

Scottish Hospitals Inquiry

Witness Statement of Questions and Responses

David Watson

This statement was produced by the process of sending the witness a questionnaire with an introduction followed by a series of questions and spaces for answers. The introduction, questions and answers are produced within the statement.

Personal Details

1. Name, qualifications, chronological professional history, specialism etc – please provide an up-to-date CV to assist with answering this question.
A David Watson – see attached CV for chronological professional history, specialism etc.

Specialism

2. Provide details of any qualifications and experience that you hold in respect of:
 - a) legionella; L8, Legionella identification, testing, management, compliance with guidance and regulations.
A See attached CV for details of qualifications and experience etc
 - b) waterborne pathogens; identification, testing management, compliance with guidance and regulations
A See attached CV for details of qualifications and experience etc.
 - c) Health and Safety at Work Act 1974 compliance
A See attached CV for details of qualifications and experience etc
 - d) Any other relevant qualifications and experience you hold in relation to your role within DMA Canyon
A See attached CV for details of qualifications and experience etc.

3. Provide details of any specific qualifications/ experience that you have in respect of working in/ with healthcare settings?

A See attached CV for details of qualifications and experience etc.

4. What is your understanding for the need of a water supply to be wholesome? What is the relevant guidance that applies? Who in general terms is responsible for the supply of wholesome water?

A The water utility company (Scottish Water) would be responsible for the supply of wholesome water to the site, with GG&C being responsible for managing the water quality within their systems. The requirement for the water supply to be wholesome is to ensure that the water being delivered to site, and on to end users of the water system(s), is safe to drink, wash, prepare food etc. The Water Supply (Water Fittings) (Scotland) Byelaws 2014 would be the primary guidance for the supply of water to buildings, with L8, HSG 274 and SHTM 04-01 being the primary guidance documentation for Hospital Estates.

Scottish Water's website states "*The Water Supply (Water Fittings) (Scotland) Byelaws 2014 apply to all plumbing systems, water fittings and appliances connected to the public water supply.*

Created under Section 70 of the Water (Scotland) Act 1980, these byelaws help ensure the safety of the water supply and the prevention of contamination of the public water supply."

SHTM 04-01 Part B states "*Current statutory legislation requires both management and staff to be aware of their individual and collective responsibility for the provision of wholesome, safe hot and cold-water supplies, and storage and distribution systems in healthcare premises.*"

5. What is your understanding of the need to appoint post holders in respect of water compliance, such as Authorised Persons etc in accordance with SHTM04-01?

A The requirement to appoint post holders in respect of water compliance is laid out in L8 and in SHTM 04-01 Part B which provides an example management structure organogram with definitions and description of the duties allocated to each of the roles required and as described in the response to Q4 above "*requires both management and staff to be aware of their individual and collective responsibility for the provision of*

wholesome, safe hot and cold water supplies, and storage and distribution systems in healthcare premises.”

DMA Canyon

6. Describe the services that DMA Canyon provide?

A DMA Canyon Ltd are independent specialists in the provision of Legionella control & consultancy and specialist plumbing solutions services. Formed in 1999 the directors of the company have in excess of 50 years' combined experience within the industry. DMA has grown and expanded since its inception and provides consultancy and service to companies across the UK. In 2016 DMA acquired Canyon Water Services Ltd. Canyon Water Services Ltd are a SNIPEF and Water Safe registered company with extensive knowledge and experience of the risks associated with Legionnaires Disease and working with Legionella Risk Assessments ensuring that remedial actions, ongoing service works or new installations are completed in accordance with the requirements of ACOP L8, Water Supply (Water Fittings) Regulations and Water Byelaws. As a result of the acquisition DMA Water Treatment Ltd was renamed as DMA Canyon Ltd. This acquisition allowed us to provide a both a standalone legionella consultancy and monitoring service as well as offering a full plumbing and mechanical service to assist with compliance where required. With a team of highly qualified and experienced independently trained field staff DMA Canyon consider its service to be second to none and aim to ensure our clients benefit from our extensive knowledge and experience to assist in fulfilling their obligations under the L8 ACOP/HSG and SHTM 04-01 guidance's as well as, COSHH, Water Byelaws and The Health and Safety at Work Act. We aim to provide our clients with a cost effective, bespoke package for their requirements. DMA Canyon provide legionella prevention and compliance services for all sizes of organisations from government bodies to facilities managers, from small independent companies to multinational organisations. DMA can provide L8 Legionella risk assessments, L8 water hygiene monitoring programs, chemical dosing, consultancy and upgrades of plumbing services and systems, provide advice and consultancy. DMA are registered with the Legionella Control Association (LCA) for carrying out a wide variety of legionella control and consultancy services under the Conditions of Compliance as laid out in the LCA's Code of Conduct for Service Providers. DMA

Canyon are also ISO 9001, ISO 14001 and ISO 45001 registered as well as having SNIPEF, Water safe and APHC accreditation.

7. Describe the areas which DMA Canyon offer experience and knowledge in.
A DMA offer services covering L8/Legionella & SHTM 04-01 Water Hygiene Consultancy and Monitoring, Microbiological Sampling, Cleaning and Disinfection, Plumbing and Water Byelaws Consultancy and Legionella plumbing and remedial services. See response to Q6 above also.

8. Describe the company structure of DMA Canyon and the role you hold, and provide details of the training have you undertaken/ which is relevant in order to meet the needs of this role?
A Please see attached Organogram for DMA Canyon. See attached CV for details of training etc. for the role I have as a Director of DMA.

9. Describe your day-to-day duties within DMA Canyon
A Day to day duties involve providing technical consultancy to clients, overseeing managerial staff and assisting with technical and operational aspects of running the company (this is split across all 3 directors). See attached CV for details.

Initial involvement with QEUH/RHC

10. Provide details of when you and DMA Canyon were first involved with QEUH/RHC; what was the remit of your instruction, who instructed you, who did you dealt with, and the nature and purpose of the work carried out by DMA Canyon at QEUH/RHC.
A DMA were first contacted in late 2014 (December) BY GG&C Estates and requested to carry out a “pre-occupation” Legionella Risk Assessment of the New QEUH Adult & Children’s Hospital (at the time referred to as the “South Glasgow University Hospital”). Our contact within GG&C Estates for these works was Ian Powrie and this is who instructed us in the works to be carried out and who we reported to. The attached quotation DMA Ref: Q33533/DW provides details of the nature and purpose of the works DMA were tasked to carry out.

11. At the point of your initial instruction did you have any concerns regarding the design of the water system at QUEH/RHC? If so, describe these concerns, and any recommendations or work carried out by DMA Canyon relative to any concerns.

A At the point of our initial instruction, we had very little idea of the design or layout of the water system, having had only a brief tour of the site, and at this point didn't have sufficient knowledge of the site and/or water system(s) to raise any concerns or make recommendations prior to conducting the assessments discussed in detail later in this document.

12. What views, if any, do you have in respect of the size of the water system used in QUEH/RHC? Would you have recommended using a water system of that size had DMA Canyon been involved in the design of the water system, for example would you have recommended using multiple smaller water systems, if so, provide details of what you would have recommended and why.

A The water system within the QUEH/RHC is a very large water system, supplying a very large building. Using multiple smaller system may have been an option for delivering water throughout the building and may have allowed for isolation and/or works on individual water systems to proceed which would impact on only the area(s) supplied from this system, with no, or little, impact on other parts of the hospital. However, we are not a water system designer and do not have the experience of designing and constructing a water system of the size required to supply the hospital, or how a different design could impact on the design of the other aspects of the hospital.

13. We are aware that handover of the QUEH/RHC site from Multiplex to NHSGGC took place on 26th January 2015. Were you present during the handover period, and if so, did you have any observations regarding the site at handover, please provide details.

A DMA were working on site around the handover period carrying out the site survey works for on the water system for the risk assessment, though I cannot state specifically if DMA were on site on the 26th of January 2015. DMA had no involvement in the actual handover of the building.

14. At the point of handover, who was the Dutyholder at QUEH/RHC? What information did you see regarding this when carrying out the 2015 report?

- A** Not aware of who the Dutyholder was at this time. We were not provided with a management structure for GG&C with named individuals appointed into specific roles. DMA were provided with a generic GG&C Written Scheme Hierarchy Diagram and Hierarchy Appointment Table (as detailed in Section 10 of the 2015 Risk Assessment), but no individuals were named within these.
15. To what extent was it clear that the obligations to appoint an authorised person/ designated person for water/ competent person for water/ authorised engineer for water required to discharge water supply safety had been complied with at handover? What awareness did you have as to when these roles had been filled as at 2015? If there were any delays in filling these roles was this a factor in any deficiencies that you identified?
- A** As stated above only generic information without named individuals who had been appointed to the specific roles was provided to DMA. We are unable to comment on whether any appointments had been made within GG&C which wasn't supplied to DMA, or when these roles were filled as DMA had no input into the water system management and control other than to conduct the risk assessment.
16. Describe any concerns you had regarding the appointments in respect of SHTM04-01 at QEUH/RHC around the time of handover?
- A** DMA noted that no appointments appear to have been made at the time of handover and that no legionella management structure had been put in place at this time for the QEUH/RHC.
17. Who was tasked with ensuring that these appointments were filled?
- A** Appointment to these roles would have been by GG&C with no input from DMA.
18. What is the risk, if any, in not having the appointments filled?
- A** It is important to have a management structure in place, to provide a formal process for the implementation and oversight of a PPM regime, and for the reporting and escalation of issues arising and to allow for specific roles with responsibilities and accountability for ensuring the necessary works are being carried out assigned and documented.

19. To what extent was it clear that the roles required in respect of Legionella required to discharge water supply safety had been complied with at the point of handover?
- A** As stated above only generic information without named individuals who had been appointed to the specific roles was provided to DMA.
20. Were the lines of responsibility clear?
- A** Unable to comment as this information was not supplied to DMA.
21. If not, what in your view was lacking from them?
- A** Unable to comment as this information was not supplied to DMA.
22. How clear was it to you that arrangements were deficient?
- A** As stated above only generic information without named individuals who had been appointed to the specific roles was provided to DMA, so unable to comment on any deficiencies within the actual roles.
23. What is the risk, if any, in not having the appointments filled at handover in respect of Legionella?
- A** Please see response to Q18 above.

L8 Risk Assessment (Pre-Occupancy) NHS Greater Glasgow and Clyde South Glasgow University Hospital 29th April 2015 (hereinafter referred to as 'the 2015 report') – Refer the Bundle 6, Miscellaneous Documents, Document 29

24. The Inquiry is aware the DMA Canyon prepared the 2015 report. Please describe your role in preparing the report, and the role of Allan McRobbie, how did the two roles differ in terms of preparing the 2015 report?
- A** Due to the size of the building and water system(s) it was agreed within DMA that it would require to have more than a single assessor on site. I worked alongside Allan McRobbie on carrying out the site surveys, reviewing documentation provided to DMA for the assessment and compiling the reports. The roles did not majorly differ between Allan McRobbie and I – it was a joint effort, though Allan took on the majority of the write up with assistance and technical support by myself. We carried out much of the site

surveys together and would work together during the write up and document review phases.

25. When and by whom were DMA Canyon instructed to carry out the 2015 report? What was the remit of instruction? If you have a written copy of this instruction, please make it available to the Inquiry by uploading it to the workspace.

A DMA were requested to carry out the Risk Assessment by Ian Powrie from GG&C Estates. Please refer to DMA quotation “Q33553 GG&C New SGH Building L8 RA” for the proposal for the assessment to be carried out and the purchase order “PO SGH L8 RA 2015” instructing DMA to carry out these works for remit.

26. What is the purpose of carrying out a pre-occupation L8 risk assessment? Please describe any regulatory requirements to have a L8 risk assessment prior to the patient occupation of a healthcare premise.

A As stated within L8 Paragraph 28 *“A suitable and sufficient assessment must be carried out to identify and assess the risk of exposure to legionella bacteria from work activities and water systems on the premises and any precautionary measures needed.”*

Paragraph 33-34 states *“Before any formal health and safety management system for water systems is implemented, the dutyholder should carry out a risk assessment to identify the possible risks. The purpose of the assessment is to enable a decision on:*
(a) the risk to health, ie whether the potential for harm to health from exposure is reasonably foreseeable, unless adequate precautionary measures are taken;
(b) the necessary measures to prevent, or adequately control, the risk from exposure to legionella bacteria.

The risk assessment also enables the dutyholder to show they have considered all the relevant factors, and the steps needed to prevent or control the risk.”

Delivery of the 2015 report

27. At the bottom of page 2 of the 2015 report it states:

‘The findings included within the report have been communicated throughout the assessment process by Allan McRobbie and David Watson of DMA Water Treatment Ltd to NHS Estates staff (Ian Powrie and Jim Guthrie) verbally in both formal and informal meetings and via email.’

a) Confirm how frequently you discussed the findings of the report during the assessment process with Estates staff.

A Most days when DMA were on site carrying out the site survey we would be in communication with Estates staff (though we can't state for certain exactly how many time we would have met). Most meetings were on an ad-hoc basis depending on availability of Estates staff. If there were any matters which we felt had to be communicated to Estates we would make a point of informing Estates as soon as practical (i.e. that day or the next).

b) Did you have discussions or communications with any other members of Estates staff, save for Ian Powrie or Allan McRobbie? If so, whom?

A Allan McRobbie worked for DMA and I was in contact with Allan continually throughout the process. Most information was relayed to Ian Powrie from NHS GG&C Estates as he was our main point of contact. We had contact with Jim Guthrie and Mel MacMillan, though this was more logistical and assisting with identifying areas within the hospital rather than reporting of findings of the RA.

c) If you have any copies of email correspondence between DMA Canyon and Estates staff during the assessment process, please make these available to the Inquiry via the workspace.

A Please see emails attached.

d) At any point during the assessment process did Estates staff appear concerned regarding the findings of the report?

A As stated above, our findings were relayed to Ian Powrie at GG&C. Mr Powrie advised that he would report the findings to the appropriate persons, however, DMA were unaware of the identity of those persons. DMA's remit and instruction was to carry out the risk assessment and to report the findings to GG&C. GG&C did not express any concern or provide comment during the assessment process or on receipt of the report.

e) Did the reaction of those you spoke to appear appropriate to you? Or as you would have anticipated?

A Yes

f) Are you aware of any action being taken by Estates staff during the assessment process in relation to the findings? If so, please provide details of actions taken and by whom.

A We were aware of actions being taken (e.g. Calorifiers being put back online) though unable to comment on who carried out these works or the dates they were completed. DMA were not directly involved in any such actions, and so any awareness on our part would have been anecdotal only.

g) At any point during the assessment process did you speak to clinical staff or microbiologists at QEUH/RHC regarding the findings of the report, if so, whom? If not, would you have expected to?

A No

28. To whom in QEUH/RHC Estates staff was the final 2015 report sent, and by what means (email/ hard copy letter)? Who sent the report from DMA Canyon? Do you have a copy of the letter or email sending the report? If so please make same available to the Inquiry via the workspace.

A 2 Hard copies of the report and 2 copies of the assessment were burned onto a CD and sent to Ian Powrie. Unable to locate delivery note, but have DMA's internal delivery note register which refers to it being delivered in early May 2024 by Darren Waldron of DMA (DMA Delivery Note 01214 – 06/05/15).

29. What would you have expected to have happened following receipt of the 2015 report by NHSGGC?

A DMA would have expected GG&C Estates to review the Risk Assessment report and work through any recommendations and implement as they deemed appropriate.

30. The Inquiry understands that following receipt of the 2015 report a meeting took place between DMA Canyon, Ian Powrie, James Guthrie and David Bratley. With the purpose of the meeting being to develop and implement an action plan to address the points raised in the 2015 report.

a) Do you recall attending this meeting? If so, what was the outcome of the meeting?

- A** This meeting appears to have been attended by Allan McRobbie, with DMA providing a quotation (QAM15031b) on 9th June to provide costs for DMA to carry out L8/SHTM monitoring works to aid Estates with their compliance with the guidelines as well as to provide a Gap analysis on the L8 Management and PPM regimes. See Email “150610 – NHS SGUH”
- b) Who was tasked with preparing and implanting the action plan?
- A** DMA were not involved in preparing and implementing the action plan and are not aware of who was tasked with this. DMA provided quotation QAM15031b for DMA to provide L8/SHTM monitoring works but DMA were not instructed to proceed with these works.
- c) Did the action plan discussed address all the points identified in the 2015 report?
- A** DMA were not involved in preparing and implementing the action plan and are not aware of who was tasked with this.
- d) What role, if any, did you play in implementing/advising/ assessing the actions to address the points raised in the 2015 report?
- A** DMA were not involved in preparing and implementing the action plan and are not aware of who was tasked with this.
- e) If you did not attend this meeting, who attended from DMA Canyon?
- A** As stated above it would appear that Allan McRobbie attended this meeting.
- f) Were you made aware of the outcome of the meeting, or of any action plan developed at the meeting?
- A** The outcome of the meeting was DMA produced quotation QAM15031b which was sent to Estates on 9th June to provide costs for DMA to carry out L8/SHTM monitoring works to aid Estates with their compliance with the guidelines as well as to provide a Gap analysis on the L8 Management and PPM regimes. DMA were not provided with any action plan by Estates after this meeting.
31. Following delivery of the 2015 report to QEUH/RHC estates staff, what action, if any, were you aware of having been taken by estates staff to address the points raised in the 2015 report, prior to DMA Canyon carrying out the L8 Risk Assessment NHS

Greater Glasgow and Clyde Queen Elizabeth University Hospital and Royal Hospital for Children Site survey completed 8th September 2017 (Plant) Outlets surveyed 10th, 12th, 13th, 16th, 20th & 24th October 2017 Management Review Meeting for Gap Analysis, 30th January 2018 (hereinafter referred to as 'the 2018 report') Refer to Bundle 6, Miscellaneous Documents, document 30 ?

- A** DMA were not involved in any ongoing works within the QEUH/RHC at this time and not aware of what actions were taken.
32. What was the purpose of the 2018 report? Who instructed you and when? What was the remit of the report?
- A** DMA understands the purpose of the Risk Assessment carried out in late 2017 & early 2018 was to update the Risk Assessment from 2015. We were requested to provide a quotation for this in November 2016 and provided an instruction to proceed in September 2017. The quotation was provided to Colin Purdon (C.C. to Ian Powrie), with the report being issued to Tommy Romeo. Please see quotation "Q171049DW GG&C QEUH L8 RA Update" and Purchase Order "170904 QEUH L8 RA Update PO" for remit of these works.
33. Were DMA Canyon present at the QEUH/RHC site between 2015 and September 2017? If so, at any point did any members of staff discuss the 2015 report, with you or your colleagues that you are aware of? If so, who from estates had discussions regarding the 2015 report? What was the nature of the discussions?
- A** DMA carried out work in the "Retained Estate" within the QEUH campus, but had very limited input into any works within the QEUH/RHC between 2015 and 2017, with only some ad-hoc works carried out as and when requested during this period, with the works being carried out being local disinfections of the hot and cold water systems within Ward 4A of the adults hospital in June/July 2016 and some microbiological sampling in Sep, Oct & Nov 2016 and more microbiological sampling during the second half of 2017. DMA were not requested to assist with any remedial actions based on the results of this sampling. We cannot recall having any conversations around the 2015 Risk Assessment with Estates during this period.
34. At any point between the 2015 report and the commencement of the assessment for the purposes of completing the 2018 report were you or colleagues at DMA Canyon

approached by any members of QEUH/RHC estates staff, or other members of staff, for advice or assistance with addressing the points raised in the 2015 report? If so, who were you approached by and what support or advice was given?

A No.

35. When you delivered the 2018 report what was the reaction from NHSGGC Estates staff? Do you recall any surprise from members of staff to the findings of the 2018 report? If so, from whom?

A We cannot recall the reaction of any Estates staff from this time. DMA were not present when the risk assessment was reviewed by GG&C Estates. As before, DMA's remit and instruction was to carry out the risk assessment and to report the findings to GG&C.

36. What are your thoughts on the lack of action taken between the 2015 and 2018 report by NHSGGC Estates staff?

A DMA were surprised during the 2018 risk assessment that there was little progress made on implementing the recommendations made in the 2015 report.

37. At any time did any member of staff offer an explanation as to why little action was taken between 2015 and 2018? If so, what explanation was offered and what did you think of the explanation?

A No explanation was offered to DMA.

38. What concerns, if any, did you have regarding the lack of action between the 2015 and 2018 report?

A Our concerns were that deadlegs which had been highlighted previously were still present and did not appear to be on a recorded flushing regime, the CWSTs did not appear to have been cleaned and disinfected during the period between the two reports and Estates were not able to provide a detailed management structure and there were gaps highlighted in the ppm regime for the water systems.

39. Any further comments you have regarding the lack of action taken between 2015 and 2018?

A No additional comments.

Guidance Compliance - General

40. At page 15 of the 2015 report it states: *'As the building is used by persons with acute underlying medical conditions which increases susceptibility to contracting legionellosis then the requirements for L8, HSG 274 and HTM/SHTM 04-01 compliance is of paramount importance.'*

a) Explain how the how compliance with the requirements for L8, HSG 274 and HTM/SHTM 04-01 is of paramount importance, insofar as what protection from additional risk of avoidable infections does compliance with the aforementioned requirements provide patients?

A L8 states *"This book is aimed at dutyholders, including employers, those in control of premises and those with health and safety responsibilities for others, to help them comply with their legal duties in relation to legionella. These include identifying and assessing sources of risk, preparing a scheme to prevent or control risk, implementing, managing and monitoring precautions, keeping records of precautions and appointing a manager to be responsible for others."*

The guidance provided by L8 helps users to comply with the legal obligations in managing and operating water systems and complying with their obligations under the Health and Safety at Work etc. Act 1974, Control of Substances Hazardous to Health (COSHH) Regulations, The Management of Health and Safety at Work Regulations and other relevant legislation, with HSG 274 and SHTM 04-01 providing technical guidance on how to manage and operate water systems in order to comply with this legislation and provide safe water systems for end users.

b) Further what is your understanding of the overarching principles of the guidance?

A See response to Q40 a) above.

Water Sampling 2015

41. At page 15 of the 2015 report in respect of the water sampling programme it states: *'DMA were advised sampling being carried out in accordance with the method statement used by the main contractor prior to handover in order to ensure continuity of methodology. DMA were advised this method statement had been reviewed and deemed as acceptable by NHS Microbiologists and was not submitted to DMA for review or comment.'*

a) Who as far as you were aware was 'the main contractor'?

A DMA were advised the main contractor was Brookfield/Multiplex with the main plumbing/mechanical Contractor being Mercury.

b) What were DMA advised regarding the 'method statement'? Who made DMA aware of the terms of the method statement? What did DMA understand the method statement provided for regarding testing? Were DMA satisfied that the method statement provided for appropriate testing? If so, how so? If not, why not?

A Unable to comment any further than the statement above we made within the risk assessment.

c) Who advised DMA that the method statement had been reviewed and deemed appropriate by NHS Microbiologists?

A NHS Estates would have advised DMA of this, though we cannot recall the person within Estate who advised this.

d) Did DMA have opportunity to discuss with matter with NHS Microbiologists at QEUH/RHC, if so, whom?

A No

e) Would you have expected to have discussed matters with NHS Microbiologists? Did you raise any concerns regarding not speaking to them?

A No

f) Were you concerned that DMA were not provided with either actual microbiological results after sampling nor the method statement for disinfections? If so, did you/DMA discuss this with anyone at QEUH/RHC? Did you/DMA ever ask for this information, but were refused it? If so by whom?

A DMA raised the issue of not being provided with method statements for the microbiological sampling in an email to 09/04/15. DMA had been provided with some H&V sampling and disinfection information, and queries regarding this were raised in the same email, advising we were unable to see what, if any, remedial actions were taken when "out-of-specification" results were returned during the commissioning (H&V) sampling. We are unable to find a response to this email. DMA also recorded the fact

that we had no access to the NHS sampling results, or to the method statements within the 2015 report.

42. What concerns, if any, at the time of the 2015 report did you have regarding 'out of specification legionella and potable results'?

A At the time of the 2015 Risk Assessment DMA emailed Ian Powrie (09/04/15) stating there were *"no remedial actions or re-sampling procedures recorded after "failed" and multiple "failed" samples (i.e. samples which have "failed on the resample")."*

a) How satisfied were you that the results were addressed by NHSGGC at the point of completing the 2019 report? What sampling results did you see to reach this conclusion.

A The main concern at the time of the 2019 report with regards to sampling results were in relation to *Cupriavidus* (and other organisms) for which there were no guidance documents for the water hygiene industry to follow. This was covered within section 10 of the 2019 report. DMA did not receive copies of all the sampling results carried out during 2018 as much of this was held internally by GG&C Microbiology and Estates, with the actual analysis carried out by GG&C internal laboratories at the Glasgow Royal Infirmary.

DMA did have access to some of the sampling results from 2018, with the majority of potable and *Legionella* samples being within specification, with out-of-specification results being for "other" organisms for which there was no guidance documentation.

All out-of-specification results were, however, considered by DMA and included within the report whether subject to guidance or not.

b) Did continuous chlorine dioxide dosing the system address these issues?

A To DMA's knowledge the dosing of the full system with ClO_2 was not started until very late in 2018, so would not have had an impact on the results.

c) At the time of the Water System Risk Assessment, NHS Greater Glasgow & Clyde, Queen Elizabeth University Hospital and Royal Hospital for Children, report issued January 2019 (herein after referred to as 'the 2019 report'), did you have any concerns regarding sampling results? Explain your answer.

A The main concern at the time of the 2019 report with regards to sampling results were in relation to *Cupriavidus* (and other organisms) for which there were no guidance

documents for the water hygiene industry to follow. This was covered within section 10 of the 2019 report.

Management Structure & Communications

43. At page 15 of the 2015 report reference is made to the lack of formal management structure, written scheme or communication protocols.

a) Did a lack of formal management structure comply with HTM/SHTM guidance? If so, how so, and if not, how not?

A SHTM 04-01 Part B and Part G (issued in draft format at the time of the report) provides the positions which should be filled in relation to the management structure. DMA were not provided with any details of the management structure at the time of the assessment. L8 also requires that a Legionella Management structure should be put in place. To the extent that no such formal management structures were in place, this would not have complied with the above guidance.

b) What concerns did you have surrounding the lack of formal management structure?

A A formal management structure provides a formal process for the implementation and oversight of a PPM regime and the reporting and escalation of any issues which may have arisen and to allow for specific roles with responsibilities and accountability for ensuring the necessary works are being carried out assigned and documented.

c) What impact did the lack of formal management structure have on the operation of the water system, and the prevention of avoidable risk of infections?

A DMA were asked to report on the system at the time of the survey and had no input into the running of the system afterwards and so are unable to comment on how any lack of formal management structure impacted on the running of the water system.

d) To the same extent explain your concerns surround the lack of written scheme, the potential patient impact, and compliance with guidance.

A The lack of a written scheme could have impacts on the allocation and management of the tasks, ensuring all required monitoring and other tasks are being carried out on the water system and potentially the ability to react to any issues that arose from this monitoring. Both L8 and SHTM 04-01 (Part G in Draft format at time of 2015 report) advice the a written scheme should be created and implemented to “for controlling the

risk of exposure". L8 also requires that a Legionella Management structure should be put in place.

e) To the same extent explain your concerns regarding the communication protocols, potential patient impact and compliance with guidance.

A The lack of communication protocols could have an impact in a large building/water system where multiple staff members or sub-contractors have responsibilities for different aspects of managing the water system, ensuring that information about the water system is reported to the relevant personnel, allowing for any appropriate action to be taken as and when required.

f) Describe the '*significant communication issues*' and confirm the meaning of '*between the parties involved*' who were the parties?

A As stated in the 2015 risk assessment:

"DMA have been informed by Estates personnel there have been breakdowns in communication between Estates, Projects and Building Contractor(s) where defects highlighted by NHS Estates to other parties are being acted upon without Estates without Estates being informed to allow proper consideration of bacterial control to be made, or to review/sign off that actions have been carried out in a compliant manner minimising any potential bacterial control impacts.

Examples include:

- *A direct and open connection installed by the Building Contractor(s) between the Hardgate Road mains supply and the PR 41/22/21 distribution pipe bypassing the filtration plant running for an unknown length of time which NHS Estates were previously unaware of.*
- *A calorifier which appeared to have been offline for over three months being reinstated by the Building Contractor(s) with no evidence of flushing/pasteurisation/disinfection."*

g) What impact did this have on the operation of the water system at QEUH/ RHC and in turn what impact or potential impact, if any, did this have on patient safety?

A As stated above this appears to have resulted in some works being carried out without NHS Estates being aware of the works. The comments by DMA were made during the

pre-occupation phase and DMA were not involved in the post handover phase and so cannot comment on the potential impact this had after handover.

44. At the time of the 2018 report, who was the Dutyholder at QUEH/RHC?

A Not aware of who the Dutyholder was at this time. We were not provided with a management structure for GG&C with named individuals appointed into specific roles. (as detailed in Section 10 of the 2018 Risk Assessment).

45. To what extent was it clear that the obligations to appoint an authorised person/ designated person for water/ competent person for water/ authorised engineer for water required to discharge water supply safety had been complied with at handover? What awareness did you have as to when these roles had been filled as at the time of the 2018 report? If there were any delays in filling these roles was this a factor in any deficiencies that you identified?

A As stated within the 2015 risk assessment DMA were not aware of any management structure being put in place at the time of the assessment being carried out, and as stated in the 2018 assessment this had been completed/updated. Unable to comment on whether this contributed to the “deficiencies” identified within the 2018 assessment as DMA had very limited involvement within the QUEH/RHC during the period between the 2015 and 2018 reports.

46. Describe any concerns you had regarding the appointments in respect of SHTM04-01 at QUEH/RHC around the time of the 2018 report?

A As stated within the 2018 assessment DMA raised concern about Tommy Romeo being nominated into the Authorised Person role, without having had the appropriate training.

47. To what extent was it clear that the roles required in respect of Legionella required to discharge water supply safety had been complied with at the point of the 2018 report?

A It was not clear to DMA this had been complied with as no management structure was supplied to us.

48. Were the lines of responsibility clear?

A As stated within the 2018 assessment the lines of communication did not appear to have been documented.

49. If not, what in your view was lacking from them?
- A** Completed management structure, with lines of communication etc. were not provided to DMA to review. As stated in the 2018 assessment a “general ‘Written Scheme’ to be implemented on each of their sites”, though this would have to be made site specific.
50. How clear was it to you that arrangements were deficient?
- A** As GG&C were not able to provide this information this appeared clear to DMA.
51. To what extent had these matters been addressed at the time of writing the 2019 report? Were the lines of responsibility clear, if not, what in your view was lacking? To the same extent do any such issues still remain?
- A** As stated within the 2019 report:
- “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 due 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.”*
- Currently DMA do not carry out the reviews of the Water Management and Written Schemes, this is carried out by Authorising Engineer during annual audits/reviews, though in DMA’s experience there appears to be clear definition of who carries out which roles and close co-operation with different departments (e.g. between Estates and Infection Control, Microbiology etc.).

Water supply to the Renal systems

52. The 2015 report states that there was no separate supply to the Renal systems, and made recommendations regarding disinfection procedures and chemicals.
- a) Would you have expected there to have been a separate supply to Renal systems?

A Not necessarily, it was a comment with regards to ensuring appropriate cognisance of this was taken at any point when disinfections or other works on the water system were taking place.

b) What issues does having a single point supply present? Insofar as avoidable risk potential infection to patients?

A A single supply system which has connections to the renal supplies would have to be taken into account if/when remedial works were being undertaken to ensure supply to renal system(s) was not interrupted and no disinfectant was drawn into the renal systems with out the knowledge or renal technicians etc.

c) Why would the Renal system have benefitted from a separate supply?

A A separate supply to this system which was not connected into the renal system would perhaps make the management of the system simpler and alleviate some of the issues described in a) & b) above re: disinfection and remedial actions.

d) What disinfection procedures were put in place by Estates staff between the 2015 and the 2017 report? If no procedures were put in place, did this surprise you, if yes why? What would you have expected to have been done by Estates staff?

A Not aware of any disinfection processes implemented by Estates staff in this period, though DMA had very limited involvement in the QEUH during this period and may not have been aware of disinfections being carried out. DMA would have expected the CWSTs to have been disinfected during this time period.

Note: DMA did carry out disinfections within Ward 4A in June/July of 2016.

e) DMA carried out a further report in 2019 and found that *'suitable filtration and testing regimes have been implemented on the renal system in light of the ClO₂ dosing systems being installed, and that supply pipework to the renal plants have been altered to bypass the local ClO₂ "top-up" units.'* Page 8 the 2019 report.

(i) When was the suitable filtration and testing regime implemented?

A This filtration and sampling regime was implemented as part of the ClO₂ installation in late 2018/early 2019, though DMA had no involvement in this.

(ii) When would you have expected it to have been implemented?

A At the time of installation of the ClO₂ plant.

(iii) What was the impact, if any, in not introducing a suitable filtration and testing regime sooner? What was the impact, if any, of the delay in action in implementing a suitable filtration and testing regime?

A This was not required prior to the ClO₂ installation.

53. Describe your involvement, if any, with disinfection of the water system supply to Ward 4A? What was the purpose? Who did you work with/ who instructed DMA Canyon from Estates staff? Was this connected to the testing and filtration systems referred to in Question 37? What was the outcome?

A DMA were requested to carry out a disinfection of Ward 4A by Jim Guthrie from GG&C Estates. We understood that this was due to “out-of-specification” microbiological results, though DMA do not have copies of these results. A disinfection was carried out in June 2016 and then repeated in July 2016. DMA were not provided with the follow up sample results.

This question makes reference to Question 37 above, but the reference appears to be incorrect.

Water System Features & Water Provisional Position Paper 11 (PPP 11)

The Inquiry has produced a Provisional Position Paper; Potentially Deficient Features of the Water System of the QEUH/RHC – please refer to within the workspace for assistance with answering these questions.

Bypass Pipes

Please refer to page 91 of the 2015 report and page 23 paragraph 5.4 of PPP11.

54. What evidence was there that the water system was filled with water that bypassed the installed filtration system prior to commissioning? If so, why what mechanism would the system have been filled bypassing the filtration system?

A As stated in the 2015 assessment DMA witnessed pipework connecting from the Hardgate road mains water supply into the booster pump sets which was after all water tanks and the filtration system, with the valves open.

55. Who fitted the bypass pipework/ mechanism at the Hardgate Road mains?
A DMA not advised who fitted this bypass.
56. What was the purpose of fitting bypass pipework/ mechanisms?
A DMA unaware of why this bypass was in place.
57. Describe the issues, if any, associated with the bypass pipework/ mechanisms at the Hardgate Road mains?
A The bypass was a temporary installation which bypassed the filtration plant, which DMA understands was a control measure for the water system, introducing unfiltered water into the system.
58. The Inquiry understands that in order to comply with SHTM04-01 that '*all incoming cold water supplies destined for domestic use within NHS Scotland premises should be filtered*'.
- a) Is this your understanding of the guidance?
A Yes – for new buildings.
- b) If so, was the bypass pipework at the Hardgate Road mains compliant with SHTM04-01 in 2015?
A Not whilst the bypass was in place and in use.
- c) If the presence of the pipework was not compliant with SHTM04-01, for how long was the system non-compliant? What impact did this have on the integrity of the water supply? Did Estates staff explain why the pipework remained in place for a number of weeks?
A Unsure how long the pipework had been in place, with no explanation of why the pipework remained in place for a number of weeks. Unsure of the impact this would have had.
59. Who filled the water system with water that bypassed the filter system?
A DMA were not informed of who filled the system with the bypass.

60. What would have been the purpose of doing this?

A DMA were not informed of the purpose of this.

61. How long did the water remain in system, after the system was filled bypassing the filter system? Did the water simply sit in the system? How, if at all, could have encouraged dead legs/ temperatures out with acceptable limits?

A DMA were not present on site at this time and unsure of how long water was in system, or what happened to the system after the water had been introduced. Realistically this would have had no real impact on deadlegs and/or water temperatures on distribution system, though may have had an impact on water within CWSTs and plantroom pipework which would not be in use.

62. How did that affect the extent to which parts of the system operated as dead legs? How, if at all, would that have affected the extent to which the system strayed outside temperature limits?

A Unlikely to have had any effect on distribution system, though may have had an impact on water within CWSTs and plantroom pipework which would not be in use.

63. How did this, if at all, potentially impact the integrity of the water supply?

A Unfiltered water, potentially with small deposits of grit, sand, debris etc. could have entered the water system, and it is possible water from within CWSTs and pipework in plantrooms which were not used whilst bypass was in place could then have been drawn into the system when system returned to normal operating conditions, unless this water was discharged to drain and system refilled.

64. How long did the bypass remain in place? When was it removed, by whom, and what prompted its removal?

A DMA highlighted the presence of the bypass being in place, but are unsure of how long the bypass was in place, when it was removed, who removed it or what prompted its removal. As noted, DMA were not involved in progressing the actions recommended to GG&C in the reports provided.

65. Was any additional cleaning or flushing of the water system carried out following removal of the bypass?

A DMA not informed of what if any actions were undertaken.

66. What impact, if any, would not flushing the system after removal of the bypass have had? Did this lead to a potentially impact the integrity of the water supply?

A As stated above small deposits of grit, sand, debris etc. could have entered the water system if unfiltered mains water entered the water system, which if not properly flushed could have remained in the system.

67. At paragraph 5.8 of PPP11 the Inquiry understands from the 2015 report that the bypass was in place for a number of weeks prior to being removed. What impact did the bypass being in place for a number of weeks have on the system? What reason was given by Estates staff for the bypass being in place for a number of weeks? Did this give you cause for concern?

A Unsure if/when bypass was in use during the period it was in place. Impact would have been as described in points 63 & 66 above. The concern for DMA at the time was as stated in the risk assessment *“may have led to sediment and other debris which would otherwise have been removed by the filtration set being introduced into the system and could be a contributory factor to any out-of-specification microbiological results.”*

68. Do you agree with PPP11 that the bypass being in place was a potential deficient feature of the water system at QEUH/RHC?

A Yes

Drain points and low turnover

69. PPP11 paragraph 5.17

a) What risk arose, if any, due the lack of flushing regime, particularly in respect of the Govan Road and Hardgate Road and low turnover areas?

A There are some deadlegs on the Govan Road and Hardgate Road mains water supplies and a dedicated mains water supply to the fire tanks in the basement which ties into the Hardgate road mains line. Water within these deadlegs and low use line to fire tanks could allow stagnant water to leach into the mains supply to the Raw Water CWSTs.

b) In the 2018 report it was noted that there was no record of flushing. Were you aware of any flushing having been carried out by Estates in respect of the low turnover areas identified?

A Estates verbally advised DMA flushing of low use outlets within Estates areas was being carried out, though no records of this were provided to DMA. DMA had very limited input into the QEUH during this period and have no first hand knowledge of what was carried out. Estates were unable to confirm if unused outlets in clinical areas were being flushed.

c) What, if any, risks are created by not carrying out flushing of low turnover areas?

A Water within low use areas can stagnate and will rise/fall to building / ambient temperature which may be in the temperature zone where microbial growth is more likely to occur, and could potentially leach into other areas, or be released when low use outlets used.

d) Were Estates staff able to confirm whether any flushing had been carried out between the 2015 and 2018 reports in respect of low turnover areas?

A As stated above Estates stated verbally that areas they were responsible for were being flushed, though no records of this were provided to DMA, and were unable to confirm if clinical areas were being flushed.

e) What requirements are there in terms of guidance and legislation to carry out regular flushing of low turnover areas?

A Both SHTM 04-01 and HSG 274 Part 2 recommend flushing low use outlets twice weekly.

f) The Inquiry understands that regular flushing had begun by the time of the review carried out by DMA Canyon in 2019. When should regular flushing have begun? What was the reason for it not having been done prior to in or around 2019?

A Regular flushing should have been implemented as soon as the water system was filled, until such times as the building was handed over and then any low use outlets should have remained on a flushing regime until such times as they were put into full usage. DMA are unable to comment on why this was not done prior to 2019 as we were not consulted on or directly involved in the actions taken by GG&C on receipt of the reports.

Deadlegs

PPP11 paragraphs 6.7-6.14

70. What concerns, if any, did DMA Canyon have regarding the short deadlegs created by installing various flushing points on the water mains? How can this impact the integrity of the water supply? Did the presence of deadlegs create an additional avoidable risk of infection to patients? If so, how so?

A Water within deadlegs can stagnate and will rise/fall to ambient building temperature which may be in the temperature zone where microbial growth is more likely to occur, and could potentially leach into other areas, or be released when deadleg is opened drawing stagnant water into the water systems(s).

71. Likewise, what concerns, if any, did DMA Canyon have regarding the valved off water tanks, one Raw Water Tank and one Trades Water Tank? How did the creation of deadlegs impact the integrity of the water supply? Did the presence of deadlegs create an additional avoidable risk of infection to patients? If so, how so?

A The presence of valved off water tanks can lead to stagnation within the tank itself, and also create deadlegs on the water supply (mains water) and on the outlet pipework to the offline tank. If the tanks are not cleaned and disinfected and simply opened to the system then this stagnant water would be drawn into the water system(s), similarly the stagnant water within inlet/outlet pipework could be drawn into the water system when lines opened. As stated above this water would be sitting at ambient temperatures within the tanks and pipework where microbial growth is more likely to occur.

72. At the time of writing the 2015 report describe the concerns DMA Canyon had with the Raw Water inlet and the similar set up on the trades system which created stagnation. What is the potential impact of stagnation in water tanks? How can this impact on avoidable risk of infection to patients? How could this have been avoided when building the water system?

A See response to Q 71.

73. The Inquiry understands that at the time of the 2015 report the supply into Raw Water Tank 1A had been isolated pending repair by Mercury Engineering, but that the issue

remained, and DMA made recommendations regarding completely isolating the tank until the mains inlet was repaired, the CWST cleaned and disinfected prior to re-use.

a) Are you aware of this recommendation having been followed by Estates/ Mercury?

A DMA were not informed of what action was taken for the reasons provided previously.

b) If so, what work was carried out, by whom and when?

A DMA were not informed of what action was taken for the reasons provided previously.

74. Was the issue resolved by the time the 2018 report was carried out? The Inquiry understands that the 2018 report appears to identify the same deadleg in the trades water tank as in the 2015 report. If not, what remained to be addressed, and what was the impact of this not having been addressed in 2015 when first reported by DMA Canyon?

A The issue with regards to the supply to the Raw Water CWSTs had been resolved, though one side of the Trades Water tank was still offline. This was creating a deadleg on the Govan Road mains water supply, which as described above could have impacted on the supply to the online Trades water tank and potentially to the Raw Water tanks supplied by the Govan Road mains supply. This was also creating a deadleg on the outlet from the online trades water tank which could impact on the system supplied from this tank.

75. When did you become aware that the issue had been addressed by Estates staff? Are you aware what cause the delay, if any, in actioning the recommendations of the 2015 report in respect of deadlegs?

A The first DMA were aware of any works being carried out to the Trades water tanks was recorded during the 2019 risk assessment, where we noted that the mains supply to the offline trades tank had been removed and the tank drained.

76. Please describe your concerns with the irrigation system at QEUH. Action was taken in 2017 to disconnect the system; the Inquiry understands that the residual system may remain in place [PPP 11 at para 23.7]. Please state your views on the adequacy of this response.

A Our concerns in relation to the irrigation system were noted within the 2015 risk assessment which stated the irrigation system was supplied by *“very long runs through*

the building and plantrooms to the outlets. All points on the trades system should be included in the site flushing regime – though additional flushing (outlets run for extended periods) may be required 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).” The response of disconnecting the system, though leaving the system in place, would be adequate.

Temperature risk/ lack of flow in the tank system

Refer to paragraphs 6.15-6.24 of PPP11.

77. Why should the temperature of water stored in water tanks not be more than 2°C higher than incoming mains? What, if any, additional avoidable risks does a rise of greater than 2°C create?

A If there is a temperature difference between the incoming supply and stored water temperatures then this could indicate the tank is not turning over within the required time period. The tanks should be insulated to prevent heat gain and all water within tank replaced every 12 hours maintaining temperatures similar to this of the tank supply water.

a) What caused the greater than 2°C rise in the stored water in QEUH/RHC?

A Potentially the water within the tanks was gaining heat from the ambient plantroom temperatures and not turning over within the 12 hour period as this was during the pre-occupancy phase and water system was not in full use.

b) What action was taken by Estates to address the issue between the 2015 and 2018 report? If no action was taken during this time, was the matter resolved at the time of carrying out the 2019 review?

A DMA have not been advised what action was taken by Estates during this period, though the building was in full use by 2018 which may have corrected the issue as this was not noted during the 2018 assessment.

c) What awareness do you have in respect of the 2019 HFS Water Management Technical Review? Action recommended and taken in response?

A None. DMA requested to carry out the water sampling and continue to sample the tanks on a monthly basis, but not aware of this being in relation to a HFS report.

d) Have any actions taken by Estates staff resolved the issues in respect of water temperature and lack of flow in the tank system? If so, how so?

A Action has been taken to correct the balancing of the water tanks to try and equalise flow through each of the tanks, and a monthly sampling regime has been implemented to monitor water condition within the tanks.

Debris within tanks

78. Both the 2015 and 2018 report identified debris within the tanks.

a) What issues, if any, does debris within tanks cause?

A Depending on what the debris within the tank is it could provide a nutrient source for any bacteria within the water system, and potentially block strainers (or damage components) within the system if the debris moves through the system.

b) What action are you aware of Estates staff having taken regarding debris in the tanks following the 2015 report?

A DMA were not informed of what action was taken for the reasons provided previously.

c) If no, action was taken, why?

A DMA were not informed of what action was taken for the reasons provided previously.

d) The presence of large biofilm was noted on the debris in 2018. What, if any, risk did this pose to the water system and integrity of the water supply? Did this create and increased risk to patients? If so, how so?

A The biofilm noted on the debris could potentially break off from the debris it was noted on and/or leach into other areas and into the water system where it could potentially seed microbial growth in other parts of the system.

e) Was the biofilm in debris still present at the time of 2019 review? If not, what action had been taken to address this issue? If no action was taken, has action now been taken to address this issue?

A No debris, other than "light silt" in the Raw Water tanks which is common in water tanks supplied from mains water, was noted within the water tanks at the time of the 2019 assessment (CWSTs had been cleaned in 2018).

f) In 2018 biofilm was identified on baffles. What was the potential cause of this? What additional risks to the water supply did this create?

A It would appear that the cause of this was splashing/spray from the 4" inlet to the Raw Water CWSTs which sprayed onto the baffle between the 4" inlet and the 15mm Keraflo float valve which due to wetting and drying appeared to have caused a build-up of material (as is often seen around the water line in CWSTs). This material could potentially drip down into the water tank, or water flush it off into the water tank where it could then enter the water supply to the filtration units.

Screens around tanks

79. At the time of the 2015 report did all raw and bulk cold water storage tanks have suitable screens fitted to the warning pipes? What regulations, if any, are applicable, and why?

A There did not appear to be any screens fitted to the warning pipes at the time of the 2015 risk assessment.

80. At the time of the 2018 report had screens been fitted? If not, why not? Was any further action required following the 2019 review?

A Screens did not appear to have been fitted at time of 2018 or 2019 risk assessments. These have now been fitted. DMA do not know why this was not carried out prior to the 2018 or 2019 reports.

Filtration Units

81. Explain what concerns, if any, you had regarding the connection of filtration units (for example refer to PPP11 paragraph 7.7)? What risk, if any, did this present?

A Concern raised by DMA was that during normal operation Filtration Unit 1 supplied Post Filter CWSTs 1A & 1B, with Filtration Unit 2 supplying Post Filter CWSTs 2A & 2B. Should there be an issue with either of the filtration units then there was no simple way for the other Filtration Unit to supply the other tanks (with back filling from e.g. 1A/1B to 2A/2B being the only realistic option) which would have required manual intervention from Estates to maintain water supply to the hospital.

a) What remedial action was taken by Estates staff between 2015 and 2018?

A DMA are not aware of any remedial action on this issue taken during this period.

b) Did the issue remain by the time of the 2019 review? If not, what remedial action had been taken? Did this resolve the issue? Do you have any concerns remaining regarding the connection of filtration units?

A No action had been taken by the time of the 2019 report, though there is now a third filtration unit in place, with the distribution pipework from all the filters reconfigured into a common header which supplies all 4 Post Filter CWSTs. This work was carried out in 2019 and resolved the issue.

82. In the 2015 report issues were reported with the filtration units failing leading the Bulk Water tanks draining down.

a) What was the impact on the water system of the tanks draining down?

A If the water tanks drained down then there would be a loss of supply to the building, until tanks refilled.

b) Why did Estates staff not have access to the BEMS system? Would they have been aware of the issue if they had of had access?

A DMA do not know the reason why this was not provided at this time.

c) Why did DMA Canyon recommend that the bypass be left open? How could doing this resolve the issue?

A If the bypass was left open then all of the post filter tanks would be linked together via the outlet distribution pipework, which would allow the tanks to back-fill each other in the event one of the filtration units failing, and would also allow all 4 of the Post Filter CWSTs to supply both sets of booster pumps, reducing likelihood of an interruption to the water supply to the hospital.

d) What action was taken by Estates staff?

A DMA not aware of what action was taken by Estates staff for the reasons provided previously.

e) Did Estates staff have access to the BEMS system by 2018? If not, why not?

A We believe Estates staff did have access to BEMS when the 2018 report was carried out.

f) In RFI response No 8 from NHSGGC it states that the 2015 report records verbal reports of issues with the filtration units. GGC have no records of faults or if there were faults, how and when they were resolved. Do you agree with this statement? If so, why, if not, why not?

A Unable to locate RFI Response No 8.

As stated within the 2015 Assessment DMA were advised verbally by Estates staff that there had been faults with the Filtration units, and witnessed the effects of this when as reported the levels within Post Filter CWSTs 2A & 2B were extremely low. Unable to comment on GG&C records for faults and repairs on these units.

Pipework

83. At paragraph 8.11 of PPP11 GGC have advised the Inquiry that the deadlegs identified by DMA were removed between 2015 and 2017, while the 2018 report identifies much of the same deadleg pipework as in the 2015 report.

a) Do you now agree with GGC's position? If so, why, if not, why not?

A Where deadlegs were recorded within the 2018 report these would have been included within the report only if physically seen by DMA risk assessors.

b) Do you now agree with the comments in paragraph 8.10? Explain your answer.

A Unable to identify where DMA made recommendations about a deadleg in Medical Day Unit MDU-005 within either of the risk assessments dated 2018 or 2019, though there was a deadleg recorded in this room in the 2015 report, so would agree this deadleg had been removed (or line put into use) by time of 2018 assessment.

With regards to the Emergency Shower in FMB-030 was flushed intermittently only and DMA recommended this should be included in a more formal flushing regime.

Other deadlegs described as "connections required for flushing purposes" would be classed as deadlegs if not in regular use, and should therefore we would advise are either removed if not required for regular flushing or added into the site flushing regime.

c) Describe any understanding you have to the Scottish Water Bylaws Inspect Reports of 28 February 2020?

A DMA understands this was a reports generated by Scottish Water after a site survey to review the water system in relation to the Scottish Water Byelaws. This report

highlighted some areas where there was insufficient backflow protection on various parts of the domestic water system(s) where it connected into other water systems. GG&C Estates have since worked through this report (with some support from DMA) to close off the actions raised within the report.

84. What issues, if any, were created by the use of copper tails? Are you aware of any remedial action having been taken in Estates staff in respect of concerns regarding copper tails?

A DMA are not aware of any issues created by the use of copper tails. This was noted in the risk assessment as a comment only highlighting that some outlets had different connections to the majority of outlets and that there were multiple metals used in the fitting of the water system.

a) Is the use of copper tails compliant with SHTM guidance?

A SHTM 04-01 does not expressly state copper tails should not be used. As stated below there are some tap types for which stainless steel tails (or tails made from other compliant materials) are not available (or were not available at the time of construction). It does state *“very careful consideration will be required if copper pipework and fittings are to be specified for healthcare premises in Scotland”* – this would have been a decision for the design team to consider.

b) What is your view regarding the use of copper tails within QEUH/ RHC?

A Some tap types do not have compatible stainless steel connectors which can be used to connect the taps, and the only option for fitting these types of outlets is to use the tails supplied by the manufacturer. We do not see this as a significant issue.

85. Describe the concerns, if any, regarding the placement of pipework, running above ceilings etc. Do you have any views on the lack of action taken by NHS GGC regarding pipework placement?

A With pipework running above the ceilings in many areas of the building access to the pipework may not be straightforward as this would involve lifting ceiling tiles in live areas to access the pipework. However, the pipework has to be run either above ceilings, below floors or in risers, each of which can present access issues.

DMA advised GG&C should consider fitting monitoring sensors onto the pipework and connecting into the BEMS system, should the original sensors fitted not be sufficient to fully monitor the system(s).

Cold Water Temperature

Refer to paragraph 10.13 of PPP11

86. In response to the findings in the 2015 report regarding the cold water temperature variation, with a majority being more than 5°C higher than those recorded at the water tanks, with peaks at 30°C, and heat gain again being recorded in the 2018 and 2019 reports GGC's response is '*that temperature issues were due to lack of occupation and have subsequently been resolved following full occupancy.*'

a) Do you now agree that the temperature issues were cause by lack of occupation? Please explain your answer.

A As stated previously lack of occupancy and the corresponding lower turnover of water through the system would in all likelihood have been the major factor in the increased cold water temperatures at outlets.

b) To the best of your knowledge were the issues resolved in 2019 at the point of occupancy?

A DMA did not carry out any temperature monitoring after occupancy, with very little involvement for DMA to record temperatures at outlets being during the 2018 and 2019 risk assessments, both of which showed a significant improvement in the cold water distribution temperatures, though both still had some locations recorded as having temperatures higher than 20°C.

c) What likely caused the heat gain? Did the design of the water system contribute to the heat gain in the cold water temperature?

A As stated previously lack of occupancy and the corresponding lower turnover of water through the system would in all likelihood have been the major factor in the increased cold water temperatures at outlets.

d) What impact did the heat gain have on SHTM compliance at 2015, 2018 and 2019?

A SHTM 04-01 recommends that cold water temperatures should be below 20°C at outlets within 2 minutes and having areas where this was not happening would not be compliant with SHTN 04-01.

e) What impact, if any, would set point increase on calorifiers have had on heat gain?

A By increasing the set point of the calorifiers, this would have delivered hotter water to all thermostatic mixing valves, which in turn would have required more cold water to blend the water at the TMVs back to the set point temperature (~41°C) which would have resulted in drawing more cold water through the system, which could have helped reduce cold water temperatures throughout the cold distribution system.

f) What impact, if any, would continuous chlorine dioxide dosing have had on the heat gain issues?

A Dosing the system with ClO₂ would not have any impact on distribution temperatures, though could help mitigate any microbial effects caused by the heat gain.

g) What impact did the cold water dump valves not operating as intended have on cold water temperature? What action, if any, was taken to remedy this issue? Did this issue remain in 2018 and 2019?

A The dump valves not operating could mean that areas where they were fitted which were experiencing heat gain did not have cold water drawn into the lines to reduce the temperatures in the distribution system until outlets in the area were run. DMA are not aware of what action was taken to remedy this.

h) What increased risks, if any, were associated with the heat gain on cold water temperature at 2015, 2018 and 2019? Do these risks still remain?

A In areas where there was heat gain in the cold water system the water would be reaching temperatures in the zone where microbial growth is more likely to occur. Whilst there are occasionally instances where high cold water temperatures are noted, these are not a frequent occurrence, and there are mitigation procedures put in place for out of use areas (flushing regimes) to minimise the occurrences of this.

Flushing

87. In the 2015 report DMA recommended that all sites of the Trades system should be included in the site flushing regime to avoid risk of stagnancy. The same recommendations were made within the 2018 and 2019 reports.

a) Was a flushing regime introduced in response to this recommendation?

A DMA not aware of what actions were taken by Estates with regards to a flushing regime.

b) Do you agree with GGC's position that as the trade system only supplied the fire-fighting equipment flushing was not considered to be required? Did this approach sit consistent with the recommendations of the 2015 report?

A At the time of the 2015 assessment the irrigation system was supplied from the Trades Water system and some bib taps within plantrooms in addition to the 12th Floor Heli-pad fire suppression system.

c) In your opinion, does this create a potential risk to the integrity of the water supply? And in turn create any potential risk to patients?

A Areas fed from the Trades System were not in patient areas (on roof gardens for the irrigation system and in plantrooms where there was no patient access).

The risk to the domestic water system was from the mains water link to the Trades system as described previously in the "Deadlegs" section of this document.

Hot Water System

88. At the time of preparing the 2015 report was the temperature in the hot water system compliant with SHTM 04-01

A There were a number of areas where it was reported that the hot distribution temperatures were not reaching 55°C (as recommended in SHTM 04-01), though were achieving 50°C, with a small number of outlets not achieving 50°C within 60 seconds. There were also some calorifiers where storage temperatures were recorded as being lower than SHTM 04-01 guidelines.

a) What caused the issues with the hot water temperatures at the time of the 2015 report?

A The low hot water distribution temperatures may have caused by the calorifier set points being set very close to 60°C which didn't leave enough of a margin to account for the natural heat loss that was occurring as the water was distributed around the system, or

there may have been localised balancing/commissioning issues (or a combination of both).

89. The following features have been identified by PPP11 as being potentially deficient features in the QEUH/RHC water system.

- a) Deadlegs
- b) Calorifiers, set points
- c) Calorifiers, flushing and disinfectant
- d) Non-operational calorifiers as deadlegs

In respect of each feature, the Inquiry is aware that DMA Canyon identified these features in the 2015, 2018 and 2019 reports. Please consider each feature explain briefly the impact the feature had on the hot water temperature; whether the hot water temperature complied with SHTM04-01 at the time of the 2015, 2018 and 2019 reports, and if not, why not; describe the impact, if any, Estates staff lack of access to BEMS had; describe briefly any work carried out to address the issue by GGC; describe any advice sought from GGC regarding the features; whether any concerns remained regarding the feature at the time of writing the 2018 and 2019 reports.

a) Deadlegs

A Water within low use lines (deadlegs) can stagnate and will rise/fall to building / ambient temperature which may be in the temperature zone where microbial growth is more likely to occur, and could potentially leach into other areas, or be released when low use outlets used.

DMA were not involved in preparing and implementing any action plan to address deadlegs identified during the 2015, 2018 or 2019 reports, and are not aware of who was tasked with this.

b) Calorifiers, set points

A The Calorifier set points appeared to be set very close to 60°C which didn't appear to be leaving enough of a margin to account for the natural heat loss that was occurring as the water was distributed around the system as some areas had lower than expected hot water temperatures at outlets and on the hot return (i.e. <55°C).

By increasing the set point of the calorifiers, this would have delivered hotter water to the hot water distribution system, which would bring the temperatures into range

required at outlets and on the hot return (i.e. >55°C). This in turn would have required more cold water to blend the water at the TMVs back to the set point temperature (~41°C) which would have resulted in drawing more cold water through the system, which could have helped reduce cold water temperatures throughout the cold distribution system.

Low calorifier flow and return temperatures were recorded in the 2015 report with most calorifier temperatures recorded on 21/04/15 below 60°C, though some temperatures issues were still recorded as low on 27/04/15 when DMA revisited to review calorifiers. SHTM 04-01 Part G (issued as draft at time of 2015 report) states *“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.”* whilst at other points within Part G and in Parts A & B the return temperature is advised as being *“no less than 50°C return (lowest limit) to the water heating device”*.

Where hot return temperatures were recorded in the 2015 and 2018 reports as <50°C DMA noted these as being lower than the *“Brookfield specified return temperature though reaches the SHTM 04-01 guidance temperature of 50°C.”* DMA were advised that the system had been designed and installed to ensure all return temperatures to calorifiers achieved 55°C by Estates/Mercury Engineering.

The 2019 reports record all calorifiers flow and return temperatures as <60°C and >55°C respectively.

DMA are not aware of what works were undertaken to increase the calorifier set points, or by whom, at any time between the reports in 2015, 2018 & 2019.

DMA do not know the impact created by Estates not having access to the BEMS system at this time.

c) Calorifiers, flushing and disinfectant

A DMA were aware of actions being taken to place Calorifiers back online during the 2015 assessment though unable to comment on who carried out these works or the dates they were completed, and what, if any, flushing and disinfection procedures were carried out prior to the calorifier(s) being put back online.

Offline calorifiers were only recorded during the 2015 report, with all calorifiers online during the 2018 & 2019 reports.

d) Non-operational calorifiers as deadlegs

A The presence of valved off calorifiers can lead to stagnation within the calorifier itself, and also create deadlegs on the water supply (cold feed) and on the hot flow and hot return line pipework to the offline calorifier. If the calorifiers are not flushed/cleaned and disinfected/pasteurised and simply opened to the system then this stagnant water would be drawn into the water system(s), similarly the stagnant water within inlet/outlet/return pipework could be drawn into the water system when lines opened. This water could be sitting at ambient temperatures within the calorifiers and pipework where microbial growth is more likely to occur.

Offline calorifiers were only recorded during the 2015 report, with all calorifiers online during the 2018 & 2019 reports.

Energy Centre and hot water temperature

90. At the time of carrying out the 2018 and 2019 reports DMA Canyon described the hot water temperatures as '*generally satisfactory*' explain what was meant by this statement. Did the hot water temperature in 2018 and 2019 comply with the requirements of SHMT 04-01? Explain your answer.

A What was meant by this statement was that in the majority of instances where hot water temperatures were recorded the temperatures were compliant with the SHTM 04-01 guidelines, and there were only a few instances of the hot temperature not being in the correct range (with these being noted within the reports).

91. What issues, if any, were known to DMA Canyon regarding the Energy Centre and hot water temperature, at the time of the 2015, 2018 and 2019 reports? How were the issue(s) managed by GGC? What action was taken and did this resolve the issue(s)?

A Any issues with the Energy Centre were as noted within each of the risk assessments, though DMA were not aware of any specific issues, and these were relayed to DMA verbally as issues at the Energy Centre, with no specifics of the cause of the issues being provided. We are not aware of what action was taken to address the issues,

through as noted within the 2019 report when issues were reported to Estates action was taken by Estates to rectify the issue.

- a) The Inquiry understands that the HFS Water Management review of March 2019 found that *“The hot water is designed for 60°C flow and 55°C return. It has been advised by GGC that these temperatures are not what is being found in practice due to issues with the Energy Centre.”* Page 56 PPP11.

Do you agree? Explain your answer

- A** DMA can only comment on temperatures recorded by us during the assessments and these were as described in each of the assessments, with our knowledge of any issues around the Energy Centre being as per our response to Q91 above.

92. Explain your concerns, if any, in respect of heating system failures, how these were connected, if at all, to the Energy Centre, record keeping regarding these issues including compliance measures and commissioning undertaken.

- A** Heating system failures impacted on calorifier storage temperatures and in turn on the hot water distribution temperatures. How these were connected to the Energy Centre and any record keeping, commissioning etc. we are not sure of as this was not within DMA's remit and instruction.

Expansion Vessels

93. Who designed the expansion vessels in place at the time of the 2015 report? What understanding do you have of the reasons for not using flow through expansion vessels as recommended in SHTM04-01 not used in the initial design?

- A** Unsure of the manufacturer of the expansion vessels originally installed, and DMA had no part in the design of the system or the decision on what type of expansion vessels were installed.

94. What impact, if any, did the use of these expansion vessels have on creating an increased risk of avoidable infection risk to patients?

- A** If there is no water flow through the vessels then this can allow water to potentially stagnate within the vessel at a temperature which may be in the temperature zone where microbial growth is more likely to occur, and could potentially leach into cold feed, or be released into the water system if/when pressure and/or flow rates change.

Commissioning and record keeping

95. The 2015 report identified that steam humidifiers did not appear to have been commissioned at the time of the report.

a) How satisfied were you at the time of carrying out the 2015 report that commissioning of the water system had been carried out? What evidence of this was provided to you? Was there any comprehensive storage system? Who was responsible for commissioning prior to handover?

A The steam humidifiers may not have formed part of the commissioning of the water system as these would supply humidification into the air conditioning/ventilation system, though there were supplies to the humidifiers from the domestic water system. It was this connection which DMA made recommendations around.

With regards to the commissioning of the water system(s) DMA understands this was carried out by H&V Commissioning, with DMA being provided with some records via the Zutec portal (an online portal which DMA were provided access to certain records on). DMA made comments on the hot and cold water temperatures within the QEUH/RHC stating these were in line with records we had been provided access to, along with our recommendations in line with what we witnessed.

b) How satisfied were you that ongoing commissioning of the water system was being carried out following the 2015 report?

A DMA had no input into the water system commissioning and were not working on site after we had completed the 2015 report – we are unable to comment on what works were undertaken after the assessment was completed.

c) Did you have any further concerns regarding ongoing commissioning of the water system at the time of the 2017 report?

A DMA made comment on there being no records available for commissioning around TMVs and that some local hot flow and return loops should be commissioned (meaning the pipework be (re)balanced to ensure hot water in flow and return lines in these areas was running at correct temperatures). DMA were not aware of any ongoing commissioning at this stage, and other than noted above did not highlight any concerns around the system commissioning.

d) Likewise, did any concerns remain regarding ongoing commissioning at the time of the 2019 report?

A The 2018 report DMA made comment that a small number of local hot flow and return loops should be commissioned (meaning the pipework be (re)balanced to ensure hot water in flow and return lines in these areas was running at correct temperatures). DMA were not aware of any ongoing commissioning at this stage, and other than noted above did not highlight any concerns around the system commissioning.

e) What impact, if any, did lack of commissioning have on the integrity of the water system and the water supply? Were there issues which could have been avoided if adequate commissioning was carried out prior to handover in 2015?

A DMA did not highlight any lack of commissioning on the water system within the 2015 assessment, though DMA made comments on the hot and cold water temperatures within the QEUH/RHC stating these were in line with records we had been provided access to, along with our recommendations in line with what we witnessed.

f) Likewise, were there any issues at the time of 2018 and the 2019 which could have been avoided had adequate commissioning been carried out?

A See responses above.

Planned Preventative Maintenance (PPM)

96. Refer to page 13 of the 2018 report in reference to the GAP analysis DMA Canyon advised '*as part of this assessment and recorded several gaps in the PPM program (verbally advised by NHS Estates).*'

a) Who in Estates advised that there were gaps in the PPM program?

A As stated within the 2018 Gap Analysis (page 1 of Gap Analysis, Page 182 of the full report) information was provided by NHS Estates Representatives: David Bratley, Paul McAllister and Tommy Romeo with additional information from Ian Powrie.

b) What were the gaps identified?

A The gaps identified were as recorded in pages 1-12 of the Gap Analysis.

c) What is the benefit of a PPM program?

A A PPM regime allows for all the tasks required in order to manage and run the water systems(s) safely, and within the design parameters, are allocated and scheduled in order to check and identify any issues in the operation of the system in a proactive manner.

d) What impact, if any, did not having a full PPM program have on the operation and maintenance of the water system at QEUH/RHC?

A Having gaps in the PPM regime could result in issues in the water system not being identified to allow corrective/remedial actions to be taken in a timely manner and potentially maintenance and monitoring tasks not being carried out on frequencies recommended within guidance and/or manufacturers instructions.

e) When should a PPM program have been implanted? i.e prior to handover, following handover?

A A PPM regime should be implemented from the time water is first introduced into the water system(s). The requirements of a PPM regime would change as the building moves from the construction phase into the handover phase and then into full operation.

f) The Inquiry understands from the 2015 report (page 236) that Mercury Engineer provided a PPM schedule. Are you aware of Estates staff having completed/ followed the schedule?

A DMA had very limited involvement within the QEUH/RHC during the period between the 2015 and 2018 reports and are unable to comment on what PPM regime was implemented.

g) What reasons were given by Estates staff for their not being a complete PPM program in 2018?

A No explanation was provided.

h) Were you surprised to find that there were gaps in the PPM program in 2018?

A It was surprising to see that some tasks had not been implemented by 2018, or had only been implemented in some “high risk” areas and not rolled out into all areas, and that parts of the management regime required around the water system had not been implemented. However, the purpose of the gap analysis was to assist Estates in

identifying any gaps within their PPM regime, and it is very rare to carry out a review of the regime and not identify some gaps in the regime on any site.

- i) Was adequate action taken to remedy this by Estates staff following the 2018 report?
- A** There were still some gaps identified in the PPM regime during the 2019 report. Currently there now appears to be a comprehensive PPM regime in place, with DMA understanding that Annual AE audits highlight very few gaps in the PPM regime.
97. Did Estates staff not having access to BEMS impact on PPM? If so, how so?
- A** As noted within the 2015 assessment some alarms/faults may have been missed because Estates staff did not have access to the BEMS system at this point. Other than this we do not know how this impacted on the PPM regime as DMA had very limited involvement after the 2015 report.

Mercury Engineering

98. Describe the role of Mercury Engineering in respect of carrying out the 2015 report? Why did they assist on site when the 2015 report investigations were being carried out?
- A** Mercury Engineering provided DMA within initial site tours of the building and the water system layout. Other than this DMA had very little involvement with Mercury Engineering, with DMA being contracted to carry out the works and report to GG&C Estates.
99. Describe your understanding of the role of Mercury Engineering prior to handover of QEUH/RHC from Multiplex? Who were they instructed by, and what was their role and responsibilities? Were they instructed in respect of the design of the water system?
- A** DMA were advised that Mercury were the water system installers. We have no knowledge of their exact remit.
100. What role did Mercury Engineering retain following handover? Who instructed them and why?
- A** DMA are not aware of what Mercury's role (if any) was post handover.
101. In respect of the domestic hot and cold water outlets page 17 of the 2015 report:

'There are connection points onto other "non-domestic" outlets (see Section 8 for details) which are connected to the Bulk Water system. It is advised that Estates (or Brookfield/Mercury) confirm these systems have suitable backflow protection installed or if necessary suitable backflow protection fitted.'

At the time did you agree with this advice? Do you still agree with this advice? If you did not agree with this advice, did you raise the matter with Mercury Engineering? If not, why not? Explain your answer.

A This statement was made by DMA – so yes we agree with the statement and would still agree with this advice being provided. This matter was not raised with Mercury Engineering by DMA as that was not within our remit and instruction – DMA were contracted and reported to GG&C Estates.

102. What explanation were you given by either Estates staff or Mercury Engineering for the delay in respect of Raw Water Tank 1A, which was isolated pending repair creating a deadleg? What impact, if any, did this delay have on the water supply? Page 22 of 2015 report.

A No explanation was provided, other than a repair was required on the mains inlet. See response to Q71 for potential impact this may have had.

103. Refer to page 26 of the 2015 report. Were Mercury Engineer advised to turn on Calorifier 32-03 during the walk-round in January 2015? Were you surprised that it remained offline in April 2015? Describe the impact, if any, this had.

A This was pointed out during the walk round with Mercury Engineering. We cannot recall the reason provided for this being offline at the time of the walk round (if one was provided). Yes we were surprised that the calorifier was still offline. The impact this would have had would have been very similar to the impact of the offline CWSTs as described in response to Q71.

104. Refer to page 111 of the 2015 report. Mercury Engineering advised *'that the domestic hot water systems do not operate on a conventional flow and return system, with principle, sub-ordinate and tertiary loops, instead utilising a reverse return circuit.'* The report goes on to advise *'This means that there are longer "deadlegs" to the outlets than SHTM 04-01 advises.'* Is this as you would expect to see in a healthcare setting?

Was this compliant with SHTM? How, if at all, did this impact the hot water system?
What was Mercury Engineering's role in respect of the hot water system?

A SHTM 04-01 Part G (which was issued in draft format at the time of the 2015 assessment) states "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);" with SHTM 04-01 Part A Note 20 stating "the circulation taken close to the draw-off point" and drawings 2(i) to 2(iv) all showing the hot flow and return being taken down to the outlets. SHTM 04-01 Part A guidance was issued in 2014 and it may have been the case that the design for the water system was complete and agreed by parties involved completed and installation underway and changes to the design and installation were not practical at this point. DMA carried out the risk assessment based on the guidance provided within SHTM 04-01 as this was the up to date standard at the time of the assessment.

As stated above DMA were advised that Mercury were the water system installers. We have no knowledge of their exact remit.

105. At page 111 of the 2015 report: *'DMA were advised by Mercury Engineering and Estates that all materials fitted during the construction are WRAs approved and therefore do not support bacterial growth. In particular Horne TMV taps were designed specifically with Legionella and Pseudomonas control in mind. The use of EPDM flexible hoses in some areas may contradict this statement and their use should be reviewed to ensure compliance.'*

a) What WRA approved mean? Why should materials be WRA approved?

A WRAS – Water Regulations Approval Scheme. The WRAS website states:
"Gaining approval from WRAS, the Water Regulations Approval Scheme, is an easy way to demonstrate compliance with water fittings regulations¹. We certify plumbing products and materials in the UK following rigorous tests in accredited laboratories – and consumers trust us."

<https://www.wrasapprovals.co.uk/about/>

b) Who from Estates advised DMA Canyon of this?

A Unable to recall specifically who advised DMA of this.

c) What was Mercury Engineering's role?

A As stated above DMA were advised that Mercury were the water system installers. We have no knowledge of their exact remit.

d) What does it mean that the *“the use of EPDM flexible hose in some areas may contradict this statement”*? Is EPDM flexible hose WRA approved?

A In 2009 NHS Scotland issued a Safety Action Notice in regard to the use of flexible hoses (SAN(SC)09/03) and SHTM 04-01 advises against the use of EPDM flexible hoses

SAN(SC)09/03 stated *“ HFS has received reports that high levels of Pseudomonas and Legionella bacteria have been found in water samples taken from water outlets fed by flexible hoses, confirmed by testing of the hoses which revealed colonisation of the lining. The lining material in these reports was EPDM. However, it is possible that other lining materials (and washers within the couplings) could be similarly affected.”*

e) Why was EPDM flexible hose used? How would have installed this?

A DMA were not involved in the decision making process for this and can't comment. It is presumed the flexible hoses were connected by Mercury Engineering.

f) The 2018 report at page 11 refers to the use of EPDM flexible hose, had any of the recommendations to remove the flexible hose from the 2015 report been actioned in 2018? If not, what explanation was provided by Estates staff or Mercury Engineering?

A DMA were not aware of any flexible hoses being removed by the time of the 2018 report. No explanation was provided.

g) What impact, if any, did this use of EPDM flexible hose have on the water system and guidance compliance?

A It is very difficult to state what impact, if any, the use of the EPDM flexible hoses actually had on the water system.

With regards to guidance compliance please refer to the response to Q 105 d) above.

h) The 2019 report further advises the removal of flexible hose. Had any action in respect of the 2018 report recommendations relating to flexible hose been actioned at the time of the 2019 report? What did you think of the action/ lack of action taken?

- A** DMA were not aware of any flexible hoses being removed by the time of the 2019 report. No explanation was provided, though DMA were aware that being able to source suitable connections to replace the EDPM flexible hoses was not always straightforward, and some tap types did not have stainless steel, copper or other approved material alternatives available.

Conclusion

106. Provide brief details of any instruction to carry out further work or investigation by GGC Estates staff following the 2019 report.
- A** DMA commenced carrying out work within the QEUH/RHC building in 2018, with tasks allocated to DMA based on Estates requirements at the time. DMA were not directly instructed to work on any issues or recommendations made within the risk assessment. Since initially starting work in the building in 2018 additional tasks have been allocated to DMA to carry out to aid compliance with guidelines.
107. Describe what concerns, if any, you had regarding communications within GGC Estates staff?
- A** As stated within the 2015 report *“DMA have been informed by Estates personnel there have been breakdowns in communication between Estates, Projects and Building Contractor(s) where defects highlighted by NHS Estates to other parties are being acted upon without Estates being informed to allow proper consideration of bacterial control to be made, or to review/sign off that actions have been carried out in a compliant manner minimising any potential bacterial control impacts.”*
108. Do you consider the state of the water system at the time of either the 2015 or 2018 reports could be said to present or presented an additional risk of avoidable infection to patients? Explain your answer.
- A** DMA recorded parts of the water systems and the Management of the water systems as being “High Risk” in both the 2015 and 2018 risk assessments, and therefore could present an elevated risk to users of the water system.
109. Confirm the basis of opinions reached in your answers, having regard to any experience or expertise that you may hold in respect of the subject matter of the question.

A See attached CV for details of qualifications and experience etc. The opinions provided in response to the answers are based on my experience of working within the Legionella Control/Water Hygiene industry for over 25 years and from personally being involved in carrying out risk assessments and other works within the QEUH, and the records and , where appropriate, my recollection of the events being referred to within the questions.

Declaration

I believe that the facts stated in this witness statement are true. I understand that proceedings for contempt of court may be brought against anyone who makes, or causes to be made, a false statement in a document verified by a statement of truth without an honest belief in its truth.

The witness was provided the following Scottish Hospital Inquiry documents for reference when they completed their questionnaire statement.

Appendix A

A33870454- DMA Canyon Report 2019- Water Systems Risk Assessment

A43293438- Scottish Hospitals Inquiry- Hearing Commencing 12 June 2023- Bundle 6
Miscellaneous documents (external version)

A47540489- Provisional Position Paper 11- Potentially Deficient Features of the water system

The witness provided the following documents to the Scottish Hospital Inquiry for reference when they completed their questionnaire statement.

Appendix B

A49139880- 141208 – FW_NSGH Water system details_Transmission No 1

A49139900- 141210 – RE_ GG+ C Policy document_written scheme

A49139907- 141216- Legionella Risk Assessment and Written Scheme

A49139946- 141230- NSGH Legionella Risk Assessment and Written Scheme

A49139888- 150106- DMA – Zutec Online O and M Access_

A49139913- 150106- NSGH Water System Drawings

A49139870- 150106- RE_NSGH Water System Drawings

A49139876- 150109- RE_NSGH Water System Drawings
A49140126- 150109- RE_NSGH Water System Drawings
A49140723- 150112- Questions to Ian Powrie
A49141059- 150116- RE_sample draw off record
A49141207- 150116- Written Scheme Guidance
A49141171- 150307- SGUH L8 RA
A49141222- 150409- Risk Assessment Queries
A49141249- 150422- Calorifiers Temps
A49140747- 150422- MRI Chillers Query
A49141304- 150506- RE_Risk Assessment
A49141233- 150610- NHS SGUH
A49139820- Q1- David Watson CV 2023
A49139804- Q10 & Q25- Q33553 GG&C New SGH Building L8 RA
A49139781- Q25- PO SGH L8 RA 2015
A49139773- Q28- DMA Delivery Note Register
A49139806- Q30a- 150610- NHS SGUH
A49139828- Q32- 170904 QEUH L8 RA Update PO
A49139846- Q32- Q171049DW GG&C QEUH L8 RA Update
A49139852- Q8- DMA Organogram 2024

– [Water Regulations Approval Scheme Ltd - About Us \(wrasapprovals.co.uk\)](http://wrasapprovals.co.uk)

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