

Maintain in accordance with manufacturers/installers instructions.

Weir overflow, overflow and warning pipework connected at inappropriate heights to function as intended. This should be corrected.

Given the potential control issues described above, but the need for such a system to be in place, it would be prudent to consider a permanent chemical dosing system, and/or filtration system, for this water system with suitable testing and monitoring included. If chemical dosing systems are implemented then control and management parameters and procedures should be compiled along with procedures for correction of out of specification results and any escalation procedures that may be required. The fire system supplier should confirm that treatment will not be detrimental to system operation or maintenance or provide suitable alternatives.

WATER SYSTEMS RISK ASSESSMENT

Rodents screens should be fitted to overflow and warning pipes.

Section 9

Legionella Control

LEGIONELLA RISK ASSESSMENT

Legionella control and documentation

Inadequate management, lack of training and poor communication have all been identified as contributory factors in outbreaks of legionnaires' disease. This is particularly important where several people are responsible for different aspects of the treatment or precautions.

Communications should be 'fail-safe'. The record system is the method to ensure that precautions continue to be carried out and that information is available for checking what is done in practice.

Legionella Management Structure

For Legionella and Water Safety Management Structure please refer to site Governance & Documentation Review

Previous risk assessment & drawings	Produced by	Date
Previous L8 risk assessment	Previous risk assessment carried out by DMA Water Treatment Ltd	2018
Review of previous assessment	N/A	N/A
System drawings	As fitted drawings supplied at time of construction and provided as part of the upgrade works within the basement area and Wards 2A/2B in the RHC.	2015 (with supplementary drawings provided in 2018/19 and 2022 for upgrade works)

Logbook/Record Auditing	
Is an audit system in place for legionella management and control?	This is carried out by Authorising Engineer.

LEGIONELLA RISK ASSESSMENT

L8 monitoring		
Is a water systems monitoring regime already in place?		Yes
Do L8 monitoring records include:	Flushing of low use outlets?	Yes – low use outlets in non-clinical areas flushed by DMA (when highlighted and requested of DMA). Other areas added into flushing regime to assist with out-of-specification results and when areas notified to DMA as out of use for a period of time. Other flushing within occupied wards etc. carried out by Clinical/Domestic staff
	Outlet temperature monitoring?	Yes - carried out by DMA as oart of the ClO_2 monitoring regime
	Calorifier temperature monitoring	Yes - carried out by DMA
	Water heater temperature monitoring	Yes - carried out by DMA
	Shower head and hose Replacement	Yes - carried out by DMA
	Spray Outlet Disinfection	No spray outlets present
	Tank Inspections	Yes - carried out by DMA
	Calorifier Base Flushing	Yes
	Calorifier Inspections	Carried out by NHS Estates.
	C&D of Water Systems	Carried out annually and on an as required basis dependant upon sample results. Generally CWSTs only disinfected routinely as building operates 24/7 and services cannot be taken offline for routine disinfections. Local disinfections carried out on new upgraded areas as part of handover of upgraded wards etc.
	TMV Servicing/Testing	Yes – in service testing carried out by DMA
	Maintenance/Service Records	TBC
	Pumps alternating	N/A - Single pumps only on each calorifier
	Biocidal Control	Yes - ClO_2 checks carried out by DMA on a weekly/monthly basis. Scotmas responsible for topping up ClO_2 chemicals and maintaining ClO_2 dosing units.
	POU Filters	POU filters fitted in designated high risk wards. Management and replace,ent of filters managed by DMA on a Monthly/Bi-monthly basis.
	Other (Specify)	

LEGIONELLA RISK ASSESSMENT

Microbiological sampling	
Is there a microbiological sampling regime in place?	Yes – carried out by DMA
Frequency of samples taken?	High risk areas (Ward RHC Ward 2A/2B, Ward 1D (PICU) and Clinics 1 & 2 Sampled Weekly. Designated Sentinel Sampling points sampled Monthly "Critical Care" designated sampling points sampled monthly. CWSTs and Filtration Units Sampled Monthly.
Are legionella samples taken as part of sampling regime?	Yes
Are potable samples taken as part of sampling regime?	Yes
Are pseudomonas samples taken as part of sampling regime?	Yes
Does sampling regime adequately reflect the complexity and scope of the water system?	Yes
Are suitable remedial actions and resamples taken after out of specification sample results recorded?	Yes - see Governance & Documentation Review document
Is there a history of Legionella colonisation of the water systems on site?	Very few instances of positive legionella results being returned, despite extensive sampling carried out across the hospital.
Is there a history of "other" bacterial colonisation of the water systems on site?	There are instances of "other" bacteria being detected as part of the sampling regime(s) implemented across the hospital. These generally take the form of Gram-negative bacteria or yeast/moulds in low counts, with a disinfection, flushing and re-sampling regime implemented when results detected.

Section 10

Summary of PPM Tasks Recommended for Written Scheme / Water Safety Plan

WATER SYSTEMS RISK ASSESSMENT

Summary of Governance Tasks Recommended for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Regular check to ensure that legislation and guidance has not changed	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review all policies relating to legionella control (e.g. Maintenance, Water Treatment, Water Management, Energy) to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of Water Systems Management Structure to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of communication lines to ensure still accurate and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of escalation & emergency procedures to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties allocated to site staff and ensure accurate and recorded (including any changes in use of wards/departments).	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of roles allocated to individual departments in relation to the water systems and ensure accurate and recorded	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of duties of sub-contractors to ensure accurate and recorded and contractors are suitably qualified/competent for tasks assigned to them (e.g. Water Hygiene contractors should be LCA Approved, Plumbing contractors should be SNIPEF and Water Safe Registered, etc.)	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review staff training and competency requirements and update training matrix	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review PPM requirements, method statements, SOPs and risk assessments to ensure still valid and correct	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review remedial work progress	L8 HSG 274 Pt 2 SHTM 04-01	
Regular review of site documentation to ensure all records up to date and present	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review "Patient Risk Rating" for all areas of hospital (including any changes in use of wards/departments).	SHTM 04-01 Part B	
Create register and regularly review sentinel outlet locations register (inc. Sentinel TMV/TMTs).	SHTM 04-01 Part B	
Create register and regularly review little-used outlet locations register (input from clinical staff required, and including any changes in use of wards/departments)	SHTM 04-01 Part G	
Create register and regularly review deadlegs/blind ends locations register (input from clinical staff required, and including any changes in use of wards/departments)	SHTM 04-01 Part G	
Create register and regularly review POU/Anti-microbial (PALL) filters locations (and manufacturer's/types of filters fitted)	SHTM 04-01 Part G	
Create register and regularly review TMV/TMT locations and manufacturer/model.	SHTM 04-01 Part G	
Create register and regularly review shower & spray outlet locations (including emergency/deluge showers)	SHTM 04-01 Part G	
Create register and regularly review primary, sub-ordinate and tertiary hot flow and return loops to reflect any system alterations.	HSG 274 Pt 2	
Create register and regularly review and record all plant, valves, equipment and services and their associated maintenance schedules).	HSG 274 Pt 2 SHTM 04-01 Part B	

Cont...

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

Summary of Governance Tasks Recommended for L8 and SHTM 04-01 Compliance	Guidance Documents	Allocated to
Create register and regularly review BEMS temperature sensor locations to reflect any system alterations	HSG 274 Pt 2	
Create register and regularly review schematic/as-fitted drawings to ensure up-to-date and accurate	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review all backflow prevention device locations/type (E.g. Check valves, RPZs etc.) to reflect any system alterations.	L8 HSG 274 Pt 2 SHTM 04-01	
Create register and regularly review all flexible hoses locations (EPDM) (E.g. at Arjo baths, Pressure reducing valves etc.) to reflect any system alterations.	SHTM 04-01	
Create register of drains to be cleaned and disinfected and frequency	Good practice in light of ongoing issues	
Review of water systems risk assessment as a "live" document (DMA recommend a maximum period of 2 years). An indication of when to review the assessment and what to consider should be recorded and this may result from, e.g.: • a change to the water system or its use; • a change to the use of the building where the system is installed; • new information available about risks or control measures; • the results of checks indicating that control measures are no longer effective; • changes to key personnel; • a case of legionnaires' disease/legionellosis associated with the system.	L8 STHM 04-01	

N.B. By "Regular" e.g. a Quarterly or 6 monthly review of all tasks above or as and when there are changes in system operation, management or other control parameters which would warrant a review of any particular task. (e.g. if change of use or changes in legislation or any other factor which could affect validity of the current documentation)

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	**Recommended**	**Allocated To**
Daily review of BEMS records (temperature records, alarms etc.)	Yes	
Daily check the flow and return temperatures on the domestic hot water calorifier systems using the temperature gauges fitted or a suitable surface temperature probe – *required when BEMS is not operational.*	Yes (if/when BEMS not operational)	
Daily water draw-off should form part of the daily cleaning process.	Yes	
Daily flushing of all outlets in "High Risk Areas". Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile.	Yes	
Verification that entire body of calorifier reaches 60°c for a period of 1 hour each day (generally at a time of low use e.g. Early morning/late evening).	Yes Monitored on BEMS	
Incoming Water Mains – maintain in accordance with installation/design guidelines, ensuring alteration of incoming mains lines to run at least daily. (advised 9 hourly swap over)	Yes Monitored on BEMS	
Cyclical alteration of CWST booster pumps (ensuring every pump runs at least weekly)	Yes Automatic on BEMS systems	
Daily check of pumps/filters on Veolia Filter Unit	Yes	
Twice-weekly flushing of all outlets in unoccupied areas and low use/sporadically used outlets. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile (<20°C for cold water and >55°C for hot water) (or until removal is carried out)[1 & 2]	Yes	
Twice weekly flushing of emergency/deluge shower for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile (<20°C for cold water and >55°C for hot water) – located in A&E Decontamination Room and Hydrotherapy Pool Plantroom[1 & 2]	Yes	
Twice weekly flushing of deadlegs/blind ends (inc CWST Drain pipework where these cannot be removed) where these cannot be removed. Hot and cold outlets should be flushed for a minimum of 3 minutes and until the water temperature stabilises in line with current temperature profile (<20°C for cold water and >55°C for hot water) (or until removal is carried out)[1 & 2]	Yes	
Weekly Chloramination sampling from hot and cold water outlet point, representative of each secondary distribution pipework system. These should initially be conducted weekly and then subject to ongoing trend based frequency risk assessment, limited to no less than at once per month sampling test frequency.	N/A (Estates advised Scottish Water have confirmed mains supply is not Chloraminated)	
Weekly check of water levels within water tanks	Yes Monitored on BEMS	
Weekly alteration of hot water secondary circulation pumps (ensuring every pump runs at least weekly)	N/A Individual pumps	N/A
Weekly test to confirm booster, recirculation and de-stratification pumps operating correctly	Yes	
Weekly initially and then moving to Monthly measure the concentration of chlorine dioxide at the sentinel taps – the concentration should be at least 0.1 mg/l (or as advised by WSG); and adjust the chlorine dioxide dosage to establish the required residual at the sentinel sample points.	Yes	
Weekly initially and then moving to Monthly test the treated water for both chlorine dioxide and total oxidant/chlorite at an outlet close to the point of injection to verify the dosage rate and conversion yield.	Yes	
Weekly check on the ClO_2 dosing system(s) operation to ensure operating correctly and dosing at correct levels (as per HSG 274 Part 2, NHS GG&C Dosing System Specifications and in accordance with manufacturer's instructions) and chemical stocks in the reservoir	Yes	

Cont...

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	Recommended	Allocated To
Monthly calorifier/water heater storage (including plate heat exchangers) temperatures checks at top (flow) and return pipework (where applicable). Recommended flow temperature – min 60°c, return temperature – min 55°c. *also note potential scald risks	Yes Monitored on BEMS	
Monthly temperature checks on hot outlets at sentinel, little-used & selected outlets. >55°c within 1 minute (also note potential scald risks and out of spec TMVs) to create a temperature profile of systems.	Yes	
Monthly temperature checks on cold outlets at sentinel, little-used & selected outlets. <20°c within 2 minutes to create a temperature profile of building and monitor heat gain within the cold water system.	Yes	
Monthly temperature checks on all primary flow and return loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system.	Yes Partially monitored on BEMS	
Monthly/Quarterly take temperatures (ideally on a rolling monthly rota to ensure all covered on a quarterly basis) at return legs of subordinate loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system. (Note: this is not practical in many areas as pipework runs above ceilings and doesn't drop to actual outlets with a Hi Scribe required to access above ceiling).	Yes	
Monthly/Annually take temperatures (ideally on a rolling monthly rota to ensure all covered on an annual basis) at return legs of tertiary loops to confirm they are at a minimum of 55°C and to create a temperature profile of the whole system. (Note: this is not practical in many areas as pipework runs above ceilings and doesn't drop to actual outlets with a Hi Scribe required to access above ceiling).	Yes	
Monthly flushing of accumulator vessels (at CWST Booster pumps) as not 'flow through' design	Yes	
Monthly changing of tap/showerhead POU/Anti-microbial filters within designated Wards/Departments/Rooms (i.e. Children's Wards 2A & 2B)	Yes	
Monthly changing of inline POU/Anti-microbial dishwasher filters	Yes	
Monthly Inspect, clean & log glass traps and overflow condition on Air Handling Units (and if fitted to CWST overflow/warning pipes)	Yes	
Bi-Monthly (i.e. 62 days) changing of tap/showerhead POU/Anti-microbial filters within designated "High-Risk" Wards/Departments/Rooms	Yes	
Quarterly[1] descaling, cleaning and disinfection of showerheads & hoses & spray outlets, or replace with new Shower Head and Hose (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	Yes	
Quarterly inspection and cleaning of system strainers (including angle valve strainers) (or frequency as indicated by the rate of fouling or other risk factors, e.g. areas with high risk patients)	Yes	
Quarterly, each calorifier and any associated storage/buffer vessels should be flushed through its drain valve by opening the drain valve 3 times, each time for a 3 minute period. Arrange for samples to be taken from hot water calorifiers, to note condition of drain water.	Yes	
Quarterly (or frequency as indicated by the rate of fouling) inspection of outlets for evidence of scale formation (descaling as necessary).	Yes	
Quarterly changing of Horne Optitherm Diffuser/Flow Straightener on non-filtered outlets	Yes	

Cont...

[1] HSG Part 2 recommends that all showers are cleaned and descaled quarterly at least quarterly. SHTM 04-01 Part G recommends that this should be carried out "Three-monthly for high risk areas and as required elsewhere, but at least once annually".

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

WATER SYSTEMS RISK ASSESSMENT

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	**Recommended**	**Allocated To**
Quarterly during periods of Change - Water System Sampling (at random water outlets in High Risk Patient Areas) in Water Systems still serving High Patient Risk Areas	Yes	
Six Monthly servicing TMV/TMTs or mixer valves, including fail safe tests and cleaning/disinfection of strainers within "Designated High Risk Area"/ICUs (more frequently if manufacturer recommends – or if 'drift' in excess of 1°C at mixed outlet temperature when highlighted during temperature monitoring or other maintenance) including thermal pasteurisation where practical and as directed by ICT/manufacturer's instructions.	Yes	
As required/as directed by ICT – drain cleaning and disinfection of drains and traps in designated areas	Yes	
Six monthly cold water summer / Winter temperature monitoring of cold water at inlet to building. Also to be continuously monitored by BEMS & log of all alarms	Yes Monitored on BEMS	
Six monthly CWST condition inspection noting appearance of water, stagnation, odour, rust, scale, sediment, debris, paint/liner condition, bio film accumulation, tank lid fitting satisfactorily and insulation condition	Yes	
Six monthly CWST temperature checks on tank supply and stored water at opposite side from tank inlet if possible (inlet and stored water should be <20°c, with stored water no more than 2°c warmer than make-up water.)	Yes	
Six monthly or Annual[2] servicing TMV/TMTs or mixer valves, including fail safe tests and cleaning/disinfection of strainers. (more frequently if manufacturer recommends – or if 'drift' in excess of 1°C at mixed outlet temperature when highlighted during temperature monitoring or other maintenance)	Yes	
Six monthly chemical and microbiological water samples from water tanks which feed drinking water outlets	Yes	
Six monthly inspection of Air Handling Units humidity section (where installed) and cooling section	Yes	
Cleaning and Disinfection of Air Handling Units	Yes See frequency guidelines provided below	
Annually arrange for samples to be taken from hot water calorifiers/water heaters in order to note condition of drain water.	Yes	
Cleaning and disinfection of Cold Water Storage Tanks (and water systems if practicable) in accordance with BS EN806/BS 8558 (Formerly BS 6700) as and when required (dependant on CWST inspection & sample results). Other remedial works to be carried out as necessary where highlighted during routine inspections or whilst tanks drained etc.	Yes See frequency guidelines provided below	
Annual internal inspection and cleaning/descaling of the calorifier/water heater with disinfection/pasteurisation upon completion	Yes	
Arrange for microbiological samples to be taken from water system which represent the complexity of the water system(s) and particularly in areas of concern. All sampling should be carried out in accordance with BS 7592:2008 and all analysis by a UKAS accredited laboratory.[3]	Yes Dependant on Monitoring results, and as directed by ICT	
Pasteurisation/disinfection of calorifier/water heaters carried out as and when required dependent on temperature monitoring and sample results	Yes See frequency guidelines provided below	
Annual turnover test on cold water storage system. Checks should be carried out to ensure that volume of water stored is no more than would generally be used in a normal 12 hour period.	Yes	

[2] TMV Servicing frequency is contradictory in the various guidance documents. We would advise an initial sweep of servicing with ongoing frequency determined based on the findings of the initial servicing.

[3] Sampling regime should be formulated by site/client based on the known history of the water systems and the details included within this and previous risk assessments, with assistance of specialist legionella consultant (e.g. DMA) if necessary. Although L8 does not specifically request legionella sampling in cases where there are incorrect distribution or supply temperatures, water quality issues or other factors which may increase the likelihood of legionella (and other bacterial) proliferation and dissemination sampling should be carried out. For further guidance please refer to HSG 274 Part 2, HTM/SHTM 04-01 and BS 7592:2008

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

WATER SYSTEMS RISK ASSESSMENT

Annually test the chlorine dioxide and total oxidant/chlorite concentration at a representative selection of outlets throughout the distribution system – the concentration should be at least 0.1 mg/l chlorine dioxide.	Yes	
Annual inspection of vibration coupling on pumps/plant, replacing as necessary (more frequently if recommended by manufacturer)	Yes	

Cont...

Summary of ppm tasks recommended within site Written Scheme/Water Safety Plan	**Recommended**	**Allocated To**
Annual inspection & cleaning of buffer/accumulator vessels (more frequently if recommended by manufacturer)	Yes Flow Through Vessels Being Installed at Present	
Annual inspection of plant and pipework insulation, repairing where necessary.	Yes	
Annual test to ensure that plant temperature, pressure gauges and thermostats are accurate (Also note during routine temperature monitoring where appropriate)	Yes	
Biennial stratification checks on calorifiers. These checks should extend over a period of seven (7) days using a logging device to establish that the water temperature at the base of the vessel achieves 60ºC.	Yes	
Maintenance/servicing of Veolia filtration plant as per manufacturers recommend frequency	Yes	
Annual (or periodic as specified by manufacturer) servicing of backflow prevention devices (i.e. RPZ)	Yes	
Drinking water dispensers - maintain in accordance with manufacturers guidelines. Please note freestanding drinking water machines (i.e. bottled) and ice machines should not be installed in healthcare premises and should be removed wherever found. ***N.B.*** *Drinking water dispensers removed from hospital at time of survey with lines incorporated into site flushing regime.*	Yes If Water Coolers Reinstated	
Reports have been received intimating that high levels of Pseudomonas and Legionella bacteria have been found in water samples taken from outlets fed by flexible hoses lined with ethylene propylene diene monomer (EPDM) due to colonisation of the lining, although it is possible that other lining materials and washers within couplings could be similarly affected. Wherever practical these should be replaced with services hard piped. Where this is not practical should be given to changing EPDM flexible hoses and other lining materials and washers. Where changing to alternative materials is not practical periodic (e.g. six monthly) monitoring should be implemented on EPDM hoses, with hoses swapped out as necessary dependant on sample results and/or rate of fouling witnessed.	Yes	
All plant and equipment should be serviced and maintained in accordance with manufacturers recommendations	Yes	
Closed Heating and Chilled Water Systems – Minimise aerosol creation during maintenance procedures. Maintain in accordance with manufacturer's/installers instructions.	Yes	
Air Conditioning and Ventilation – Maintain in accordance with manufacturer's/installers instructions and SHTM 03-01.	Yes	

Task frequencies described above are for guidance only. Frequencies may vary dependent on system conditions highlighted during routine monitoring. Suitable Method Statements/SOPs should be followed for each task.

N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

WATER SYSTEMS RISK ASSESSMENT

System / Service	Circumstance Requiring Cleaning and Disinfection	Frequency
Domestic Cold Water Tank	New installations Re-commissioning empty/unused tanks Tank temperature exceeds 25ºC Tank contains moderate sediment, i.e. a complete covering of the tank base. Evidence of tank corrosion Any contamination of tank (by organic, by vermin or vermin faeces or similar) Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
	Regular programme for high-risk healthcare category, with disinfection	Annually
Domestic Cold Water Distribution System	New installations and modifications or additions Temperature exceeds 25ºC Any contamination of tank (by organic, by vermin or vermin faeces or similar) Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
Domestic Hot Water Calorifier and Storage/ Buffer Vessels	New installations and modifications or additions Temperature has fallen below 45ºC Re-commissioning of empty/unused plant Any contamination of header tank (by organic, by vermin or vermin faeces or similar)	As required
	Regular programme	Annually
Domestic Hot Water Distribution System	New installations and modifications or additions Temperature has fallen below 45ºC Any contamination of header tank (by organic, by vermin or vermin faeces or similar)	As required
Air Handling Units	Any contamination (by organic, by vermin or vermin faeces or similar) Gross organic contamination e.g. large number of dead insects, feathers, animal or bird bodies etc.	As required
	Chiller battery, drip trays and drainage pipework	6 monthly

N.B. *Information in table above taken from SHTM 04-01*

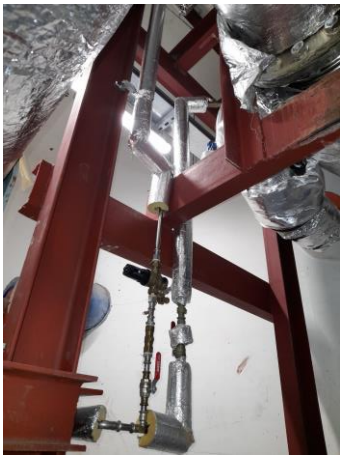
N.B. Ensure all actions are recorded and stored in the site Water Systems, or other appropriate Logbooks

A49585984

Section 11

Photographic Appendix

LEGIONELLA RISK ASSESSMENT



Govan Road Mains with Branch to Pressurisation Unit & Supply to Children's Hydrotherapy Pool Balance Tank - DCV Fitted Upstream of PRV.

Hardgate Road Incoming Town Mains & Fire Tanks Main

Children's Hydropool Balance Tank - No Suitable Air Gap on Mains Supply

Example 1 of Corroded Internal Supports & Fittings in Filtered Water CWSTs

Example 2 of Corroded Internal Supports & Fittings in Filtered Water CWSTs

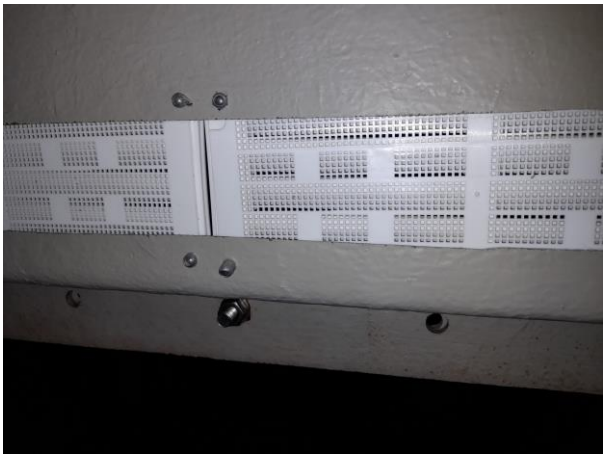
Example 3 of Corroded Internal Supports & Fittings in Filtered Water CWSTs

LEGIONELLA RISK ASSESSMENT

Example CWST Drain Points - Flushing Regime

Example of CWSTs Fittings Condition

Example of Staining on CWSTs Raised Chambers

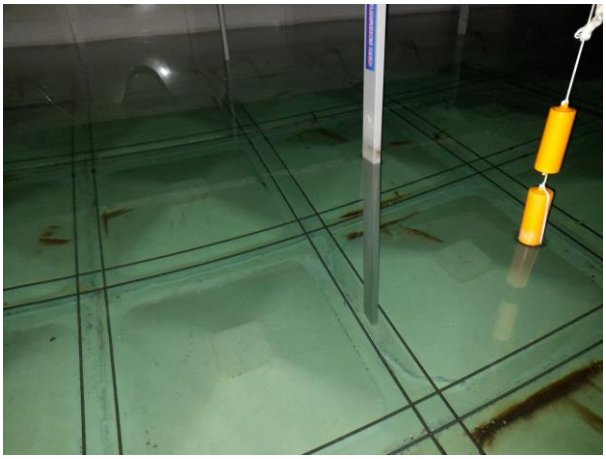


Example of CWSTs Raised Chamber Screen

Filtered Water Booster Set 1

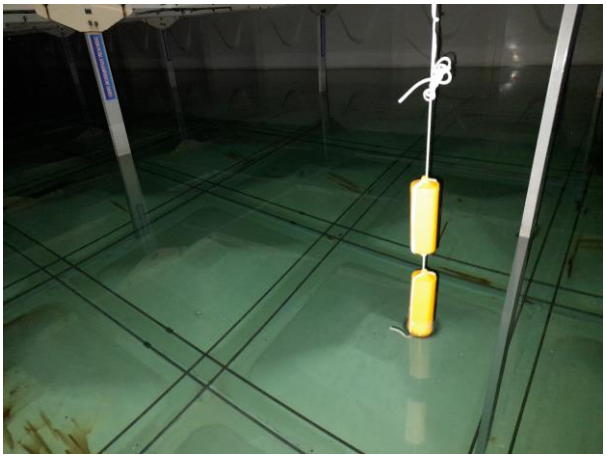
Filtered Water Booster Set 2

LEGIONELLA RISK ASSESSMENT



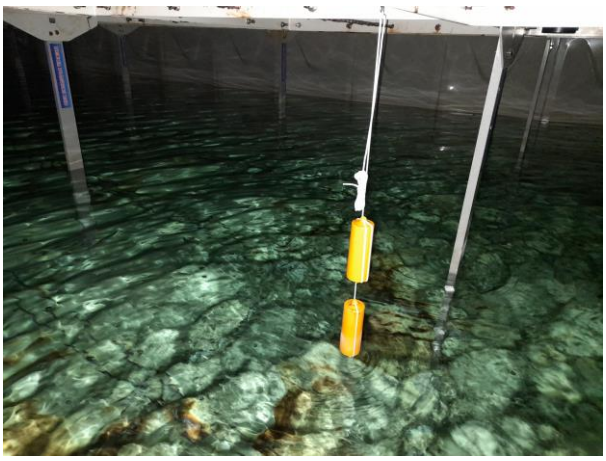
Filtered Water CWST 1A Internal

Filtered Water CWST 1A

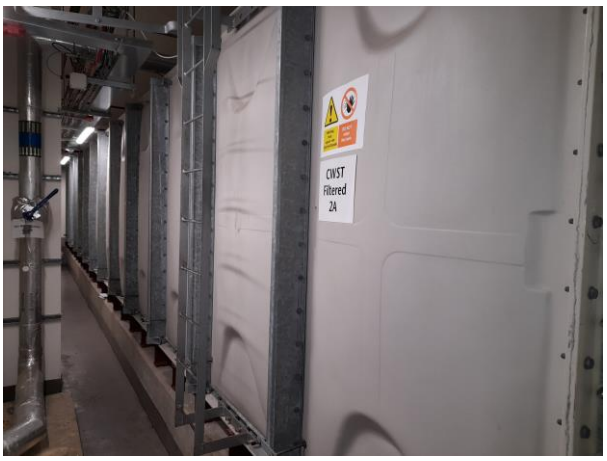


Filtered Water CWST 1B Internal

Filtered Water CWST 1B

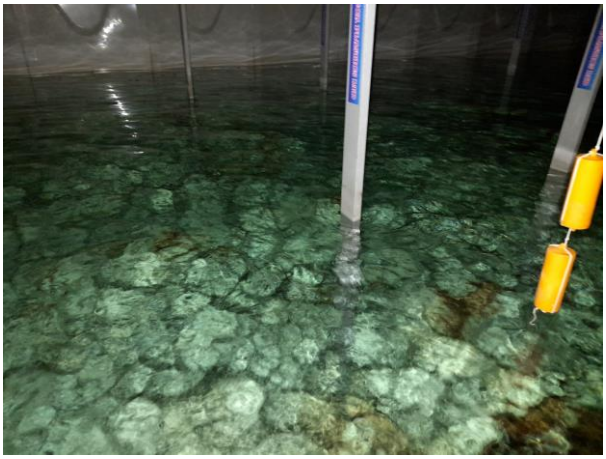


Filtered Water CWST 2A Internal



Filtered Water CWST 2A

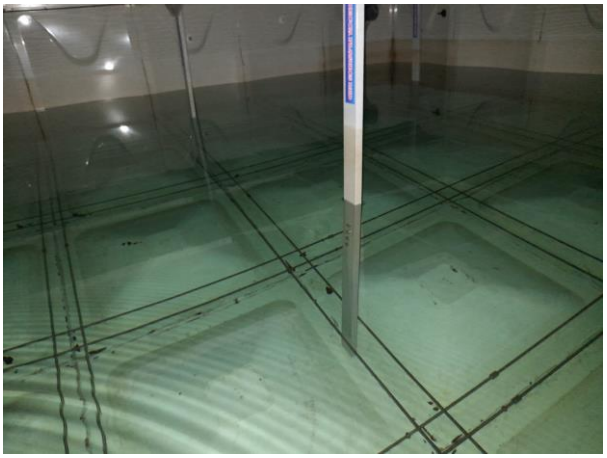
LEGIONELLA RISK ASSESSMENT



Filtered Water CWST 2B Internal

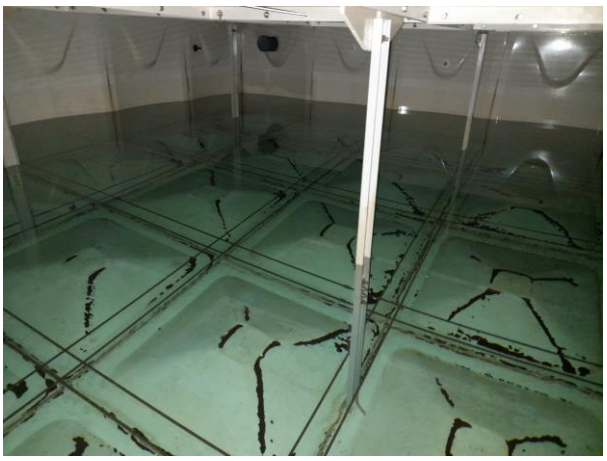
Filtered Water CWST 2B

Position of DCV on Supply to Trade Water CWST 1 after Water Meter.



Raw Water CWST 1A Internal

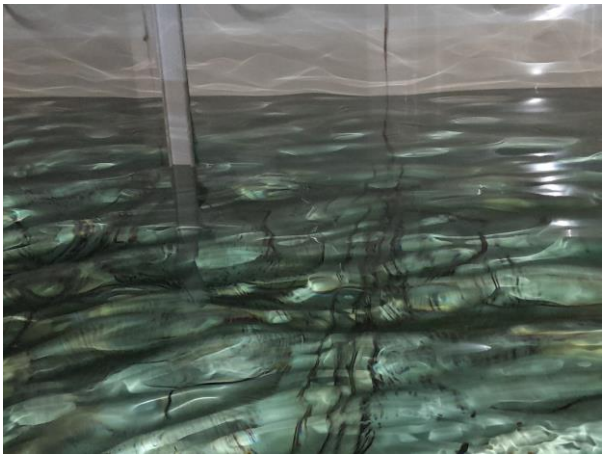
Raw Water CWST 1A



Raw Water CWST 1B Internal

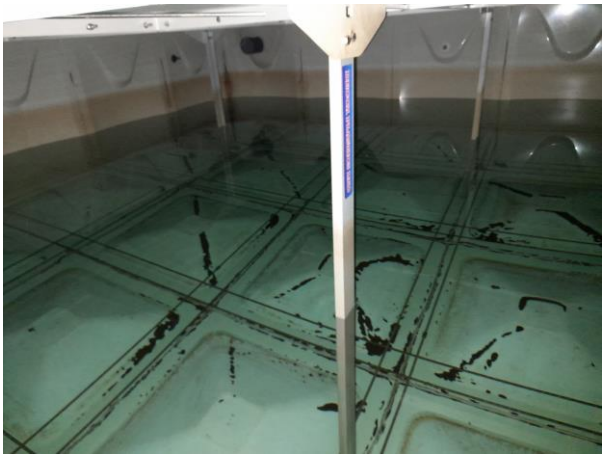
LEGIONELLA RISK ASSESSMENT

Raw Water CWST 1B



Raw Water CWST 2A Internal

Raw Water CWST 2A



Raw Water CWST 2B Internal

Raw Water CWST 2B

Raw Water CWSTs Filtration Unit 1

LEGIONELLA RISK ASSESSMENT

Raw Water CWSTs Filtration Unit 2

Raw Water CWSTs Filtration Unit 3

Trade Water CWSTs 1 & 2

Trade Water CWSTs Booster Set

Open Face Safety Valve in Calorifier Plant Room 41

Plant Room 22 Offline Calorifier 1 (Mid)

LEGIONELLA RISK ASSESSMENT

Plant Room 31 - Calorifiers 1-3

Plant Room 31 - Calorifiers 4-6

Plant Room 31 - Calorifiers 4-6

Plant Room 32 - Calorifiers 1-3

Plant Room 41 - Calorifiers 1-3

Plant Room 41 - Calorifiers 1-3

SCOTTISH HOSPITALS INQUIRY

Bundle of documents for Oral hearings commencing from 19 August 2024 in relation to the Queen Elizabeth University Hospital and the Royal Hospital for Children, Glasgow

Bundle 25 – Case Note Review Expert Panel, Additional Reports, and DMA Canyon

A49585984