SCOTTISH HOSPITALS INQUIRY

Provisional Position Paper 7

Non-ventilation issues with the potential to adversely impact on patient safety and care at the Royal Hospital for Children and Young People and the Department of Clinical Neuroscience; and remedial works to resolve them

A44257882

Purpose of the Paper

This Provisional Position Paper sets out the Inquiry's understanding of issues with key building systems, aside from the ventilation system, that could have the potential to adversely impact on patient safety and care and which arose in the construction of the Royal Hospital for Children and Young Persons and the Department of Clinical Neurosciences (RHCYP/ DCN). The paper also outlines the Inquiry team's understanding of actions that have been taken to remedy these issues.

It follows on from an earlier version of this paper that was published on the Inquiry's website and distributed to relevant core participants. Comments were provided by NHS Lothian, NHS NSS, IHS Lothian Limited, Multiplex Construction Europe Limited and TUV SUD Limited.

The Inquiry has carefully considered the comments received, together with the supporting material submitted and other material held by it. It has reviewed and revised the Provisional Position Paper accordingly to produce this updated version.

As a result, the views expressed in this version of the paper are firmer than those set out in the previous one. It follows that the Chair will be invited by the Inquiry Team to make findings in fact based on the content of this paper. However, while the views may be firmer, that should not be equated with "final". The Inquiry's investigations are not yet concluded and, at the time of publication, there is to be a hearing dealing with matters arising in relation to the Royal Hospital for Children and Young Persons/ Department of Clinical Neurosciences commencing on 26 February 2024. Evidence at that hearing and submissions made following it (as well as any other evidence received) may require the Inquiry to reconsider matters set out in this paper. Nonetheless, in the absence of such evidence or submissions, it is likely that the contents of this paper will be used as a basis for the Inquiry's report.

Readers of this paper should note that section 2 of the Inquiries Act 2005 provides that an inquiry is not to rule on, and has no power to determine, any person's civil or criminal liability. Accordingly, in the context of the Scottish Hospitals Inquiry's investigations into the matters falling within its remit in relation to the Royal Hospital

for Children and Young Persons, the issue of any liability arising under the Project Agreement is not a question for the Inquiry to rule on or determine and nothing in this Paper should be taken as doing so.

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Glossary

ac/hr	air changes per hour (air change rate for ventilation)
ACOP L8	Approved Code of Practice dealing with the risk of Legionnaires disease issued by the Health and Safety Executive, enforceable under the Health and Safety at Work Act 1974
AE	Authorising Engineer
AHU	Air Handling Unit
ARHAI	Antimicrobial Resistance and Healthcare Associated Infection Service, Scotland
BAU	Business as Usual
BYES	Bouygues Energies & Services FM UK Limited, the facilities management contractor appointed by IHSL
CAMHS	Child and Adult Mental Health Service
COSHH	Control of Substances Hazardous to Health Regulations 2002
DCN	Department of Clinical Neurosciences
DSSR	Engineering Consultants
ED	Emergency Department
ESG	Executive Steering Group
FM	Facilities Management
H&S	Health and Safety
HAI or HCAI	Healthcare Associated Infection
HAI-Scribe	Healthcare Associate Infection Systems for Controlling Risk in the Built Environment
HCID	High Consequence Infectious Diseases
HEPA filter	High Efficiency Particulate Air filter
HFS	Health Facilities Scotland (part of NHS National Services Scotland)
HIIAT	Hospital Infection Incident Assessment Tool
HPS	Health Protection Scotland (part of NHS National Services Scotland)
HV/LV	High voltage/low voltage
HVC	High Value Change

IHSL	Integrated Health Solutions, Lothian, the Project Company or private partner to NHSL with whom NHSL contracted to deliver the new hospital.
IMT	Incident Management Team
IOM	Institute for Occupational Medicine, third party validators for ventilation
IPCT	Infection Prevention and Control
IPCT	Infection Prevention and Control Team
LVC	Low Value Change
OB	Oversight Board
NHSL	National Health Service Lothian
NHS NSS	National Health Service National Services Scotland
MM	Mott MacDonald Limited, NHSL's technical advisors
MPX	Brookfield Multiplex Construction Europe Limited, the construction contractor appointed by IHSL
MVC	Medium Value Change
NIPCM	National Infection Prevention and Control Manual
Project Agreement	the agreement between NHSL and IHSL dated 12 and 13 February 2015 for the design, build, finance and maintenance of the new RHCYP building at Little France.
RAG	**R**ed **A**mber **G**reen risk rating
RHCYP	Royal Hospital for Children and Young People (name given to the new children's hospital)
SA1	Settlement and Supplementary Agreement No.1
SA2	Project Agreement Supplementary Agreement No. 2
SBAR	Situation, Background, Analysis and Recommendation
SG	Scottish Government
SHTM	Scottish Health Technical Memorandum
SHPN	Scottish Health Planning Note
TUV SUD	TUV SUD Limited (trading as Wallace Whittle) – the building services engineer appointed as a sub-contractor by MPX
WSG	Water Solutions Group

WSP	Water Safety Plan
QEUH	Queen Elizabeth University Hospital

1. Introduction

1.1 Terms of reference

1.1.1 Included in the terms of reference of the Inquiry is:

> 1. To examine the issues in relation to adequacy of ventilation, water contamination and other matters adversely impacting on patient safety and care which arose in the construction…of the RHCYP/DCN; and to identify whether and to what extent these issues were contributed to by key building systems which were defective in the sense of:
>
> A. Not achieving the outcomes or being capable of the function or purpose for which they were intended;
> B. Not conforming to relevant statutory regulation and other applicable recommendations, guidance, and good practice.
>
> And,
>
> 7. To examine what actions have been taken to remedy defects and the extent to which they have been adequate and effective.

1.1.2 In July 2019, after concerns were raised about the ventilation system in Critical Care areas of the Royal Hospital for Children and Young People (RHCYP), a decision was made to delay opening the hospital until it was confirmed safe for patients. Thus, there was effectively an opportunity to remedy any potential 'defects' or issues in building systems before they could have an adverse impact on patient safety and care.

1.1.3 The focus of this paper is to consider whether issues identified with building systems prior to opening were resolved before the hospital opened. Any references to 'defects' and 'non-compliances' in this paper are taken from contemporaneous sources and are not intended by the Inquiry to be references to whether or not the contractual requirements under the Project Agreement were met. Rather, the paper is concerned with systems that are or may have been "defective" in the sense that

the term is used in Term of Reference 1 (with Term of Reference 7's reference to "defects" being interpreted accordingly).

1.1.4 An adverse impact on patient safety and care as referred to in Term of Reference 1 is understood fairly broadly in this paper to include

- an increase in the risk of healthcare associated infection (HAI)
- an increased risk of interruption of clinical services
- an increased risk of patient injury

1.2 Identification of issues

1.2.1 In the lead up to the date originally fixed for the opening of the hospital, and in the months following the decision to delay opening the hospital, NHS Lothian (NHSL), the Scottish Government (SG) and National Services Scotland (NHS NSS) commissioned various reports which, taken together, assessed the safety of building systems, and whether they were fit for purpose.

1.2.2 Some of these reports were undertaken as part of the normal course of preparing for hospital opening. Other reports were commissioned either by NHSL or by the Scottish Government in response to the escalation of concerns regarding the safety of building systems not just at the RHCYP but at the Queen Elizabeth University Hospital (QEUH) in Glasgow where there were incidents of infection. A brief summary of these reports can be found in Appendix A.

1.2.3 The reports identified a number of potential issues, some of which had the potential to impact on patient safety and care. Excluding concerns regarding the ventilation system, they included:

- Water contamination (limited to specific components of the water system) which increased the risk of HAI
- Non-compliant shower hose lengths and use of retaining rings, and concerns about water management, including water temperature control, which increased the risk of contamination of the system and HAI.
- Concerns about management structure, appropriate personnel and assurance processes which increased overall risk to patient safety and care.

- Electrical installation that created ligature risks for patients in the child and adult mental health service (CAMHS)
- Other Health and Safety concerns such as fire safety

1.2.4 The issues varied in significance. NHS NSS categorised the issues they raised in their review in terms of their priority:

1. Significant – Concerns requiring immediate attention, no adherence with guidance (none identified)
2. Major - Absence of key controls, major deviations from guidance (shower hose lengths, electrical installation)
3. Moderate – Not all control procedures working effectively, elements of noncompliance with guidance (water document management system, water management and contamination; electrical management and assurance, fire doors)
4. Minor – Minor control procedures lacking or improvement identified based on emerging practice (management structure and reporting processes, plumbing systems)
5. Observation and improvement activity (fire safety)

1.2.5 The NHS NSS review, which drew on the findings of other reports and investigations and followed months of working with NHSL and third parties, found no significant priority issues. Four major issues were found, three of these had the potential to impact on patient safety and care and are discussed further in the body of this paper. All issues, whether major or simply an area for improvement or 'enhancement', were recorded in action logs which were used to track progress and note evidence of completion.

1.2.6 Some other issues or concerns emerged at a later date, during the course of preparing to open the hospital. These include faulty window restrictors and concerns about cladding which introduced general Health and Safety risks, and issues with drainage which could introduce contamination and increased risk of HAI.

1.2.7 Some Core Participants do not agree that all of the issues identified by NHS NSS and others in the course of 2019 were in fact issues. In some specific cases,

the particular aspects of building systems that NHS NSS raised concerns about may have reflected a solution previously agreed upon between NHSL, IHSL and contractors.

1.3 Action to remedy issues with building systems

1.3.1 The remainder of this paper provides an overview of the actions taken to remedy issues, and the governance, management and assurance processes put in place.

2. Governance, management and assurance from July 2019 to April 2021

2.1 Overview

2.1.1 This section considers the governance, management and assurance processes put in place after the Cabinet Secretary decided to delay opening the hospital following the discovery of potential issues with the ventilation system.

2.1.2 On 8 July 2019 NHSL convened an Incident Management Team (IMT), to be chaired by Susan Goldsmith, Director of Finance NHSL. This was renamed the Executive Steering Group (ESG) on 26 August 2019, with Alex McMahon (Executive Nurse Director) as chair. The ESG's remit was to "provide a forum for NHS Lothian executive management to consider all business relating to responding to and addressing the delay to the Royal Hospital for Children & Young People and Department of Clinical Neurosciences."

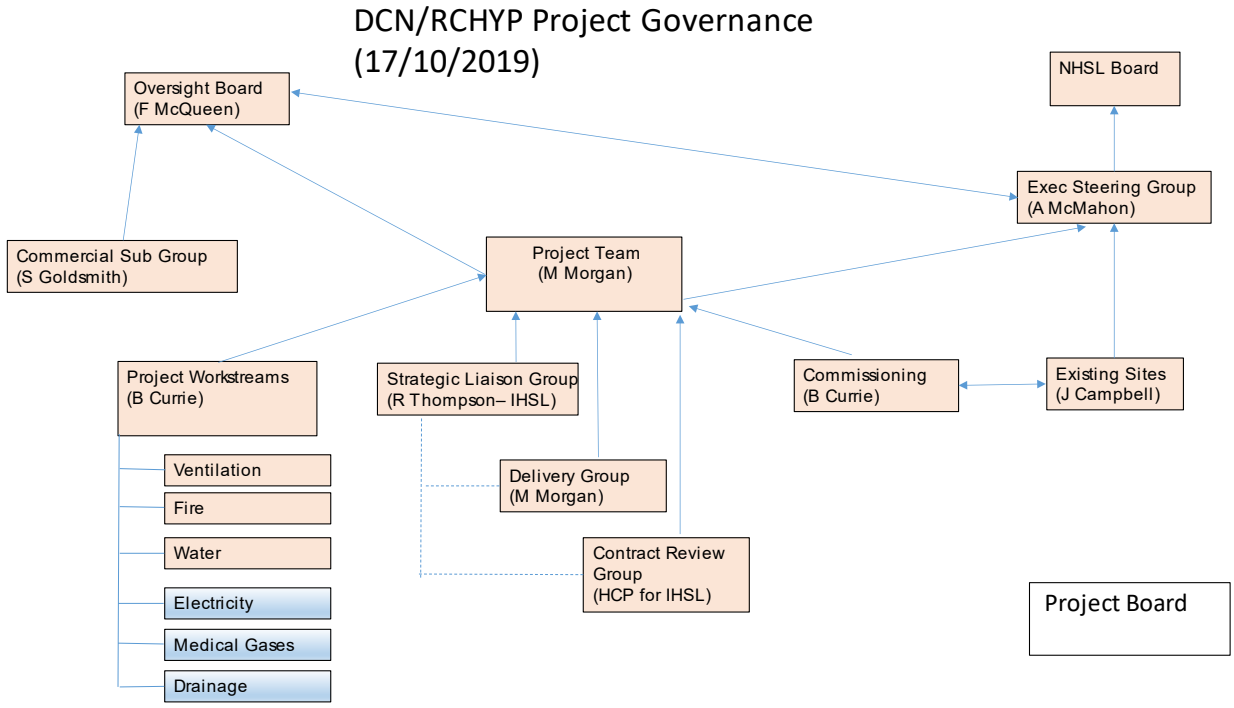
2.1.3 An Oversight Board (OB) was set up in August 2019 to support NHS Lothian in delivering the new hospital. The OB co-ordinated advice and provided assurance to Scottish Ministers on the work and the readiness of the new facilities to open, providing an additional layer of assurance. On 13 September 2019 Mary Morgan, Director of Strategy, Performance and Service Transformation NHS NSS, was appointed Senior Programme Director to lead this work, reporting to Scottish Government. Membership of the OB included representatives from Scottish Government, NHS Lothian, Scottish Futures Trust, and NHS NSS/HFS, with IHSL in attendance "on an 'as required' basis".

2.1.4 IHSL did not attend any meetings of the OB. From February 2019 through to August 2019 IHSL reported to NHSL through the Joint Steering Group. The Joint

Steering Group was established in accordance with the Settlement and Supplementary Agreement No.1 (SA1) to provide a mechanism at senior level to monitor the progress of the Post Completion Works, to escalate any operational issues and then latterly to escalate any further issues for commissioning of the RCHP/DCN until completion of the Post-Completion Works. From late 2019, the Joint Steering Group continued as the Liaison Group. This was also described as the 'Strategic Liaison Group'.

2.1.5 Brian Currie, the Project Director (NHSL), led a number of workstreams set up to resolve the issues identified with ventilation, water, electrical installation, fire safety and management and assurance. The issues were recorded in separate action logs created by Mott MacDonald. Ronnie Henderson (Commissioning Manager for Hard FM) managed these. IHSL/MPX contributed their responses and NSS HFS had sight of them in their support/assurance role.

Extract from "Project Governance and meetings October 2019" slidepack



2.1.6 With respect to the above governance arrangements and workstreams, NHSL has provided the Inquiry with:

- The papers and minutes of the IMT /ESG from its inception in 2019 to the final meeting on 8 March 2021. In addition to minutes of meetings this includes:
    - a regular Senior Programme Director's Report with updated action logs, dashboard and programme risks
    - regular updates on NHS Lothian's response to the NHS NSS review, showing progress to close out actions recommended by NHS NSS
    - papers by the Infection Prevention and Control team, including risk assessments of proposals to resolve issues
    - reports from consultants providing assessments, advice, technical assurance and third party validation
    - Change Notices for works to be undertaken
    - designs and proposals, and documents relating to design assurance
    - other evidence used to close out issues, obtained from MPX, BYES and others.

- The papers and minutes of the OB from its inception in 2019 to its closure in April 2019, similar to the above but with less consideration of operational issues.
- Separate action logs showing the progress of ventilation, water safety, fire safety, electrical and other workstreams. Minutes of workstream meetings.
- Correspondence of Ronnie Henderson (Commissioning Manager - Hard FM, NHSL) Brian Currie (Project Director, NHSL), Iain Graham (Director of Capital Planning and Projects) and others with members of the Infection Prevention and Control Team, NHSL's technical advisors Mott MacDonald, NHS NSS, MPX, BYES and others showing discussion and debate on key issues, agreements and disagreements on actions to take, confirmation of actions taken and evidence of issue closure.

2.1.7 Thus, NHSL has provided the Inquiry with a body of evidence showing how decisions were reached, actions taken, concerns raised and evidence provided to close out issues identified in the summer of 2019.

2.1.8 NHS NSS has also provided the Inquiry with documents, including correspondence, meeting minutes and consultation with experts, that show a high level of engagement in ensuring hospital building systems at the RHCYP and DCN were compliant and fit for purpose.

2.1.9 A priority for NHSL and the Scottish Government, who were also responding to incidents at Queen Elizabeth University Hospital (QEUH), Glasgow, was to put in place a robust technical assurance structure to ensure that building systems were designed and built to be compliant with guidance. This work, outlined in papers presented to the ESG, included:

- Design and construction sign-off: Assurance proposals for RHCYP + DCN remedial & enhancement works. Includes 'experiences to be amended' reflecting on experiences with MPX and IHSL
- Learning from colleagues at Glasgow and discussion of issues at ESG.
- Scottish Centre for Reducing Infection and Risks in the Healthcare Built Environment Services Validation.
- RHCYP/DCN Assurance processes.
- Capital Projects Assurance and Resources.

2.1.10 A key outcome of the attempt to improve assurance processes was the establishment of NHS NSS Assure after NSS received a commission from Scottish Government to support the creation of a Scottish Centre for reducing Infection and Risk in the Healthcare Built Environment as outlined in the 2019 / 2020 Programme for Government.

2.2 Duty Holder Matrix

2.2.1 At the management level, a Duty Holder Matrix (or responsibility matrix) was developed in direct response to the NSS reviews which had noted "omissions identified in key roles within the management structure". The duty holder matrix, which "used the format adopted by Health Facilities Scotland for national use as a template" was a series of tables giving the details of appointments to key roles in the management of different building services, as outlined in the associated SHTMs. For example it included key personnel (or roles) identified for decontamination as per SHTM 01-01, medical gas (SHTM 02-01), ventilation (SHTM 03-01), water systems

(04-01) electrical (SHTM 06-01) and so on, including a named person against each role, and the name of the person who appointed them, the date of appointment, and other details. This became a live document to be amended as appropriate.

3. Water

3.1 Overview

3.1.1 An L8 Legionella Risk Assessment conducted by Clira in February 2019 on behalf of BYES, and a Compliance Audit, conducted by Callidus in May 2019 found problems with water management, and a high Legionella risk.

3.1.2 NHSL later commissioned Westfield Caledonian to do Legionella testing and TVC testing and to "quantify the risk of infection from *Pseudomonas aeruginosa* in augmented care areas and to assess the bacteriological load within the domestic systems generally". This was to confirm the safety of the water supply and was in response to

a) Publication of interim guidance by HPS for *P. aeruginosa* routine water sampling in augmented care areas for NHS Scotland in September 2018
b) Water related infections identified at the Queen Elizabeth University Hospital (QEUH) which had been linked to issues with the hospital water supply
c) Limited information on potential contamination of water outlets at RHCYP with *P. aeruginosa* identified during commissioning by MPX.

3.1.3 Westfield Caledonian found 56 positive samples for *P. aeruginosa* in a number of shower outlets, Zip Hydrotap outlets, Arjo baths and Markwik 21 thermostatic mixing taps.

3.1.4 In response to concerns around water safety the Scottish Government asked HFS and HPS to determine whether the domestic water systems at the RHCYP and DCN were fit for purpose given the risk profile of patients being treated there.

3.1.5 Water Solutions Group (WSG), which had experience at the QEUH, were commissioned to provide specialist technical and analytical support to HFS and HPS. They widened the scope of water testing beyond what was required by guidance and found evidence of some gram negative activity and mould. The WSG

report also found that the indicators for audit and assurance were largely either partially satisfactory or unsatisfactory.

3.1.6 On 9 September 2019 NHS NSS reported back on their findings, including those from the Water Solutions Group. They noted that the water testing carried out as part of their review was not detailed in current guidance and the review was influenced by 'lessons learned' from recent projects. Furthermore:

> "Independent testing identified no widespread contamination of the water systems, however, remedial action is required on a number of water system areas as well as system wide disinfection prior to occupation."

3.1.7 Amongst the areas requiring work, the NHS NSS report noted that shower hose lengths were non-compliant with Scottish Water Bylaws.

3.1.8 The water action log, which consolidated issues identified in various reports, recorded 18 issues with water, some of these contained a number of sub-issues requiring action. The issues were divided into three overarching themes:

- Documentation: records and evidence that an appropriate site-specific water safety plan was in place
- Individual Remedial Actions: a small number of specific actions to rectify components of the water system that were connected incorrectly or were not performing as expected. One action involved a risk reduction measure to address the risk posed by a fire water tank which was a large volume of stagnant water. (These were straightforward to resolve as evidenced by the action log and are not discussed further here)
- Resolution of Contamination: a more complex set of actions to address the contamination found in parts of the water system. This included replacing contaminated components eg taps and Arjo baths, as well as additional investigative and risk-reduction measures recommended by NHS NSS.

3.1.9 In November 2019 an interim RHCYP and DCN water safety group was set up, chaired by Dorothy Hanley, Commissioning Manager, NHSL. The group reported to the NHSL Water Safety Group and RHSC Site Infection Control Committee, from

which the reporting chain ultimately reached the Board Chief Executive. The purpose of the group was

> "to minimise the risk of hospital acquired infection (HAI) associated with waterborne pathogens such as legionella and pseudomonas aeruginosa. Until such time as the building is occupied, this group will oversee the implementation of a water safety policy, in line with that of the overarching NHSL version, and the development and review of the specific water safety plan associated with this site."

3.1.10 Its aim was also "to provide assurance that water safety and water management at RHCYP and DCN is sufficient to mitigate and manage any hazards or risks prior to, and up to occupation by patients." The group reviewed key documents related to water management and water safety. A formal Water Safety Group was set up in February 2020 chaired by Tracey Gillies.

3.2 Documentation

3.2.1 NHSL and the OB required documentation from BYES, the Facilities Manager responsible for water management, which would show that appropriate water management was in place as required by SHTM 04-01: Water safety for healthcare premises, SHTM 00-00: Best practice guidance for healthcare engineering, Control of Substances Hazardous to Health Regulations 2002 (COSHH) and the Health and Safety at Work Act 1974. Specifically:

- As-built information of the water system (full water schematic)
- Site Specific Water Management or Water Safety Plan including:
    - flushing regimes
    - planned preventative maintenance (for occupied and unoccupied building)
    - temperature control for Legionella
    - remedial actions in response to non-conformances and positive water samples.
    - Programme of disinfection works
    - Names and qualification of responsible person (duty matrix)
- Records for review, including:

- Confirmation of turn-over of water tanks
- Flushing records and Kemper System records
- Legionella (L8) Risk Assessment
- Water turnover records (report)
- Temperature logs

3.2.2 Dennis Kelly, NHSL's authorising engineer for water, completed two audits of water management which involved reviewing BYES' water safety plan and relevant records. The final audit, completed on 11 February 2021, found that:

> "the hospital is well run by people with a high level of understanding of the requirements of successfully operating a hospital water system. There were no "very high" risk issues identified during this audit. Seventeen recommendations have been made and some of these are for suppliers in terms of evidencing competence and providing suitable paperwork.
>
> Overall the conclusion from this audit is that the hospital operates well run water systems and is generally able to evidence that with the onsite water safety plan that is in use."

3.2.3 BYES internal authorising engineer for water had also completed two internal audits in November 2019 and October 2020, and an 'unofficial audit' was completed in January 2021. Mr Kelly called this "an excellent practice" which "should be continued". He also noted that BYES undertake "a monthly review of the on-site water action plan."

3.3 Resolution of Contamination

3.3.1 Lindsay Guthrie and Donald Inverarity prepared a Water Safety Report for the OB to provide an assessment and a proposed response to the actions recommended by NHS NSS in their review of ventilation, water and drainage at RCHYP and DCN to address contamination.

3.3.2 The Water Safety Report outlined the risk-based approach NHSL would take to "demonstrate that water quality and delivery systems are safe, and conform with legislation and technical guidance." It took into consideration the fact that:

- there was no evidence of systemic contamination

- the testing for mould and fungus had gone beyond what was required by regulations
- potable [drinkable] water is not sterile
- the hospital was unoccupied and
- “NHS Lothian is not in an outbreak situation, and has no clinical cases to investigate”.

3.3.3 The paper provided a summary of actions taken to date which included the “removal, cleaning and replacement of all tap strainers”; gave a description of the current controls in place required by legislation and guidance; and noted actions required to improve existing controls. It made some recommendations to further manage risks to water safety.

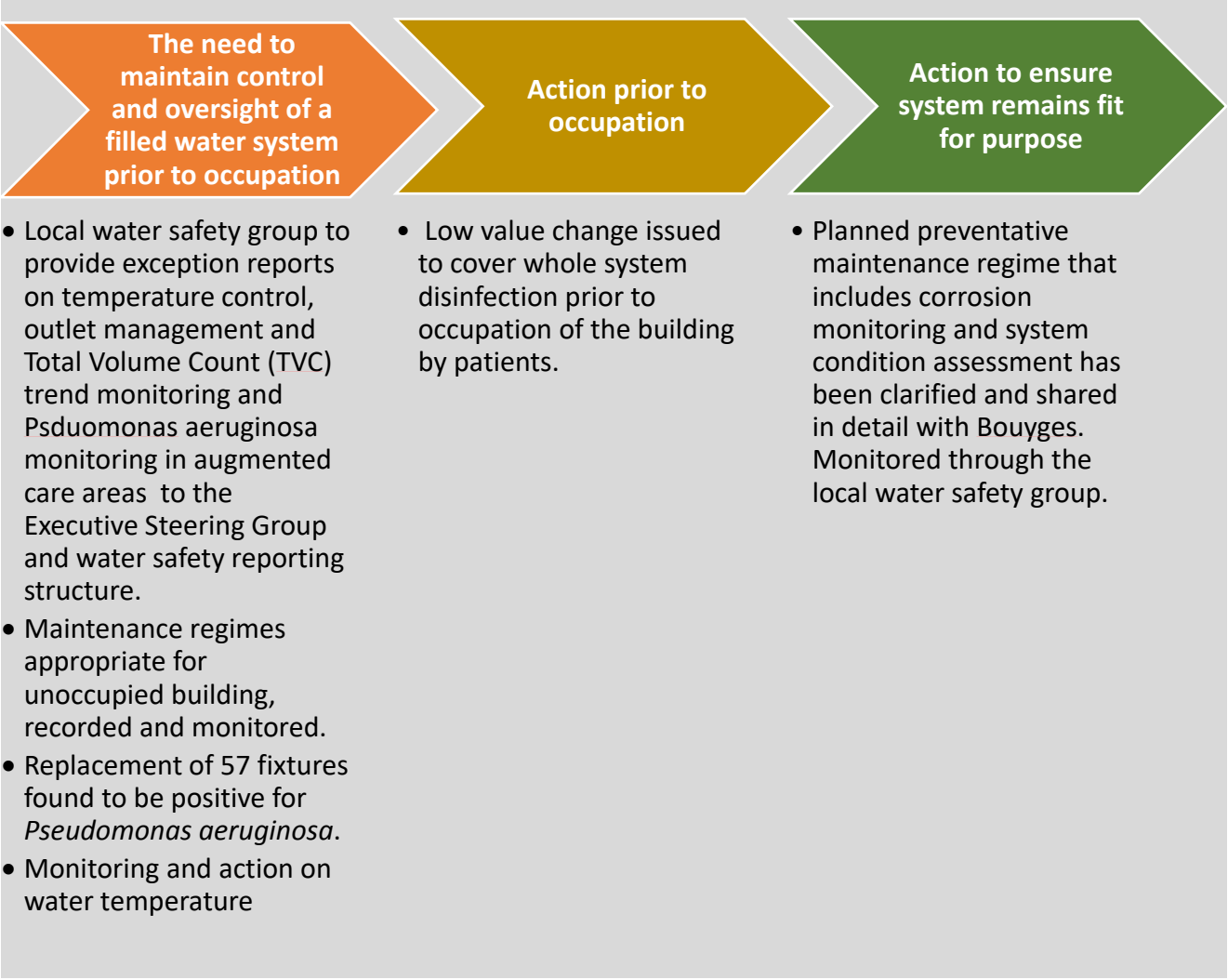
3.3.4 The paper also recommended that NHSL not undertake or partially undertake certain actions recommended by NHS NSS because, to summarise: they were not required by current guidance; there was no clear methodology; and it was not clear what benefit they would provide in the absence of systemic contamination and in an unoccupied building; in some cases the risks of taking action outweighed any potential benefits, or alternatively, the actions were not warranted given the controls in place which were expected to effectively manage risks to water safety.

3.3.5 The paper was initially shared with the OB on 14 January 2020. OB minutes on 16 January noted that NSS were “content with overall direction and infection control and prevention plan”. The next draft was shared with the OB on 28 January 2020, following which the OB asked for “a shorter paper summarising NHSL intentions against the actions in the Report that would sit behind it.”

3.3.6 In response, the ‘Water Quality Update paper’, dated 20 February 2020, was shared with the OB. This outlined actions to address five key issues:

- The need to maintain control and oversight of a filled water system prior to occupation.
- Action prior to occupation
- Action to ensure the system remains fit for purpose
- System level assurance
- Compliance with national guidance

3.3.7 This plan, which involves an overarching approach to guidance and assurance, as well as specific actions, is illustrated below:



3.3.8 The paper also noted there was a risk of further delay "by seeking a level of assurance about water safety that is greater than the assurance of the water quality that can be provided for either of the current sites." It recommended:

> "that the Oversight Board accept the actions and monitoring described in the paper to allow closure of the outstanding actions from the Water section in the NSS phase 1 report."

3.3.9 The OB Minutes for 20 February 2020 record:

- The OB accepted the actions and monitoring as described in the paper to allow closure of the outstanding actions from the Water section in the NSS phase 1 report.

- The OB took assurance from the detail provided in this paper and accepted the recommendation to close the outstanding aspects of the actions pertaining to water quality.
- It was noted that all the actions had been discussed and agreed with NHSL's Authorising Engineer for Water, who is the expert contracted to provide advice to NHSL.
- It was noted that in order to provide further assurance, it had been agreed that NHSL Internal Audit would undertake an assessment of water safety and quality monitoring in NHSL in quarter 1 of 2020-21.
- The OB noted that both HFS/HPS were content with the paper as it stood.
- The large amount of good work undertaken to get to this position was recognised by the OB.

3.3.10 Once laboratory results for pseudomonas came back clear, management of water safety was passed onto the local Water Safety Group. On 12 March 2020 the OB "approved the mechanisms in place in terms of water" and "agreed to closing off the water safety workstream action tracker once the shower hose compliance was confirmed." The Water Safety Log dated 4 March 2020 shows all actions closed.

3.4 Shower hose lengths

3.4.1 The final outstanding issue in terms of water safety was shower hose lengths which were not compliant with the Water Supply (Water Fittings) (Scotland) Byelaws 2014. . This was also the only issue which NHS NSS considered a 'major priority' (ie where there is an absence of key controls and major deviations from guidance). Poorer quality water coming from the shower head could generate a risk of infection.

3.4.2 Welded, disposable shower heads with a shorter hose length were installed. To become compliant with SW Bylaws, a programme of regular water sampling to test for contamination was put in place, eventually returning to 6 month sampling. Scottish Water formally approved the solution for shower hoses as compliant on

20/03/2020. At a meeting of the ESG on 23 March 2020 “It was agreed that the detail of the resolution in this area should be shared nationally.”

3.5 Drainage

3.5.1 The NHS NSS report found issues with sinks drains, bottle traps and pumped drainage to be a ‘minor priority’. NHSL felt that concerns around sink drains and bottle traps would be addressed through business as usual water safety management (eg, appropriate cleaning and maintenance).

3.5.2 The issue with the basement sump (pumped drainage) had arisen during the construction phase when IHSL’s design and installation diverged from their initial proposals contained in the Project Agreement. A dispute arose, a summary of which is included in the Project Agreement Settlement Agreement of February 2019, along with a description of the agreed resolution. These works and measures, as well as the Board’s ‘impact and continuity plans’, helped to mitigate the risks of the drainage design.

3.5.3 NSS’s recommendation was for ‘active monitoring’. The issue is not considered further in this paper given that it was considered a ‘minor’ priority by NSS, and had operational as opposed to direct patient safety risks.

3.6 Actions taken by NHS NSS

3.6.1 As noted above, the water testing that took place went beyond existing guidance and was targeted, focusing specifically on the RHCYP + DCN. This was influenced by ‘lessons learned’ from recent projects.

3.6.2 NHS NSS have told the Inquiry that because the ‘lessons learned’ were derived from a live incident they “were not appropriate for inclusion within guidance at that stage”.

3.6.3 Health Protection Scotland and ARHAI Scotland (Anti-microbial resistance and healthcare associate infection, Scotland) are a national body that provides support, advice and guidance, including sharing lessons learned from unpublished incidents and outbreaks. NHS Boards “after appraisal of this advice, may or may not choose to act upon these shared lessons learned”

3.6.4 HPS/ARHAI have a process to update guidance. This was paused due to NSS's involvement in respect of COVID-19, but has now restarted and is at the stage of external consultation.

4. Electrical

4.1 Overview

4.1.1 The NHS NSS review found two major priority issues and one minor issue with electrical installations.

4.1.2 One of the major issues was with the electrical installation in the Child and Adult Mental Health Service. Here, it "was observed that there may be the potential to defeat the ligature reduction measures. In addition, the power to the CAMHS unit rooms cannot be isolated outwith the room" which "might require modification". NHSL were advised to check the installation against HBN 03-01: Adult mental health units: planning and design.

4.1.3 NHSL completed clinical risk assessments relating to ligature reduction measures, which was reviewed by HFS, and issued Medium Value Change 099 to address the isolation of services from outside the room. These and other changes to the Melville Unit (CAMHS) were outlined in a paper to the ESG dated 27 January 2020, and relevant items closed on the action log on that date.

4.1.4 The other major issue identified by NHS NSS related to electrical cabling, but whether this was indeed an issue was questioned by TUV SUD. Since any issue in this regard would have presented a resilience rather than patient safety risk, it is not considered further here.

4.1.5 The High and Low Voltage Systems Audit Report issued on 13 February 2020 by TAD Facilities Management for BYES found no major non-compliances. The report noted that "the site demonstrated that its procedures and processes were in accordance with the current legislation and relevant Safe Systems of Work." The report also commended the local site team for the resolution of several issues and the "continued positive attitude to achieve compliance" and commented positively on the ability of Bouygues to secure trained personnel despite challenges.

4.1.6 At the OB meeting of 12 March 2020 it was noted that:

- "Excellent progress made and noted that evidence statement was expected this month. Noted that the expected evidence statements from IHSL were confirmatory and that there were no major items remaining outstanding…
- Agreed that the electrical workstream could be closed off upon receipt and appropriate certification of evidence statements by the MPX authorising engineer."

5. Fire Safety

5.1 Overview

5.1.1 The NHS NSS report did not find any major deviations from guidance or absence of key controls in relation to fire safety. The report found that fire doors were a moderate priority issue (meaning there were elements of non-compliance with guidance). There were also opportunities to enhance fire safety through creating protected evacuation routes that would be less affected by smoke. Otherwise, NHSL noted, "The facility has received the necessary building warrant and completion certification to demonstrate fire safety and compliance with legislation."

5.1.2 NHSL provided a proposal for Fire Safety Enhancement Works which was reviewed by Richard Walker of 3-FE Fire Engineering Consultancy. The 3-FE report concluded that "once the additional fire protection measures have been incorporated into the design of this building, it will exceed the minimum fire safety requirements."

5.1.3 Fire Safety Enhancement Works, which included necessary work to fire doors, took place under Supplemental Agreement 4. Specifically:

- MVC 112 - fire enhancements (DCN)
- MVC 126 – fire enhancements (RCYP)
- MVC 127 – changes to CAMHS
- MVC 131 – fire enhancements to CAMHS
- MVC164 – fire enhancements critical care, haematology/ oncology

5.1.4 Oakleaf, which provided third party validation for fire enhancement, confirmed completion to relevant standards. Jim Gardner, the Fire Safety Adviser, Royal Infirmary Edinburgh emailed Ronnie Henderson and Brian Currie to confirm

"that the current building fire risk assessment and emergency fire evacuation plans remain valid" following the works.

5.1.5 A further issue with cladding was reported at the ESG meeting of 28 October 2019. On 8 March 2021 an SBAR was produced confirming that Atrium Wall Coverings were not made of ACM (Aluminium Composite Material) which had been linked to the Grenfell Tower blaze. This was following a request from Bill Connolly, the National Fire Advisor, HFS, for such confirmation.

6. Medical Gas Installation

6.1 NHS NSS Review

6.1.1 Medical gas installations were found to have been "designed installed and commissioned in accordance with the relevant standards".

7. Final issues:

7.1 Window Restrictors

7.1.1 In August 2020 an issue emerged that a number of windows in DCN could be opened wider than the restricted level. BYES), surveyed all of the window restrictors and found that some others showed signs of damage

7.1.2 All damaged window restrictors were replaced.

7.1.3 This issue prompted action to review other health and safety issues referenced in the Callidus Report and Health and Safety learning, in case any issues had been side-lined. The paper concluded "Overall no other concerns were identified and everyone was in agreement that relationships were constructive and collaborative." It was not felt necessary to send anything to the OB.

7.2 Dental rooms

7.2.1 On 31 December 2020 an issue was reported regarding significant longstanding damp identified in two dental surgery rooms following an invasive survey involving wall removal. Black mould was found to a height of 5 feet. A wall had to be stripped down and rebuilt. According to ESG minutes Brian Currie noted it was "important to recognise that issues like this were a normal and routine occurrence in an operational hospital". Lindsay Guthrie "commented that she was

anxious that two drainage issues had emerged in a building that was not yet occupied" and "questioned whether there was confidence that all drainage and plumbing issues had been signed off".

7.2.2 The infection prevention and control team reported the incident to the Antimicrobial Resistance and Healthcare Associated Infection Service (ARHAI) Scotland using the Healthcare Infection Incident Assessment Tool (HIIAT).

7.2.3 A water leak was found to have caused the damage in dental rooms, as well as water damage in the Atrium. Remedial Action was expected to take 4 weeks. According to ESG minutes relating to this update, "The HIART [sic – HIIAT] was showing amber in respect of public anxiety given that his was a new hospital and was already having issues of mould reported."

7.2.4 According to ARHAI procedures, if an incident is amber or red, then the IPCT must complete Healthcare Infection, Incident and Outbreak Reporting Template ("HIIORT"), send a press statement (holding or release) to ARHAI Scotland, request ARHAI Scotland (HPS) support as required and follow local governance procedures for assessing and reporting. ARHAI Scotland (HPS) then share this information with SG HAI PU.

7.2.5 When amber, the HIIAT is reviewed and reported at least twice weekly or as agreed between the IMT and ARHAI Scotland (HPS). The HIIAT should remain amber only whilst there is ongoing risk of exposure to new cases or until all exposed cases have been informed.

7.2.6 Children who had received treatment between October and December 2020 who might have been exposed to the mould were regarded as low risk. NHSL have noted that

> "There is general surveillance for fungal and mould organisms in the population and **if** any of the individuals who had received treatment **had** presented with such an organism, an epidemiological link to the dental treatment would have been considered (**they did not**). All children

who had received dental treatment between Oct and Dec 2020 had diseases which entail regular secondary care follow-up for the disease not the dental treatment."
[NHSL's emphasis]

7.2.7 The impact on patients was that six children had to be rebooked. There were no cancellations. A communication was prepared for parents to provide information regarding the incident, and a Q&A.

7.3 Further incidents submitted using the Healthcare Infection, Incident and Outbreak Reporting Template (HIIORT)

7.3.1 In their response to the PPP, NHS NSS noted two further incidents were submitted using the HIIORT:

"The first was dated 18 January 2021: 'Water damage to dental rooms causing mould growth in the wall cavities. No staff or patients involved following a look back exercise. Remedial works undertaken and incident closed 10/03/21.'

The second was dated 19 November 2021: 'Water leak in patient room in Lochranza ward (Haematology/oncology). Mould contamination identified in wall cavity. No patient infections identified from look back exercise. Incident closed 01/12/21 following remedial works.'
Both of these incidents were reported timeously, action was taken and, to the best of NSS's knowledge, there was no adverse impact on patient safety."

7.4 Frequency of cavity barriers in external walls

7.4.1 The Inquiry team asked Core Participants whether they were aware of any further unresolved issues or defects with building systems not discussed in the paper that could have an adverse impact on patient safety. NHSL and IHSL note that the only other issue with building systems they are currently aware of relates to fire cavity barriers in external walls. After the hospital was constructed an insulating material used in the construction of the hospital was re-classified. Under the previous classification, fire cavity barriers at 20m intervals would have been sufficient to

comply with the relevant building regulations. Following re-classification, intervals of 10m were required. Work is underway to address this. IHSL note that the issue "is not necessarily one that could have an adverse impact on patient safety" but they raise in response to the Inquiry's question "for completeness".

7.5 Conclusion

7.5.1 A number of reports raised issues with key building systems (other than ventilation) which may have had the potential to adversely impact on patient safety and care. However, because the opening of the hospital was delayed, there was an opportunity to remedy these before they could have an adverse impact on patient safety and care.

7.5.2 The Inquiry team has found that despite some areas of disagreement between parties in resolving complex issues, there was an effective governance structure, robust assurance processes and improved management not just to undertake remedial actions, but to ensure similar issues would not arise again in future.

7.5.3 The Inquiry team has seen papers and minutes of the ESG and OB in this regard, along with action logs used to track resolution of issues. These show an appropriate escalation and decision making process which took into account risk assessments by Infection Prevention and Control experts, and evidence gathered by NHSL's Facilities Manager- Hard FM from IHSL and third parties through improved management and assurance processes respectively. Ongoing consultation with NHS NSS provided an additional level of assurance, as did the OB itself.

7.5.4 NHSL has also shared over 40,000 documents with the Inquiry, including significant amount of correspondence, which show the challenges and significant amount of work involved in resolving complex issues.

7.5.5 Issues relating to possible non-compliance were resolved either through remedial work, or alternatively, where works were deemed too costly or high risk, mitigations and control measures were put in place following risk assessments. These solutions had the support of NHS NSS and other third parties.

7.5.6 Remedial actions followed a risk-based approach in consultation with NHS NSS and others. Building systems were found to be fit for purpose by third party validators. Mary Morgan, the Senior Programme Director, stated at the penultimate OB meeting on 25 February 2021, that “The new Hospital was now one of the safest and best buildings in the whole of Scotland.”

7.5.7 Appendix A: Key reports identifying issues, and completion of recommended actions

Report details	Issues Found	Confirmation of Completion of recommended actions
Arcadis Snagging Notice and Settlement Agreement 1 Outstanding Works February - March 2019 Commissioned by: IHSL	Outstanding works and snagging issues to be resolved following handover.	Confirmed closed in ESG paper 20 September 2020, following receipt of "Snagging Review Report" July 2020 along with additional evidence to Michael Pryor and Outstanding Works Completion Certificate
Callidus Compliance Audit May 2019 Commissioned by: NHSL	Health and Safety control measures not functioning or lacking. Management arrangements poor and documentation lacking High legionella risk	ESG paper 20 April 2020 noted completion of Callidus actions Some issues covered in NHS NSS review, closed in May 2020. "Health and Safety Learning" paper to ESG 5 October 2020 reconsidered Callidus report.

Refers to Clira Legionella Risk Assessment commissioned by BYES		
IOM validation June 2019 Commissioned by: NHSL Draws on: IOM validation, added to following site visit by Q-Nis, the AHU Manufacturer to demonstrate compliance with SHTM 03-01	Poor commissioning of systems, issues with theatre ventilation, air handling units (AHU), air change rates in the high dependency unit (Critical Care), the building management system, general readiness, and use of 'swirl diffusers' which is a component 'not normally used in critical areas'. Additional AHU issues discovered during Q-nis visit.	Consolidated in ventilation action log, which was confirmed closed at the final meeting of the OB on 8 April 2021.
Westfield Caledonian Water Safety Assessment Report July 2019	No systemic contamination of the hot and cold water systems, however: • 56 positive samples for *Pseudomonas aeruginosa*, found in a number of shower outlets, Zip Hydrotap outlets, Arjo baths and Markwik 21 thermostatic mixing taps.	See NHS NSS Review

Commissioned by NHSL	• Post-commissioning strainer decontamination was not carried out effectively, and a number of areas of the water system were not achieving the right temperature.	
NHS NSS Review of Water, Ventilation and Plumbing Systems September 2019 Commissioned by: Scottish Government Draws on: • IOM issues log • Malcolm Thomas site visit • John Rayner Report • Callidus Compliance Audit	• Management and Assurance: Moderate Priority: document management system Minor issue: management structure and reporting processes, and an unprioritized alarm system • Ventilation: Major Priority: 'General ventilation systems' deviations from SHTM 03-01, including maintenance bypass, air handling units and ductwork, single and multi-bed ventilation design, access to fire dampers, location of the helipad, and external plant door gap created risk of contamination. Moderate priority: 'theatre ventilation systems' and 'isolation room ventilation systems' were 'moderate priorities'. • Water	"NHS Lothian Response to actions" report 1 May 2020 showed most actions completed, closed or necessary works agreed. 7 May 2020, OB noted formal completion of actions in both reports (caveat that HVC 107 works still to be completed)

• Westfield Caledonian report • Water Solutions Group Report	Major Priority: Shower hose lengths not compliant with Scottish Water byelaws and guidance in SHTM 04-01 Water safety for healthcare premises. Moderate Priority: swarf and biofilm found in tap strainers, contrary to SHTM 04-01 in non-augmented care areas, fungal and mould contamination, water management, water tanks, hot and cold water temperatures and the flushing regime. Minor issues were found with plumbing systems	
NSS Review of Fire Systems, Electrical Systems and Medical Gas Installation October 2019 Commissioned by: Scottish Government	• Management and Assurance: Moderate Priority: Lack of qualified and experienced Authorised Persons and Competent Persons for High Voltage and Low Voltage electrical installations and no responsible person for HV electrical installation, as required by The Electricity at Work Act (1989) and SHTM 00, SHTM 06-01 and SHTM 06-02. • Electrical Installations: Major Priority: electrical cabling used for Medical IT systems too long, in contravention of manufacturer and SHTM 06-01	As above

Draws on Paul Harris Report	recommendations, and building standards wiring regulations (regulation 134.1.1 of BS 7671). CAMHS Unit: ligature risk and power to unit could not be isolation from outside the room. Minor Priority: Uninterruptable Power Supplies all located in the same room, reducing resilience of power supply to critical areas in the event of catastrophic failure. Not rated: Earth Bonding Bars not installed correctly creating infection control risk. • Fire Safety: Moderate priority: issues with fire doors which were not all appropriately fire-rated or fitted for fire safety. Minor priority issue with remedial snagging and housekeeping issues Potential for improvements noted • Medical Gas Installation: Compliant.	