**Scottish Hospitals Inquiry**
**Witness Statement of Questions and Responses**
**Ian Powrie**

*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** Ian Powrie B.Sc. (IEng). Qualifications:
Glasgow Caledonian University 1992 – 1995: B.Sc. Building Services Engineering (Distinction).
Stow College, Glasgow 1990 – 1992: SCOTVEC (Level 5) Higher National Certificate in Management Studies.
1982 – 1985: SCOTEC (Level 5) Higher National Certificate in Electrical and Electronic Engineering Springburn College of Engineering, Glasgow
1989 – 1990: SCOTVEC Certificate (Level 3) in Mechanical Engineering (Plant)
1980 – 1982: SCOTEC Certificate (Level 3) in Electrical and Electronic Engineering
1976 – 1980: Scottish Health Service Apprenticeship certificate
EITB Certificate of Engineering Craftsmanship.
City & Guilds 232 Part III Certificate in Electrical and Electronic craft studies.
City & Guilds 232 Part II Certificate in Electrical and Electronic Craft Studies.
EITB 2nd Year Training Certificate
City & Guilds 200 Part I Certificate in Basic Engineering Craft Studies.

Roles held within NHS Greater Glasgow & Clyde from 1976 -2019 (43 Years Service):

Jan 2017 – July 2019: Deputy General Manager Estates Services.
Sept 2015 – Jan 2017: Sector Estates Manager (South Glasgow)
Aug 2012 – Sept 2015: New South Glasgow Hospitals Project, Project Technical Liaison\Input\ with responsibility for Board wide Energy Management
2003 – Aug 2012: Sector Estates Manager (North & East Glasgow), Inc Glasgow Royal Infirmary, Stobhill Hospital, Lightburn Hospital, Central Surgical instrument Decontamination Centre (Cowlairs).
1988 – 2003: Glasgow Royal Infirmary University NHS Trust, including roles:
2000 – 2003: Site Estates Manager.
1995 – 2000: Chief Engineer.
1992 – 1995: Senior Engineer.
1988 – 1992: Electrical Engineer.
1982 – 1988: Ruchill Hospital (Grade 5 Maintenance Technician) Responsible for maintaining all hospital building services and large-scale industrial laundry plant & Laboratory autoclaves.
1980 – 1982: Broomhill Hospital (Grade 4 Maintenance Electrician) Responsible for maintaining all building services and medium scale industrial laundry plant.
1976 – 1980: NHS Greater Glasgow Heath Board, Stobhill Hospital, Apprentice Electrical Engineer, responsible for learning craft skills required for maintaining building services and specialist plant for provision of health care facilities.

Core specialism

Electrical plant Engineering, supplemented by Education and experience in all aspects of building services required to support hospital\clinical environments.

## Professional Background

2. Professional role(s) within the NHS.

**A** 2003 – Aug 2012: Sector Estates Manager (North & East Glasgow), Inc Glasgow Royal Infirmary, Stobhill Hospital, Lightburn Hospital, Central Surgical instrument Decontamination Centre (Cowlairs).
2000 – 2003: Glasgow Royal Infirmary Site Estates Manager.

3. Professional role (s) at QEUH/RHC, including dates when role(s) was occupied.

**A** Jan 2017 – July 2019: Deputy General Manager Estates Services.
Aug 2016 – Jan 2017: Sector Estates Manager South & Clyde.
Sept 2015 – Aug 2016: Sector Estates Manager (South Glasgow)
Aug 2012 – Sept 2015: New South Glasgow Hospitals Project, Project Technical Liaison\Input.

4. Area(s) of the hospital in which you worked/work.

**A** My role involved a knowledge and awareness of all services and infrastructure across the full campus. Including Retained Estate, QEUH, RHC, Laboratory Medicine, Energy Centre, I therefore worked across all areas of the campus to develop an operational and working knowledge of the building services plant and infrastructure.

5. Role and responsibilities within the above area(s)

**A** Sector Estates Manager role held specific responsibility as Professional Lead for the Estates Maintenance services and personnel. Develop and Implement the Estates Strategy and departmental business plans in line with the division's objectives. Responsible for the strategic Direction, professional and managerial leadership of the divisions Estates Department.

6. Who did you report to? Did the person(s) you reported to change over time? If so, how and when did it change?

**A** My line manager was Billy Hunter, Facilities General Manager South and Clyde, however during the project liaison period 2012 – 2015, I also reported

in parallel to Karen Connelly Project Facilities Lead. Billy Hunter was also my line manager when I took up the role of Sector Estates (south) & Sector Estates Manager (South & Clyde) Roles from Sept 2015 – Jan 2017. July 2016 Alan Gallacher was appointed as the General Manager (Estates) as Technical Lead for the Estates department Board wide, I now reported to Alan on technical matters and Billy Hunter on operational issues. I also reported directly to David Louden in ongoing contract\defect issues and site development issues. On Jan 2017, I was redeployed to work with Alan as Depute General Manager Estates.

7. Who selected you for your role(s)? When were you selected for your role(s)? Please describe the selection process for appointment to this/these roles?

**A** Alex McIntyre, Director of Facilities (DoF) called me to a meeting in his office in July 2011 and outlined his plans for a management reshuffle to align with the strategic plans for the New South Glasgow Hospitals, as part of his plan he asked if I would be interested in transferring to the South Glasgow facilities team with responsibility for technical liaison/input to the new South Glasgow Laboratories and Hospital and managing the operational commissioning of both buildings from a technical perspective. Following the opening of the Hospital, taking over as Sector Estates Manager south & Clyde. I was not subject to a selection process, I believe the selection options were discussed between the DoF and the then Corporate General Manager (Mary Anne Kane).

8. Had you worked with any of your QEUH/RHC estates and management colleagues before your current role? If so, who had you worked with before this current role? When did you work with this/these colleague(s)? What role were you in when you worked with this/these colleague(s)? How long were you colleagues in this/these previous role(s)?

**A** From the Facilities management team, I had worked with: Mary Anne Kane as my General Manger at the North & East Sector 2006 -2008, while I was the Sector Estates Manager 2003 – 2012. Likewise while I was in the same role Billy Hunter was my General Manager from 2008 - 2017, and Mary Anne Kane became the Corporate General manager 2008, where my working

relationship continued with her while she held that role. I had also worked with Alex McIntyre 2004 – 2006 supporting him in his role as ACH project Director, where I provided operational & technical support and advice with respect to PFI hard FM contractual elements, my working relationship continued with Alex from 2006 when he became Director of Facilities for NHS GG&C. With Respect to the Estates team at the QEUH, I had worked with Jim McFadyen (Sector Estates Manager South & Clyde) from 2006 – 2012 in our sector Estates Managers roles as part of the Boards Estates Management team and with regards to my extra responsibility for Board wide Energy Management (where bolt on responsibilities covering Board wide topics were added to the Sector Estates Managers role), my working relationship with Jim continued during the construction of the new QEUH campus until he retired Aug 2016. The only other member of the new operational Estates team I had work with before the QEUH , was Cyril Dowson (Planning Supervisor QEUH) I had worked with Cyril at the GRI since circa 1990 in his role as shift supervisor, I held various roles at the GRI during this period.

**Specific Role(s) at QEUH/ RHC**

9. Describe your role(s) at QEUH; job title and responsibilities including day to day responsibilities, and details of staff who reported to you, who you worked alongside and who you reported to. Please fully describe where the role was in the hierarchy of the organisational structure.

**A** My role as Technical Liaison from 2012 – 2015 I was responsible for Technical Liaison\input into the new South Glasgow Hospital & Laboratories Project, managing the operational commissioning of both buildings from a technical perspective as well as the integration and interfaces between the new and retained Estate (i.e. Infrastructure and services interface, i.e. High Voltage network, Appointed as lead Authorised Person-High Voltage (AP-HV) on behalf of the project for planning and management of all HV network connections as per safe code of practice, Medical gas supplies and infrastructure, telecoms\IT support), As well as developing a strategic Maintenance \manpower plan. During this time I reported to Billy Hunter\Karren Connelly as Project Facilities Lead and engaged with Mary

Anne Kane & Alan Seabourne (Project Director) over strategy (Latterly David Loudon after Allan retired 2014). I had no direct staff reports during this time, I worked with Members of the project team Karen Connolly (Facilities Lead), Peter Moir (Depute Director\Contract Manager) Frances Wrath (Project technical manager), Alistair Smith (Project M&E Technical Commissioning Manager), Hugh McDermid (Building Technical\Commissioning Manager), David Hall (Curry & Brown Independent Technical advisor),Graham Forsyth (Project Manager), Fiona McLuskey (Project Lead Nurse), Heather Griffen (Lead Contract Manager Adults), Mairi McLeod (Lead Contract Manager Childrens), Lorraine Pebbles (Laboratory Migration\integration Manager), Darren Pike (Brookfield Project M&E Manager), David Wilson (Multiplex Commissioning Manager), as well as Jim McFadden for coordination and support for issues of interface\integration with the retained Estate.
In my role as Sector Estates Manager (south) Jan 2016 – Sept 2016: I was responsible as Professional Lead for the Estates Maintenance services including and personnel, managing the implementation of the Estates Strategy for the full campus within the reduced operating budget made available as detailed within the initial QEUH Business plan, while contending with the high volume of ongoing contract works, defects and remedial actions. During this time, my line manager was Billy Hunter (Facilities General Manager), with technical lead from the newly appointed Estates General Manager Alan Gallacher. My direct reports were Senior Estates Managers David Brattey (with responsibility for the Adult & Childrens Building) & Colin Purdon (With Responsibility for the Retained Estates\Energy Centre & Laboratory Medicine).

My role as Sector Estates Manager (South & Clyde) Sept 2016 – Jan 2017, On the retirement of Jim McFadden from his temporary role as Sector Estates Manager (Clyde) the Clyde Remit was incorporated into my role, Billy Hunter remained my line manager for this extended remit of my responsibilities across the full South & Clyde Sector, My Site Estates manager direct reports remained the same for the QEUH but now included for RAH was Frank Zielinski, IRH was Ross Campbell and for VoL was John Menzies. Within all of these roles I worked alongside the site Facilities Managers, and all clinical

directors, service managers and nursing managers on a day-to-day basis as required to provide appropriate service and support.

10. When did you start your current role? How many people worked within QEUH hard facilities management when you started? How many people worked within QEUH soft facilities management when you started? Did the number of people working at QEUH change during your time there? If so, how many people changed in soft facilities management? If so, how many people changed in hard facilities management?

**A** I retired from NHS Greater Glasgow & Clyde on the 2nd July 2019, my role at that time and my last post from Jan 2017 to July 2019 was as Depute General Manager Estates reporting to Alan Gallacher (Estates General Manager) Initially with day to day responsibility to shadow and deputise for Alan as required as well as supporting Andy Wilson my replacement as Sector Estates Manager (South & Clyde) where required. This was until the water incident occurred and I was tasked with developing and implementing a solution to the contamination issue.

a) What concerns, if any, at this point did you have regarding staffing levels in Estates? Did you escalate any concerns and if so to whom?

**A** I had concerns over staffing from the time that I was advised that my management strategy paper had to be revised to meet the budget restrictions as detailed in the project outline business case, where staffing levels had to be reduced as part of meeting the budget allocation, this revised maintenance strategy was called the Affordability Model.

I also advised my Facilities General Manager Billy Hunter, when the operational estates department were required to contribute to the Board's Cash Releasing Efficiency Savings (CRES) programme, and the only way to achieve this at this time was to release vacant posts. While Mr Hunter accepted and agreed with my concerns, he advised that the department had to meet the CRES target set for the South & Clyde Sector Facilities department, he overruled my concerns and released the budget for these posts (from memory I think this was equated to 2 WTE's).

I shared my concerns over staffing levels at the time I was redeployed to the Depute General Managers post with Andy Wilson (my replacement Sector Estates Manager), who carried out his own staffing assessment and concluded that he required circa 108 WTE staff to deliver the required level of support.

11. How did Estates management operate on a daily basis? Was responsibility shared between different teams? If so, to what extent was responsibility shared?

**A** The Estates Structure within the QEUH was designed with geographic responsibility for Estates Services divided between two senior Estates Managers, David Brattey who was responsible for the operation, maintenance and compliance of the new Adult and Childrens Hospitals and Colin Purdon who was responsible for the operation, maintenance and compliance of the Retained estates, Energy Centre and Laboratory Medicine, each team was supported by an Estates Manager & planning supervisor along with a cohort technical staff to support each area, with joint working/resource sharing where required to meet the daily needs of the operation. In addition to this and due to the sites size and complexity a team of 5 duty Estates Managers managed and 20 technicians on a rotary shift basis to provide 1st line response to any emergency occurring anywhere on the campus on a 24/7 bases, this team also provided support to both day shift teams to address planned maintenance where possible.

12. Refer to the **Estates Team Bundle, document 29** - Organograms showing the organisational structures within QEUH.

a) Does the organogram match the organisational structures of QEUH?

**A** Yes, this was the structure for the South & Clyde sector.

b) If not, why not?

**A** N\A

c) How did the structure and hierarchy operate across the different sectors?

**A** The structure was replicated across each sector with a Sector General Manager Facilities Responsible for the sites within their sector, and supported by a Sector Estates Manager, each site has a site facilities manager reporting to the General Manager and each site has a site estates manager reporting to the Sector Estates Manager. Each General Manager reporting to the Director of Facilities (DoF) .

13. What role did you hold in Estates until 2019?

**A** I held the role of Estates Depute General Manager.

a) When were you appointed to this role? How did you come to be appointed, who selected you, what was the selection process, did you have previous working relationships with those who selected you?

**A** I was Appointed to this role In Dec 2016, and took-up post in Jan 2017 after providing a 4–6-week familiarisation\introduction for Andy Wilson. I was unaware of the proposed change of role, until Jim McFadden's retirement, following which I requested authorisation from Mary Anne Kane to fill the Site Estates Managers post (which was included within the Estates strategy for the QEUH), as Jim's retirement should have released the funding to support this role! At this point Mary Anne advised me that she and Alan Gallacher were interviewing the following week for a new Sector Estates Manager for South & Clyde. This was a surprise to me as I had not been consulted on this plan, I enquired how this was intended to work as this was my post. To which Mary Anne advised that I was being redeployed to support Alan Gallacher as Depute General Manager. There was no selection process that I am aware of for this new post. Yes, I have worked with very well and successfully with Mary Anne since 2006 and to a lesser extent with Alan since circa 2011 due to my involvement with the QEUH project we had little contact until 2015/16.

b) Describe the role of Deputy General Manager of Estates.

**A** There was no Job Description for this post, when I requested the job description from Alan, he provided a copy of his job description and advised that my role would follow his job description. My understanding was that I

would support Alan in his role and deputise for him as required as well as supporting Andy Wilson (Sector Estates Manager South & Clyde) on technical and procedural issues for the QEUH as required. Initially there was no workload direction for my post as Mary Anne was on sick leave, so I was left to address ongoing and legacy issues that were raised directly with me by QEUH departmental leads etc, allowing Andy more time to bed-in.

c) What were your duties in this role?

**A** My duties centred around project work rather than managerial roles for example following the Grenfell Tower fire, I was allocated the task of investigating, collating and populating the HFS External Cladding reporting tool for Scottish Government for all buildings across NHS GG&C, establishing if the cladding materials used were constructed of Aluminium Composite Material (ACM). Ward 2A Isolation room ventilation conversion from PPVL to positive pressure review/procurement/ implementation, Ward 2A General ward ventilation modification feasibility report. Ward 2A services modification works. Water incident control response, lead on investigation and design solution to address systemic contamination.

d) Who did you report to in this role? Detail superiors/superiors for this role.

**A** My line manager for this post was Alan Gallacher (Estates General Manager), with a close working relationship with Mary Anne Kane.

e) What was your relationship like with your supervisor in this role.

**A** It was a reasonable relationship, working well together to address the challenges surrounding the QEUH

f) Provide details of staff who reported to you, and you were responsible for in this role, and your relationship with them.

**A** I had no direct reports, in this role, Alan took point on man management.

g) Provide the name and role of any managers you worked with. Please provide their Job (s) and role responsibilities.

**A** Andy Wilson (Sector Estates Manager South & Clyde) this role held specific responsibility as Professional Lead for the Estates Maintenance services and personnel. Develop and implement the Estates Strategy and departmental business plans in line with the division's objectives. Responsible for the Strategic Direction, professional and managerial leadership of the divisions Estates Department. Colin Purdon, (QEUH, Site Estates Manager & then in his role as Sector Estates Manager), responsible for the implementation of the Estates strategy and day to day management of the sites staffing and physical assets. Sector Role as detailed above. Darryl Conner (Site Estates Manager QEUH), responsible for the implementation of the Estates Strategy and day to day management of the sites staffing and physical assets. Melville McMillan, Estates Manager, responsible for the management of staff and physical assets in line with technical, statutory as well as H&S compliance requirements. Dr Teresa Inkster (Microbiologist & Infection Control Doctor), Infection control lead for QEUH and ICT lead on water management issues. Dr John Hood (Microbiologist & Infection Control Doctor), lead on ventilation review relating to the cryptococcus incident.

14. Detail any other roles held by you within the Estates team and provide details as referred to in a-g above.

**A** I did not hold any other roles and responsibilities other than the project roles described.

15. How was work delegated in the Estates team?

**A** Generally, work was delegated ether by e-mail, formal team meetings or verbally on day-to-day interactions.

16. How did you keep a record of work delegated?

**A** e-mail correspondence or meeting minutes.

17. How did you check that the work delegated had been carried out?

**A** E-mail correspondence, one to one meetings or management team meetings. Although due to workload pressures for all of the estates team it was challenging to maintain planned meeting as invariable one or two of us were diverted to other priorities resulting in the meetings being cancelled.

18. Did you have any concerns about any member of staff? If so, please describe these concerns. What action, if any, did you take in relation to these concerns?

**A** As Sector Estates Manager (South) I had no concerns about the competence or capability of my site managers, I was however concerned about the work load placed on such a small team with respect to the high volume of contract defects and systemic system issues (such as the Pneumatic Transport System PTS\AGV's) etc and the pressure this was placing on the Estates team to prioritise based on immediate adverse impact to clinical service. These issues lead to Estates managers working longer hours, Particularly David Brattey, Colin Purdon and myself.

a) Did you ever ask for additional resource for the Estates department? If so, to whom? What was the response?

**A** I raised my concerns with David Loudon and latterly with Billy Hunter. David Loudon's position was that we had to work within the Budget constraints set in the Project Business Case and enforced by Robert Calderwood with David Loudon. Although David Loudon indicated his intention to address this at a later stage with Robert Calderwood once we established the actual operating cost pressures, to my knowledge David did not address this before his departure from NHS GG&C. Billy Hunter had a similar view that we needed to work within the set budget as demonstrated in my response to supplementary question 10 above.

19. Did you have any concerns/ ever raise any concerns regarding management/ managers? If so, please describe these concerns. What action, if any, did you take in relation to these concerns?

**A** I did not have any concerns with regards to the managers within my team, they were all experienced managers from the demitting sites transferred to QEUH, bear in mind that we did not know each other before coming together as a team. I did raise concerns on several occasions during one-to-one meetings with my line manager (Billy Hunter) regarding my inability to effectively perform my job function and that of my team due the high pressure of continual firefighting of critical issues on a daily basis. Billys response was to work through the pressures we faced until the site settled down and we can collectively return to normal.

a) What sort of critical issues were you firefighting on a daily basis?

A It is difficult for me to recall the details of all the issues that were dealt with on a daily basis at that time, however this is some of the more high-profile issue that I can recall:

- Repeated blocked drainage risers, causing sewage discharge into wards, the blockages were not evident until after migration when the system was challenged by routine activity. The cause of these blockages was found to be deliberate sabotage by Multiplex contractor staff who had their contracts terminated. We found bags full of rags pushed in to the stacks with lengths of screwed rods as well as plastic bottles, tools and other obstacles.
- Repeated surcharging of underground drainage, causing discharge of sewage into the Adult and Children's hospital ground floor departments, ED, Physio etc. (Caused by building debris in the main underground drains.
- Automatic Guided Vehicles (AGV's) daily issues including system failure, network communication issues, battery failures, charging issues.
- Pneumatic Transport System (PTS): on-going daily faults, system blockages, lost samples and operational issues as well as programming issues, having immediate and direct impact on clinical services and patient care, and placing pressure on reduced soft FM staffing levels to Implement and manage manual sample transfers and delivery of goods. In addition to system design intent not

being delivered i.e. ED\ICU direct priority line to the Laboratory not being designed correctly.

- Energy Centre boiler failure to operate automatically.
- Failure of Low Temperature Hot Water (LTHW) heating circuits and Chilled Water Circuits push fit connections to Heating and Cooling batteries, causing repeated widespread flooding damage and loss of service, ultimately all push fit connections were replaced with compression fittings.
- PPVL isolation room issues relating to noncompliance with SHPN 04 Supplement 1 which they were designed to. Working directly with ICD support from Dr John Hood, Prof Craig Williams and Dr Christine Peters
- On-going assessment and rectification of issues identified under the preparation of the written scheme of examination as per the Boards legal duty under the Pressure System Safety Regulations (PSSR) 2000, and the failure of Multiplex to meet their legal requirements under the Pressure Equipment Directive (PED).
- On-going works to secure and maintain the Pollution, Prevention & Control (PPC) permit as per the annually reviewed conditions of improvement applied by SEPA.
- With support from ICD (Dr Christine Peters), identify and address the omission of shared theatre prep room door interlock arrangements, required under SHTM 03-01 for control of infection between theatres.
- Asset register review and preparation for transfer to FMFirst (2 years working with IT)
- Lead on the development and redesign 4 PPVL isolation rooms in RHC ward 2A to convert to positive pressure isolation room facilities as per the requirements and approval of ICD and clinical leads.
- ETFE roof failure, as instructed by the David Loudon, Director of Facilities, carry out an investigation into the cause of the failure and prepare a report on my findings. I also contacted the Central Legal Office for advice on cost recovery under the contract but was advised by David Loudon that this was out with my remit! I also suggested that the Board should instruct an expert forensic analysist to carry out an investigation, this was not implemented until sometime later.

- Lead on the investigation and analysis of the external glazing failure of the toughened glass spandrel panels utilised on the building, establishing from lab assessments of the points of failure that that were recovered, that the failures were due to Nickel Sulphide Inclusion (NiS) impurities in the glass.
- Universal interstitial window blind failures, Multiplex would not accept these as design or product failures, but insisted that this was a result of misuse by the staff and patients? I was then tasked with developing, procuring and implementing a robust solution for the issue.
- Initial high volume BMS lighting controls failure, light could not be switched off.
- Initial high volume BMS heating control Failures.
- Fuel delivery system failures to both Generators and Boilers.
- En-suite shower flooring issues, water not running to drain, Multiplex insisted that this was due to the client's instruction to remove the shower curtains from the wet room design?
- High Voltage (HV) Substation, Underground water ingress to the HV cable ducts, H&S risk as well as a risk to the integrity of the HV equipment from the effects of high humidity.
- Boiler safety valve discharge was unsafely discharging to the boiler room floor, placing operators at risk in the event of an emergency safety valve operation. This addressed under the PSSR assessment and redesigned and modified by multiplex to address the PSSR\H&S non-compliance.
- Plant room electrical supply overload impacting several critical systems.
- Cold water System leak In the Acute Receiving Unit (ARU), this leak was caused by the corrosion of a section mild steel pipe installed in the stainless-steel Cold-Water System (CWS) between two modular service units. This compromised the integrity of the CWS.
- On going fire door issues.
- Fire Sprinkler zone control failure. (wiring fault).

This list is not exhaustive but is indicative to the type and scale of issues arising.

b) Did you expect to be ‘firefighting critical issues on a daily basis when you undertook the role? Explain your answer.

**A** No, I had expected to have a full team to support me, and that the new hospital would have been well designed and constructed with zero defects as per the NEC 3 contract.

20. Describe the interpersonal relationships within the Estates team. How would you describe communication between you and your supervisor(s)/ superior(s)? How would you describe communication to you from those you senior to you/ supervised you?

**A** Relationships between myself and my management team were good, communication was clear and instructions\responses were clear and any deviation from the intended direction were quickly clarified and addressed. Pressures on delivering on expectations were generally relating to unforeseen pressures relating to the size and scale of the campus as well as the ongoing level contract defects, impacted by the reduced staffing level due to the budget restrictions imposed from the outline business case. Likewise my working relationship and communications with my line manager and senior management team were good.

21. How many occasions, if any, did issues arise caused by misunderstandings or poor communication?

**A** This is a difficult question to answer due to the time lapse since my retirement, I am sure that there are examples of communication issues, but I cannot think of any at this time.

**<u>Training</u>**

22. What training had you undertaken for your role(s) in estates?

**A** Construction Site Managers Safety Certificate Awarded by CITB 1992. Management & Communication Skills for Estates Managers, Issued by: NHS Scotland Property & Environment Forum, 2000.

23. What qualifications did you have for your role(s) in estates?

**A** Glasgow Caledonian University 1992 – 1995: B.Sc. Building Services Engineering (Distinction).

Stow College, Glasgow. Awarded AHS Emstar award for Outstanding Dissertation

1990 – 1992: SCOTVEC (Level 5) Higher National Certificate in Management Studies.

1982 – 1985: SCOTEC (Level 5) Higher National Certificate in Electrical and Electronic Engineering

Springburn College of Engineering, Glasgow 1989 – 1990: SCOTVEC Certificate (Level 3) in Mechanical Engineering (Plant)

1980 – 1982: SCOTEC Certificate (Level 3) in Electrical and Electronic Engineering

1976 – 1980: Scottish Health Service Apprenticeship certificate

EITB Certificate of Engineering Craftsmanship.

City & Guilds 232 Part III Certificate in Electrical and Electronic craft studies.

City & Guilds 232 Part II Certificate in Electrical and Electronic Craft Studies.

EITB 2nd Year Training Certificate

City & Guilds 200 Part I Certificate in Basic Engineering Craft Studies.

24. What experience did you have working in estates prior to the QEUH/RHC? How similar was the industry, role, and responsibilities to your work in QEUH/RHC estates?

**A** Prior to working at the QEUH\RHC I had 38 years of experience within the health care environment (NHS Greater Glasgow).

9 years as Sector Estates Manager (North & East)

15 years in various Estates Management roles within the Glasgow Royal Infirmary Campus:

2000 – 2003: Site Estates Manager.

1995 – 2000: Chief Engineer.

1992 – 1995: Senior Engineer.

1988 – 1992: Electrical Engineer.

1980 – 1988: 8 years in various Electrical Engineering Technician\Tradesman roles.
1976 -1980: 4 year NHS GGHB Electrical Engineering Apprenticeship.

25. Did you have any formal training or qualifications in respect of:

a) Water

**A** 2009: BS1 Legionellosis: The Role of the Responsible Person. Issued by Develop Training Ltd. Providing awareness of the risks, issues and responsibilities relating to control and management water systems with respect to Leionellosis.
2019: BS1 Legionellosis: The Role of the Responsible Person. Arranged by the compliance team.

b) Ventilation

**A** Eastwood-Park,(NHS-Training-Centre-Falfield)
1988: V.175 Air Conditioning & Ventilation. Providing basic training and awareness of the operation and management of ventilation systems within a health care environment.

c) Infection Control

**A** In-House:
Annual-Infection-control-awareness.
Annual Hand hygiene. Provides basic infection control principles for working within a clinical environment.
If so, please detail above any training and qualifications – when trained? When qualified? Who was the awarding body? Please describe how the training and qualifications applied to your work at QEUH.

26. Have you ever had any specific roles or duties in relation to the water systems operation or maintenance within NHS facilities? When did you have these roles and duties?

**A** I was responsible person for water systems at the Glasgow Royal Infirmary 2003 – 2012.

a) What qualification(s)/ experience was necessary for this role? Did you have this experience/ qualification(s)?

**A** The Responsible Person will possess sound professional knowledge of Legionella and water safety issues and appropriate training. The Responsible Person should also be fully conversant with the design principles and requirements of water systems and should be fully briefed in respect of the cause and effect of water-borne organisms. I had received a 1 day Training course (BS1) Legionellosis: The Role of the Responsible Person, November 2009, my experience was gained on the job and from reference to SHTM\HSE guidance.

27. If you did:

a) What were these responsibilities?

**A** Ensure all water systems on site are fully compliant with all aspects of current H&S and Legionella specific legislation and guidance and manage any source of risk through the preparation of a legionella risk assessment. Carry out full risk assessment on all water systems and implement action plans to address any areas of risk. Implementation of an effective maintenance policy including preparation of fully detailed operating and maintenance documentation and the introduction of a Written Scheme and logbook system.

Chair the water safety group.

Advising on the potential areas of water-related risks and identifying where systems do not adhere to this guidance.

Liaising with the water authority and environmental health departments and advising on the continuing procedures necessary to ensure acceptable water quality.

Monitoring the implementation and efficacy of those procedures.

Approving and identifying any changes to those procedures.

Ensuring equipment that is to be permanently connected to the water supply is properly installed.

Ensuring adequate operating and maintenance instructions exist and adequate records are kept.

b) What was the purpose of these responsibilities?

**A** To ensure that the quality of water in healthcare premises is maintained and comply legislation & guidance.

c) Were you aware of any specific legal responsibilities/ obligations relating to working with the water systems. If so, please detail.

**A** Yes, these legal responsibilities are:
The Health and Safety at Work Act 1974.
Management of Health and Safety at Work Regulations 1999.
Control of Substances Hazardous to Health Regulations 2002 (COSHH).
Health & Safety Executive: Approved Code of Practice ACOP L8 "Legionnaires' disease. The control of legionella bacteria in water systems."
Health & Safety Executive: HSG274: Technical guidance Part 1: Evaporative cooling systems.
Health & Safety Executive: HSG274: Technical guidance Part 2: Hot and cold water systems.
Health & Safety Executive: HSG274: Technical guidance Part 3: Other risk systems.
Department of Health: Health Technical Memorandum HTM 04-01: Safe water in healthcare premises (where applicable).
The Notification of Cooling Towers and Evaporative Condensers Regulations 1992 (where applicable).

28. If you did not have any such roles or responsibilities in relation to the water systems operation or maintenance within NHS facilities:

a) Who did?

**A** N\A

b) What were these responsibilities?

**A** N\A

c) What did you understand the responsibilities to be?

**A** N\A

d) Were you aware of any legal obligations/ responsibilities? If so, please detail.

**A** N\A

29. Have you ever worked on a large scale water or ventilation system before? If so, when was this? How did this compare to working on QEUH? What was your role and duties?

**A** I have experience of large scale water distribution and ventilation system plant during my time working at the Glasgow Royal Infirmary 1988 – 2012, in various roles. The water systems in place at the QEUH where on a larger scale in both storage capacity & system complexity. The ventilation systems at the QEUH where more modern but with concerns over the design used for neutropenic patient isolation facilities being of PPVL design? From 2003 – 2012 I was Responsible person legionella with the duties detailed in Q27 above.

**Pre 26th January 2015 involvement in QEUH/RHC**

30. Describe the operational commissioning, what did this entail? How involved with the commissioning of the water and ventilation system were you in this role. Describe what, if any, commissioning in respect of the water and ventilation system was carried out and where these records were stored?

A Operational commissioning entails making the hospital ready for accepting patient following practical completion of the construction project, including:

- Tendering and managing the supply and installation of ward equipment.
- Carrying programme of ward/department modifications and changes of use from design, to meet the changed need of these services.
- Specify and procure and manage fit out new mop laundry facility.
- Installing all fixed and movable equipment.
- Managing the installation safety systems such as fire extinguishers.
- Specifying tendering and awarding specialist services support contracts.
- Instruct, manage and supporting the preparation of a Written Scheme under the Pressure Systems Safety Regulations (PSSR 2000) requirements.

- Instruct, manage and supporting the preparations of the written scheme of examination for all patient lifting equipment under the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).
- Support the installation of 3rd party radiology equipment.
- Specify, tender and manage the retrospective installation of a Patient Entertainment System (PES) throughout the adult hospital, (this had previously been removed from the Multiplex contract).
- Support the installation of Scottish Ambulance Service (SAS) emergency services radio communications system with ED.
- Support the installation of IT wireless hubs across the site.
- Manage conditions applied under the PPC permit award under the control and direction of SEPA.
- Manage and coordinate the contractor access requirements including review and approve contractor Risk Assessments & Method Statements (RAMS) for all contractors including the 300 plus operators still working on site for Multiplex.
- Commission and support preparation and production of Water Risk assessment and written scheme.
- Continuation of water flushing control programme. (Records were held in the project office archive store)
- Water sampling programme and sanitisation of wall wards and departments prior to occupation. (Records for sampling results were held on the AI-control Laboratory Services Portal, I also understand that these results were e-mailed to Jim Guthrie/Melville McMillan and myself. Records of sanitisation programme would be held in the Operational Estates office managed and recorded by Jim Guthrie.).

  This is an indicative list of the works involved but is not exhaustive. I was not involved in the contractual commissioning and validation of the water and ventilation systems.

a) What technical input did you have during this time in respect of QEUH/RHC? What was your role? What areas were you responsible for? The Inquiry understands from later in your questionnaire response that you attended the

TMT product presentation/ selection meeting in respect of the selection and use of Horne Taps in QEUH/RHC. What had your role and involvement in respect of tap selection been prior to then?

**A** My technical input was to ensure that the hospital was ready for occupation providing technical support, guidance and management of the works required to make the hospital ready for patients, this included identifying technical problems with the hospital as provided at handover, these issues only became evident as the building was accessed and utilised by NHS staff. At the point of handover my remit was as technical manager for the new hospitals, and Energy Centre as well as the operation under the PPC permit conditions as applied by SEPA for the whole campus new and retained estate. With respect to the TMT selection presentations, I had no previous involvement in the specification or selection of any service\equipment required under the project up until this point. I had no previous experience of TMT selection prior to this other than knowledge gained from reading SHTM and DO8 guidance on the requirements for TMT's.

b) Have you advised on tap choice in other projects? What experience did you have in respect of taps?

**A** No, I had not advised on tap selection prior to this, my experience was from SHTM \DO8 Guidance.

c) Describe your day to day dealing with infection control staff during this period. Were there regular meetings between infection control staff and the project team? How regularly was input sought from infection control staff by the project team in design matters and the build of QEUH/RHC?

**A** I was not generally involved in design matters as most design issues had been addressed prior to my secondment to the project team. I believe that during the early stages of the design Jackie Barmanroy (ICN) was assigned to the project team to support design matters as well as Prof Craig Williams (Lead ICD). There was an Infection control nurse assigned to the project operational commissioning team, but his input was mainly to address ward \department setup with respect to infection control.

d) Describe any involvement you had in respect of room data sheets? Process, relevance etc.

**A** I had no involvement in the room data sheet preparation, this was developed before my secondment to the project. I did use them to verify elements were in place as required.

e) At this time clarify the roles and responsibilities of Currie & Brown, Capita, Mercury, IBI and Multiplex. Describe any involvement you had with these companies.

**A** Please note I was not provided with any formal induction into the project team, I was given a desk and left to review Aconex contract document management system, forge relationships with the various groups and become familiar with the site layout and functionality.

I assume that you are referring to the design stage. My understanding was:

- Currie & Brown: where technical advisors to the Board on design and contract matters. My involvement with Currie & Brown, was to gain insight & familiarisation into the project delivery.
- Capita: were project supervisors under the NEC3 contract, to my knowledge had no design input but were responsible for monitoring and verifying contractual compliance and delivery. I did not have much involvement with Capita until after hand over where they attended routine monthly defect meetings.
- I do not know who IBI are. I had no involvement with IBI.
- Multiplex: where the main contractor under contract for delivery of the project within the NEC3 contract requirements to the Board. I worked with multiplex on site and system familiarisation and technical understanding of the site.
- Mercury: were the M&E sub-contractors to Multiplex and partners in the contract delivery with Multiplex (however did not have a formal contract directly with the Board). I also undertook the role of Authorised Person (AP) High Voltage (HV) for the Board managing safe system of work and issue permits to work HV works under the responsibility and control of the Board.

f) Describe your involvement in any design aspects of the QUEH/ RHC build?

A I had no involvement with the design of the build other than spending one day circa 2007/8 along with Brian Gilespie (Clyde Sector estates Manager) working with Wallace Wittle shadow design team on electrical infrastructure operational issues and requirements for inclusion in the outline specification.

g) Questions for Witness: What is your understanding of the Employers Requirements? What involvement did you have with them/ how did they impact your role during this time?

**A** The Employers Requirements (ERs) were the Board's specification of accommodation and functionality requirements, including clinical details, departmental adjacencies, room data sheets etc, advising the successful contractor of their contractual responsibilities for the design and construction requirements to meet these requirements. Including the hierarchy of statutory, mandatory and guidance documentation that will be applied to the design and construction arrangements. I used these as a baseline for understanding what was being delivered, however it was difficult for me to keep track of variations\amendments to the ERs without reference to the project team.

h) Describe your understanding at this time of BREEAM. How important was BREEAM in the design and build stage?

**A** BREEAM, is a sustainable building and environmental assessment and certification tool used to quantify compliance with building standards requirements for sustainability. The Boards fundamental aim for the building design and construction was to achieve a BREEAM excellent rating, including a low carbon design with a stated energy target of 80Kg CO2/m2/annum. My understanding is that these requirements were paramount.

i) Refer to the ZBP Ventilation Strategy Document (separate document not in bundle). Were you aware of the ZBP Ventilation Strategy document dated 15 December 2009? If so, when did you first become aware of it? Were you consulted? If so, what were your views?

**A** I was not aware of ZBP ventilation strategy document until after patient migration circa late 2015, following concerns raised by ICDs over the

ventilation. I was not consulted on this strategy; I was not seconded to the project team until August 2011

j) When did you first learn of the Agreed Ventilation Derogation i.e., that 2.5 ACH was the agreed rate? When you became aware, to which wards did you understand this to apply to?

**A** I only became aware of this derogation after patient migration late 2015 when questions were being raised by the ICD team. When I carried out an assessment of the ACR for a typical ward single room accommodation in support of Dr Christine Peters to find that the ACR was 2.5 – 3 ACH and 0 differential pressure between the single rooms and the ward corridor. I advised the project team of these findings as a possible contract failure as the SHTM 03-01 guidance requirements are 6 ACH, I was directed to the Clarification log which indicated the acceptance by the project team of the standard room ventilation ACR derogation. With a caveat that the single rooms must be negative pressure to the general ward. Following further questions from ICD\Clinical colleagues over the validity of this derogation the "Ward Ventilation Design strategy" was shared. My understanding is that this derogation applied to all general ward, single room facilities, were chilled beam technology was adopted (most patient rooms)

k) Were your views asked for before the Building Contract was signed in December 2009?

**A** No

l) If you were aware of it and/or consulted about it, what did you think its scope was? e.g. did it apply to all wards in the QEUH/RHC including specialist wards and specialist ventilation and isolation rooms then intended to be included in the hospital, and any specialist facilities to be later added to the hospital before it opened?

**A** I was not aware or consulted on the ventilation strategy and had no input or involvement on the decision to accept this strategy at design stage.

m) Do you have any knowledge of the reasons why GGC would agree to derogate from their Employer's Requirements that said that compliance with SHTM 03-01 was mandatory?

**A** I have no knowledge of why GGC agreed to the proposal against the mandatory compliance with SHTM 03-01.

n) Do you think this agreement had an effect on the safe operation of the hospital?

**A** I believe that the design was implemented in areas that were not designated as general ward accommodation (e.g. RHC ward 2A, respiratory medicine etc) where it would have had an effect of the safe operation of wards not categorised as general wards. The designed installation also did not achieve the derogation requirement of negative pressure from the room to the corridor which introduces the risk of cross infection between rooms.

o) Do you think this agreement continues to have an effect on the safe operation of the hospital?

**A** Assuming that there have been no changes to the conditions reference above, the potential effect on the safe operation of hospital will remain.

**Documents, Paperwork and Processes in Place as at 26th January 2015**

We know that handover of QEUH occurred on 26th January 2015:

31. What contractual documentation would you expect to see in place at handover?

**A** From and operational Estates perspective I would have expected to have access to: A Full system \service\plant description of operation, as fitted schematic diagrams, commissioning certification and documentation, test certificates confirming that the systems had been designed and installed to meet the contractual, statutory and guidance requirements as per the contract higher archie of compliance. (e.g. for domestic hot & cold water: Flow rates, Temperature trend logs, Water quality tests for Bacteriological & Legionellae), Planned Preventive Maintenance (PPM) plan for all systems, associated plant and relevant components i.e. Water storage Tanks\ Calorifiers\ TMV's, etc.

Asset register of all plant and relevant equipment along with unique asset ID (The Asset Register and PPM programme along and itemised PPM task list should have been added to the Boards preferred Computer Aided Facilities Management system (ECIPSE, now FMFirst). Asset IDs should have also been tagged to all items on the asset register.

32. Describe the process for handover of QEUH:

**A** I was not involved in the handover process this was managed by Peter Moir supported by Capita Symonds, Contract Supervisors. I therefore do not have any working knowledge of this process.

a) What contractual documentation was in place?

**A** After hand over I tried to access contractual documents, drawings specifications and commissioning and maintenance data, however the information available within the official Post Completion Documentation (PCD) files were random and sparce, I enquired via David Willson (Brookfield Multiplex Commissioning Manager) when this data would be available and he advised that the contract allowed a 2 month period after contractual Practical Completion for the PCD to be handed over. I checked this with the project team and was advised that this was correct.

b) Was the paperwork you described in place after the 2 month period? If not, why not? Did you escalate any concerns regarding paperwork not being in place, if so, to whom?

**A** Zutec was populated by the sub-contractor to Multiplex at the 2-month mark, and vetted by Multiplex to ensure a consistent standard, however in my view the quality and content was variable. The menu structure was unclear resulting in it being difficult to interrogate and retrieve the data\documents required. Invariably, if multiplex were advised that a document was missing, they would claim to find it in an unrelated section of the archive. I did not believe that all the required PCD documentation was delivered (which has been demonstrated by multiple external agencies providing support to GGC and seeking access to PCD data). I raised this with David Hall\David Loudon

and Peter Moir. I understand that it was Capita's remit to verify and sign off on the PCD, however I believe that they experienced problems with the sheer scale of the task, however I am not aware of the details as I was not party to these actions.

c) How was the relevant paperwork handed over to QEUH?

**A** The PCD files were loaded onto the ZUTEC document management system adopted by Brookfield Multiplex for this purpose, to my knowledge all documents were provided electronically only, there are no paper copies. Point to note: Brookfield also utilised the Zutech system for the asset register and PPM schedule, this was a manual system requiring manual retrieval and feedback, it was not compliant with the contract requirements to adopt and populate this data on to the Boards preferred Computer Aided Facilities Management (CAFM) system.

d) Did you ever raise concerns about this non-compliance? If so, to whom, and what action was taken in response and by whom?

**A** I raised my concerns about the non-compliance with the contract requirements to adopt and populate the Boards CAFM system with David Hall, Peter Moir & David Loudon, to my knowledge this was not addressed contractually. I was instructed to work with IT & Zutec (with the approval of Multiplex) to:

- Rationalise the asset schedule for migration to the Boards CAFM system FMFirst. I spend 18 months working with Eugene Smyth (IT) on the rationalisation of the asset data.
- Conver the PPM paperwork to a PPM format for migration to FMFirst (this element was taken over by Alan Gallagher (Estates GM) in line with his work on the Board wide CAFM strategy)

33. Was the building of the QEUH complete at handover – if not, what was incomplete? Was QEUH ready at handover? If not, why was it not ready at handover? **Refer to Estates Team Bundle, document 3 – 'Stage 3 Adult and Children's Hospital Completion Certificate'** defects noted therein when considering this question.

**A** Having reviewed document 3 above, I do not believe that this completely represents the condition of the building at point of hand over, I don't see any reference to the RHC's status, there were also multiple elements of finishing works required around the Adults building not included within the Capita defect report, unfortunately I cannot recall the detail of these works other than the following major Items:

a. The Energy Centre Combined Heat & Power Plant (CHP) was not handed over until Dec 2015 and was not brought online until Jan 2016.
b. The ETFE Roof burn-off was not operational until Sept 2015.

I am not aware as to why the building was not completed in time for hand over as I was not party to contractual meetings or Board decisions, however I believe that the Board needed to complete handover when it did in order to meet its target dates for migration of patients into the new facility allowing sufficient time for the operational commission programme.

a) In your response you state '*I do not believe that this completely represents the condition of the building at point of hand over'* was this a view you held at the time? If so, what action did you take at the time?

**A** This statement represents my view having reviewed the **Estates Team Bundle, document 3 – 'Stage 3 Adult and Children's Hospital Completion Certificate'**. I did not have access to this at the time of hand over and therefore did not raise any concerns. The project team were aware of the outstanding works and to volume of contractual activity on site after handover.

34. Describe the site when QEUH/RHC at handover in January 2015.

**A** Contract works stopped on the 23rd January with all construction site boundaries and control arrangements removed ready for Hand over on the 26th January 2015. It was clear at that time that the RHC was not complete, with substantial fit out works incomplete in all areas of the building, the RHC

still looked like a construction site. There were also outstanding works required around the Adult hospital, however this building appeared to be complete ready for operational commissioning.

a) Did you expect that RHC would have been completed at handover?

**A** Yes, I would have expected the RHC would have been complete at point of handover.

35. Did Multiplex remain on site? How was this managed, and were records kept of Multiplex staff being on site, if so who was responsible for this and where were such records kept? Did you have any concerns?

**A** The following week after handover, 200+ Multiplex construction workers turned up to carry on with outstanding works including the fitout of the RHC. This level of activity was continued until June/July 2015 when the Children's Hospital was ready for patient migration (Note: Operational commissioning was carried out in parallel to the fitout works where possible). The operational estates team were required to manage the contractor access on site as the building now legally belonged to NHS GG&C. In addition to our Operational commissioning requirements for the build in preparation for Migration this required me and the five new duty managers to:

a. Review and approval all Brookfield Multiplex & sub-contractor Risk Assessments & Method statements (RAMS) for each element of ongoing constructions works.

b. Manage, control and monitor daily contractor access to the site and issue visiting contractor access passes for the specific area's they were designated to work. Records of access were kept in the form of the visitor passes logbook, recording the names of contractors, purpose, location and duration for each visit, these visitor logs were retained in the Estates Management offices. My concerns related to the volume of activity on site by Multiplex and my team's inability to directly supervise and monitor the activity of all their contractors, ensuring that these activities did not clash with the range of works\contractors involved in the operational commissioning activities.

36. At handover who was responsible for ensuring that paperwork was produced to confirm contractual compliance?

**A** My interpretation of this question would be: That David Wilson (Multiplex Commissioning Manager) was responsible for the production and provision of paperwork and certification to confirm contractual compliance, this documentation would then be witnessed, reviewed and verified by Capita Symonds project supervisors' team for presentation to Peter Moir, Project Manager. However, I was not involved in this process and therefore am not able to advise what was missing or how this was managed?

a) Paperwork

**A** John Redmond Lead Contract Supervisor (Capita Symonds)

b) O&M Manuals

**A** John Redmond Lead Contract Supervisor (Capita Symonds)

c) M&E Clarifications Log

**A** Peter Moir (Project Manager)\Alister Fernie (Multiplex Project Director)

d) Others paperwork as per the contract

**A** John Redmond, Lead Contract Supervisor (Capita Symonds).

Provide as much detail as possible – was anything missing? If so, how was this managed?

37. What commissioning and validation documentation for the water system did you see at handover? What commissioning and validation documentation for the ventilation system did you see at handover?

**A** Documentation was not complete at hand over due to the contract clause allowing 2 months for population by Multiplex and its sub-contractors. For water, I remember seen the disinfection method statement, which I shared with Prof Craig Williams for ICD approval as required, I then saw the Microbiological test results and the repeat iterations carried out where tests results were outwith expected limits. These were also shared with Prof

Williams until the results obtained received his approval. I don't remember seeing any other water documents at that time of hand over.
Ventilation Systems: I don't recall if the ventilation Commissioning reports were available to me at the point of hand over or 2 months later in line with the contract PCD clause? However I do recall seeing the H&V Commissioning reports for ventilation systems as well as the Medical Air Technology (MAT) commissioning reports for Ultra Clean Ventilation (UVC) terminals within Theatres etc.

a) What is the difference between commissioning and validation?

**A** From SHTM 03-01 Part A:
Commissioning - Commissioning is the process of advancing a system from physical completion to an operating condition.
Validation - A process of proving that the system is fit for purpose and achieves the operating performance originally specified. It will normally be a condition of contract that "The system will be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life."

b) What documentation would you expect to be available for both the water and ventilation systems?

**A** For Water: I would expect to see commission data in line with the requirements of SHTM 04-01 Pt A: "Water safety for healthcare premises Part A"
For Ventilation: I would expect to see commission data in line with the requirements of SHTM 03-01 Pt A:" Ventilation for healthcare premises Part A – Design and validation".

c) Did you see this commissioning data? What concerns, if any, did you raise in respect of lack of commissioning data for water and ventilation, and with whom? What action, if any, was taken and by whom?

**A** At the point of hand over this detail was not available, I advised the project team of the lack of data and was advised that the contract allowed for a 2-

month population period, I am not aware of any further action being taken over the commissioning data.

d) Did you see the validation data for both the water and ventilation system? What concerns, if any, did you raise in respect of lack of validation data for water and ventilation, and with whom? What action, if any, was taken and by whom?

**A** I did not see the validation data at the point of hand over as it was not populated on the PCD ZUTEC system at that time and don't recall seeing separate validation data later. I had expected that validation had been carried out and accepted as fit for purpose by Capita in-order for the board to accept hand over and therefore do not recall raising any concerns over separate validation.

e) Who was responsible for this documentation?

**A** Multiplex was responsible for the provision of the data, however this was largely delegated to their sub-contractors to populate Zutec, this was not done in a consistent manner and Multiplex were then responsible for sense checking the uploaded data. I Believe that Capita Symonds were responsible to verifying the PCD content to the Project Manager. I think there may have been issues regarding the size and scale of this task, however I am not sure how this was resolve with the Project manager.

f) What was your role?

**A** I had no involvement in the project sign off of documentation, my role was to access the data available as required to take the building into operation.

g) Were you ever aware of commissioning and validation having been carried out?

**A** Yes, commissioning dates where issued to the project team in advance to allow for suitable client representation and witnessing. However I was not in the co-hort of client representatives.

h) What about validation?

**A** I don’t recall ever seeing any notices regarding validation.

i) If not, why were you not aware of commissioning and validation having been carried out?

**A** I was aware of the commissioning being carried out, but I was not included or involved in the commissioning\validation process and therefore did not have access to the results prior to handover.

38. Was any other paperwork missing at handover? If so, would you consider this missing paperwork to be of importance?

**A** Invariably any information that was required we needed assistance from Multiplex to source or find, documents were not always in the section of Zutec you would expect to find it, therefore it is difficult to quantity what was missing?

39. Operating systems at handover:

a) How many staff were allocated to maintaining operating systems and how was this determined?

**A** Approximately 2 months before handover, 5 supervisors previously recruited internally for fast-track estates management development programme were re-deployed from their substantive roles on other sites, to take up their new posts at the QEUH campus. Their initial role was to support me in managing the site after hand over and operational commissioning works on a Day shift basis until migration was complete, then they would take up their roles as shift duty managers providing 24/7 on site support. Their initial task was to become familiar with the site\infrastructure and services, supported by me and taking part in the Multiplex familiarisation training. In addition we were allocated 2 Maintenance staff from agency recruitment on a temporary basis to support operational commissioning works. All other staff were scheduled for redeployment to the QEUH for phased transfer as and when each of the demitting sites completed their patient migration. This meant that we had a skeleton staff at the QEUH until June/July 2015. After full Migration was complete most of the redeployed staff transferred, however a small number

were retained at their demitting sites for a period to assist in site closure decommissioning. There were circa 52 staff allocated to the QEUH Adults & Childrens complex made up of 5 off rotary shift duty managers, 1 off day shift manager, 1 off day shift planning supervisor, 20 of rotary shift M&E technicians and 24 M&E Technicians\Maintenance assistants. These numbers were part of the overall team of 80 supporting the whole campus including retained Estate. The staffing levels were determined within the Maintenance Strategy paper prepared by me for David Loudon (Project Director/Director of Facilities), The staffing levels identified within the initial paper was circa 111 WTE (Including Management), based on a previous GG&C statutory compliance formula included within a previous consultancy report. And modelled against the Whole life Cycle Cost (WLCC) Model prepared by Multiplex under QEUH contract requirements. David Loudon presented this paper to Robert Caulderwood (CEO). I was later advised by David Loudon that the CEO instructed that the Outline Business case had a built maintenance budget of £4.8m and that was what we had to work to. I therefore had to rework the Maintenance Strategy known as the affordability model, which reduced both the staffing compliment and the operating budget in line with the imposed budget. The final Budget £5.8m. was utilised following work with the Facilities Head of Finance.

b) What training was put in place for maintaining the operating systems?

**A** The Contract included a schedule of client training, however this did not allow for maintenance training it only provided familiarisation training for service infrastructure, and plant layout\configuration. I asked Multiplex about more detailed training for operation and maintenance but was advised that technical staff were expected to be competent in their respective trades and have a basic knowledge of building services.

**c)** Who carried out the training? **Refer to Estates Team Bundle document 5 – 'Brookfield Multiplex Client Training & Familiarisation Register for Ventilation'.**

**A** The training was managed by Multiplex and delivered by a combination of Multiplex\Mercury project staff along with specialist\supplier\installer contractors where Multiplex deemed appropriate.

d) Were Multiplex involved in the training?

**A** Yes, Multiplex developed and managed the programme and provided instructors for Multiplex delivered systems supported by instructors from Mercury as well as instructors from specialist equipment suppliers\installers where Multiplex deemed appropriate.

e) Was sufficient training provided to allow staff to operate the systems?

**A** Not in all cases, there were gaps in understanding of system interface\control panels, this was partly due to the restricted numbers of staff made available for training, requiring to be released from their demitting sites for regular training sessions over an extended period of time. Equally my small operational commissioning team and I, struggled to attend all sessions that we would have liked to have attended due to our commitment and volume of works during the Operational commissioning period, when the training was being carried out. Therefore attendance was generally in lower numbers than I would have liked.

f) Did you ever raise concerns about the lack of training or ability to attend training? What, if anything, was done in response?

**A** I did raise concerns with Multiplex over the depth of training as I had expected more than just an overview\familiarisation, I was advised that this was agreed by the Board, I raised this with the project team, and this was confirmed. I also raised the issue over the short timeline for the delivery of the training during Operational commissioning and the competing pressures, but other than some session date adjustments the programme delivery schedule was fixed.

g) Please describe the manuals/ documents that were handed over.

**A** In each session, the instructor issued a folder containing a written description of the topic covered along with supporting details such as schematics, key component data, manufacturers operating guides and references.

40. What was your involvement/ role in the handover process? How did you manage this?

**A** I was not involved in the handover process, this was a contract process and I was held at arm's length from project contract issues.

41. Who signed the completion certificates?

**A** I believe that the completion certificates were signed off by the Contract supervisor's team from Capita Symonds and or Peter Moir (Project Manager)

42. Who was the person with the responsibility to sign the completion certificates under the contract?

**A** I Believe this was the Project Manager Peter Moir.

43. **Estates Team Bundle, document 3 – 'Stage 3 Adult and Children's Hospital Completion Certificate'**:

(i) What is this?

**A** This is the "Stage three- Adult & Childrens Hospital Sectional Completion Certificate" I believe that this completion certificate indicates the client's acceptance that the contract has been brought to Practical Completion Stage.

(ii) Have you seen it before?

**A** No

(iii) Have you seen other such certificates?

**A** No

(iv) Who signed off these certificates?

**A** From document 3 above, it would appear to be: John Redmond Contract Supervisor (Capita Symonds) and Peter Moir (Client Project Manager)

(v) What checks were carried out prior to sign off?

**A** I don't have any knowledge of the checks carried out prior to sign off other than what might be included in the contract supervisors report?

(vi) What was your role/ responsibility?

**A** I had no role or responsibility in contract sign off.

(vii) Looking at the defects referred to in the completion certificate documents 3 above: Look also at Estates Team Bundle, document 4 – 'Capita NEC3 Supervisor's Report (No 46)':

(i) What are these defects?

**A** Generally most of the items reported as defects appear to be incomplete contract work, however I don't see any reference to the incomplete works for the RHC. Items 45 – 49 are defect works reported prior to hand over date. Items 14 & 34 are Project managers' instructions not defects (however it depends on when these were issued as to the expected status). I also notice that the energy model evidence of compliance with Energy targets is recorded as complete 20/2/2017, to my knowledge this was still outstanding when I retired July 2019, as it was affected by the ongoing failures of the CHP plant to deliver on expected outputs.

(ii) What was the impact of these defects?

**A** The Impact was ongoing contract continued works during Operational commissioning phase causing disruption to the mobilisation of the operational equipping and setting up of the hospital. I am not able to comment on the contractual impact.

(iii) Why two years to deal with the defects?

**A** The contract included a 2 year defect liability period, therefore Multiplex aim would be to have all agreed defects addressed and completed by January 26th, 2017.

(iv) Who decided that it was appropriate to accept handover with outstanding defects?

**A** I am not aware of the who made this decision, this would have been decided at Board level or between the CEO and DoF?

(v) Is this usual practice in the construction industry?

**A** It is not normal to accept practical completion with outstanding contractual works, as this would normally involve contractual penalties if the contract has over run on the agreed completion date.

44. **Refer to Estates Team Bundle, document 8 – 'Programme for handover to start of migration':**

(i) Do you know what this is?

**A** Yes, this was the programme for operational commissioning and preparation for Migration of patients from the demitting sites. Overall time scale was three months.

(ii) Have you seen it before?

**A** Yes.

(iii) What are the numerous defects?

**A** I don't recognise the high numbers of issues covered in Items 21 – 37 they seem to be managed by Heather Griffin (Project Manager) & Mairi McLeod (Project Manager). Items 39 – 93 are the issues detailed in the Completion certificate (Document 3) and or NEC3 Supervisors Report No46 (Document 4). Items 94 – 110 appear to be additional works for Multiplex to be defined by Heather Griffin (Project Manager) & Mairi McLeod (Project Manager).

(iv) What is your understanding of the purpose of this document?

**A** The purpose of this document is to programme and monitor progress of the works required to be complete during operational commissioning and equipping of the site ready for migration of patients from the demitting sites, all within the specified 3 month window.

(v) What comments if any do you have regarding the number of defects?

**A** I don't recall this number of defects at the time on the initial working version, I suspect that items 39 – 93 may be minor snagging issues identified during NHS Operational commissioning? Would need to see the detail of these items to response in more detail.

(vi) To what extent were you aware of this document at handover?

**A** This Document was shared at the weekly project management meeting ahead of hand over and tasks allocated to each member of the team before handover date to allow preparations for starting on hand over.

(vii) If not, should you have been aware of this document at handover?

**A** N\A

45. What did the contract say about retention of certain parts at handover? Was this enforced and why?

**A** I am not able to answer this question.

46. To what extent did Multiplex retain responsibility for the build following handover? Did Multiplex give any warranties? What were the terms of any warranty relating to Multiplex's work? How long was the warranty period following handover in January 2015?

**A** Multiplex did not retain any responsibility for the building after handover, although they did provide support under the contract known as soft landings, this was a hand holding exercise to allow time for NHS staff to settle-in and become familiar with the building this was for a period of 6 weeks, for example this included continuing with the hot and cold water flushing programme during this 6 week window. The warranties for the project were built into the contract for a period of 2 years ending 26 Jan 2017. NHS GG&C were now the owners of the building including the RHC where fitting out was ongoing.

47. How many companies have on-going responsibility following handover? If so, describe the responsibilities of the companies. How long post-handover were the other companies involved for?

**A** Multiplex and Mercury (M&E Contractor) had a joint contract liability although the Board Contract was with Multiplex, both companies remained present during the 2 year warranty, and would call in sub-contractor to the contract as and when required.

48. What concerns, if any, did you have about the opening of the hospital after handover? **Refer to Estates Team Bundle, documents 19 and 21 and 21.1** when answering.

**A** At the point of hand over the biggest issue that was immediate to me was the status of the RHC, this was still in a fitout condition. The secondary VIE plant located at the Maternity unit was not in place and therefore the MGPS Oxygen resilience was not in place. The issues raised in my e-mail (document 19) initiated June 7th, 2015, following handover, were all defects under the contract and only became apparent once the adult's hospital was occupied. Of the issues raised in Document 19 the most concerning was the PTS impact and ongoing PTS design and control issues. Ward 4B heating turned out not to be passing valves but a control wiring issue where the cables supplying the control valve throughout the ward where inducing a low voltage from surrounding services causing the actuator control valves to hold open, this was Identified using the Boards maintenance support contract with Schneider, the cable replacement was carried out by inhouse staff during the Christmas 2016 holiday, with the ward closed. The issues raised in Document 21 Early Warning (EW) process are mainly Project Manager instructions for variations and\or additional works to contract. There were also mass failures of MTHW flexible pipe push fit connections around that adult hospital resulting in high temperature water flooding of the areas affected, these push fit connections proved to be unable to cope with the MTHW pressure (Circ 4 bar), all flexible push fit connections were replaced across the site by flexible mechanical pipe connections prior to patient migration.

(a) Was there anything missing that you thought should have been constructed/installed? If so, please describe what was missing.

**A** Yes, the Energy Centre CHP plant was not in an operational condition due to design issues, it was almost a year before this plant was in a position to be brought online (Dec 2016) and did not go live until Jan 2017. I prepared a paper for David Loudon (DoF) detailing the lost revenue as a result of this delay. The CHP plant also did not perform as intended with output approximate 60% of design, the fluctuation (hunting) operation of the CHP plant also had a detrimental impact on the operation of the direct fired boiler

plant impacting on the stability of MTHW temperature affecting heat transfer levels for heating and DHW. This issue was still under dispute with Multiplex when I retired in 2019.

I believe that due to the size and complexity of the domestic hot and cold-water systems that water treatment plant should have been included in the system design and installation, this would have been a more practical, manageable and affordable way to maintain water quality.

The RHC ward 2A HEPA filters and associated range of issues surrounding the adoption of the PPVL design for Neutropenic patients.

(i) What action, if any, was taken, and by whom, following your paper for David Loudon?

**A** My understanding is that financial loss was raised by David Loudon at a contractual review meeting with Multiplex, and it was agreed that the loss would be offset against additional contractual costs to the Board.

(b) Did you have any other concerns about areas of the hospital at handover?

**A** Yes, as part of my operational commissioning requirements at hand over 1: I highlighted to David Loudon (Project Director/DoF) at the weekly project meeting that Multiplex were responsible for the provision of a pre-occupancy Water Risk Assessment, but this had not been provided. I believe that David raised this with Multiplex following which he instructed me to arrange for the Risk Assessment. 2 I had also engaged Zurich Engineering as Competent Persons (CP) Pressure Systems, to undertake the production and certification of our Witten Scheme of Examination (WSE) under the requirements of the Pressure Safety Systems Regulations (PSSR) 2000, pre-migration. During the system assessment and preparation of the WSE, I was advised by the CP (Brian Baldasara) that there were several items of plant as well as the onsite manufactured pipework that did not have certificates of conformity under the requirements of the EU Pressure Equipment Directive (PED) and as such he could not be included in the WSE. All plant issues where address and ready for inclusion of the WSE before the migration date, however Multiplex\Mercury could not provide the required certificates of conformity or supporting evidence of the onsite manufacturing process, I on behalf of the board had to

instruct Zurich to undertake a risk assessment of the MTHW pipework installation, from this a list of defects was produced for rectification by Mercury. Once these works were completed and assessed by the Board CP, the pipework risk assessment was underwritten by Zurich and added to the written scheme satisfying the boards legal requirements under PSSR, however PED status of the pipework remains unresolved as a non-compliance under Multiplex\Mercury duty.

49. Refer to **Estates Team Bundle, document 22** at the point of patient migration Mhairi Lloyd states that there were rooms/ areas 'not yet fit for purpose': Look also to **Estates Team Bundle, document 19:**

a) Detail your understanding of the concerns – namely what the concerns were any why?

**A** The decontamination room concerned was constructed for dealing with patients contaminated when exposed to Hazchem agents etc. I remember being involved in this room reviewing the issues with Christine Peters and separately with a member of the ED team (Can't remember her name). The aim of Christine and the ED team was to utilise the decontamination isolation facility for housing and initial assessment of VHF & MER patients, this requires the area to be isolated from the general population within the department to avoid potential cross infection. The concerns raised were around the status\condition of the Decontamination suite and its suitability for the proposed additional functionality. From the correspondence this seems to be premised on the ceiling being open and the ventilation being off.

b) Your involvement with the dealing with any concerns?

**A** I remember reviewing the requirements with Christine and the ED manager separately and establishing the operating conditions of the suite room, I can't recall the exact design requirements for the suite but from memory the suite was designed to be -ve pressure to the adjacent spaces with separate ventilation (I would think the extract would be HEPA filtered? but can't remember that detail.) the room was also connected to the general drainage system with a divertor valve taking discharge water to a separation tank when activated prior to a decontamination event from a dedicated control panel in

the decontamination room. Following discharge to this tank the tank requires to be emptied as licenced hazardous waste, ( I provided this detail to the ED team as the hazardous materials need to be identified before transportation) the control panel warned when the tank required decant\disposal. This is the separation tank and decontamination room identified in the **Estates team Bundle, Document 3 - Stage 3 Adult and Childrens Hospital Sectional Completion Certificate, Schedule of Incomplete works item 5 – Separation Tank**, Noted as Complete 13/3/2015 and Item 16 – Decontamination room, noted complete 28\2\2015, however the NEC 3 supervisors report No 46, Feb 2015 states that Item 16 is dependent upon tank installation? The room also had external ambulance access to avoid transferring potentially contaminated patients through unprotected areas.

c) If so, how matters were resolved prior to patient migration?

**A** I believe that although the separation tank had been fitted there where control interface compatibility problems between the control panel and the tank diversion control valve, Colin Grindly Multiplex M&E manager) was dealing this issue as a defect. There were also concerns about the electronic door lock as the door defaulted to open on several occasions presenting a potential containment issue. Unfortunately, I can't recall the date this was resolved but I would estimate this was June\July 2015.

d) Who signed off prior to patient migration?

**A** I am not sure who would have signed this element off but would expect it to be Capita Symonds\Peter Moir.

50. Detail the snagging process, refer to Estates Team Bundle, documents 90 and 91 when considering your answer detail:

a) What happened

b) How long were Multiplex on site following handover?

c) Main areas for snagging

d) Records of works carried out

e) Sign off – who as responsible and when signed off.

**A** I do not recognise the Wallace Whittle defect observations listed in documents 90 & 91, this was not shared with me. The snagging process from an operational Estates\Facilities point of view was that any member of our team could log a defect on to the online defect report tool similar to those shown in Documents 90 & 91, Before we logged a defect we had to check the issue was in our opinion a contract defect, were this was not confirmed Multiplex would return the task for confirmation. Once logged Capital Symonds would apply a defect log ref number and issue the defect to Multiplex. Multiplex would investigate and if they agreed it was a defect would address the matter or delegate to the appropriate sub-contractor. Access to site to addresses these defects was managed through the Estates Contractor log\ID system. If Multiplex did not agree the issue was a defect they would close the matter down on the log accordingly. Regular post completion works (defects) meetings were held, chaired by a Project\Capital team manager supported by Capita Symonds and attended by various members of the Multiplex team and the QEUH Estates team, these meetings were minuted. Multiplex were on site for 12 – 18 months eventually taking offices off site but close by. Snagging was widespread and diverse, I couldn't say what the main areas were after all this time. Records of works carried out would start from the defect log unique reference number, from there Capita Symonds would have the detailed records. The defect would be referred back to the person who raised it to confirm their satisfaction that it was complete for formal sign off by Capita Symonds. I am not sure what the Vetting\oversight was from the Project Manager (however the project team were quickly disbanded 6 -9 months after hand over) and redeployed to other roles.

51. Refer to Estates Team Bundle, document 132 with the benefit of hindsight do you agree with Frances Wrath's comments that all area were commissioned in line with Employer's Requirements?

**A** No, I would not agree. I think this is indicative that the project team were under the belief that the system had been commissioned in line with Employers requirements however it is now clear that the commissioning and Validation processes did not follow guidance documentation requirements, these failings only coming to light over the various investigations carried out retrospectively.

**Wards and Hospital Occupation from January 2015**

52. At the point of taking occupation of QEUH/RHC on 26th January 2015 please confirm whether the following wards were fully handed over from Multiplex to NHS GGC:
Ward 2A/2B
Ward 4B
Ward 4C
Ward 6A
Ward 6C

**A** 2A/B RHC, were not handed over on this date, ward 4b (BMTU) was handed over but due to design compliance issues for the BMTU function the ward was used as a general winter pressures ward until a remodelling plan was put in place with Multiplex by Peter Moir. I think wards 4C, 6A or 6C (Adults) were handed over as I don't recall any issues with these wards at that time.?

53. Please also confirm your understanding of the ward specification and patient cohort to be located in each ward.

**A** Ward 2A (Schiehallion): Housed 3 patient cohorts, namely:
Haemato-oncology Isolation suite for Neutropenic\immuno compromised patients, Isolation facilities designed to PPVL standard.
Teenage Cancer Trust (TCT) Haemato-oncology unit designed as general ward with general ventilation design.

Children's Haemato-oncology ward designed as general ward with general ventilation design.
Ward 2B: Haemato-Oncology Day unit, designed as a general ward with general ventilation design.
Ward 4B (Adults): Initial design under the contract as a general ward, at some point well into contract fit out but before handover the Board requested this ward be converted to accommodate BMTU patients from Gartnavel. The ward was altered to provide single isolation room accommodation using the principles of SHPN 04 supplement 1 for the design alterations, with HEPA filtered air provided to all rooms from an existing central AHU plant, there were no protective lobbies and the ACR improved to circa 6ACH as opposed to the initial general ward 3ACH.
Ward 4C (Adults): designated as a Renal ward designed as a general ward with general ventilation design.
Ward 6A & 6B: I can't recall the patient cohort in these wards, but they were designed as general wards with general ventilation design.

54. If a ward or wards were not handed over on 26th January 2015, or were partially handed over, please confirm:

a) Why they were held back?

**A** Wards 2A & B were held back because the building and indeed these wards were not complete at handover.

b) Any financial consequence to both Multiplex and NHS GGC of the ward(s) being held back?

**A** I am not able to answer this question.

c) What works were carried out in order to allow this ward(s) to be handed over the NHS GGC?

**A** Building and ward fitting out.

55. Were any other wards, aside from those referred to above, retained? Answer as above?

**A** All Wards within the RHC were not included in the handover 26th Jan 2015.

56. We know that the energy centre was retained by Multiplex

a) Why was the energy centre retained?

**A** My recollection was that the energy centre was partially handed over to allow day to day operation of the campus, the area retained related to the CHP plant which had not yet been fully installed and commission at handover, this was not achieved until Dec 2015 and did not go live until Jan 2016.

b) What financial consequences, if any, arose for either Multiplex or NHS GGC if the energy centre was retained?

**A** I prepared a paper for David Loudon at the time indicating what the financial revenue impact was to the Board of not having the CHP plant online this was Circa £1m for the projected period of down time.

c) What works were carried out to allow hand over of the energy centre to NHS GGC?

**A** Full installation and commissioning of the CHP plant, this was not achieved until Dec 2015 and did not go live until Jan 2016. There was also another issue that arose from the PSSR inspections for the written scheme which Identified that the safety valve discharge from the MTHW boilers discharged to the boiler house floor, and this was a PSSR\H&S contravention. Multiplex had to redesign the discharge arrangements to run pipe work to a new bulk buffer tank for any safety valve discharge to be collected safely, the contents then needed to cool before they could be discharged to Drain. This also then required to be included in the PPC permeant management arrangements due to potential environmental impact.

57. Were any other parts of the hospital retained by Multiplex pending works being carried out? Why? What works required to be carried out prior to them being handed over?

**A** Other than the RHC and those detailed in **Estates Team Bundle, Document 3 – Stage 3 Adult & Children's Hospital Completion Certificate** I cannot think of any!

58. At the point of handover on 26th January 2015 how satisfied were you that all areas accepted by NHS GGC were designed to the intended specification and suitable for the intended patient cohort, meeting all the relevant guidance requirements?

**A** On the understanding that the Project Supervisor and the Project Manager where satisfied, I had no reason at that stage to be concerned.

59. If not, why were the wards handed over? Were any issues escalated to more senior management/ Board level? Please confirm.

**A** I do not recall having or escalating any issue regarding the specification\suitability of areas for the intended patient cohorts at the point of handover.

**Asset Tagging**

60. Describe and detail asset tagging:

a) What is this?

**A** An Asset register of all tangible assets and sub assets should be compiled for the development and programming of a full maintenance plan, each Item recorded on the asset register should be allocated a unique asset number and using this asset number an asset tag should be produced with a QR code and readable asset number and physical attached to the asset in and accessible location. The details of each asset should also be recorded in the Computer Aided Facilities Management (CAFM) asset register against the asset number.

b) Why is this important?

**A** This is important as the asset ID is used to assign all maintenance and repair tasks and record activities\actions for each asset on the estate.

c) Who was responsible?

**A** Under the contract Multiplex were responsible for the creation of the asset register, asset tagging development and population of a full PPM plan for all assets and its upload to the Boards preferred CAFM system, at the time of

handover the Board had fully adopted the FMFirst CAFM system. The contract also required Multiplex to provide the hardware required to run this system i.e. PC's, Handheld QR code readers and PDA's etc.

d) What was the impact if this was not done?

**A** If the asset register is not available and interfaced with the Asset management system within the Boards CAFM platform at the point of handover then the building maintenance requirements for its building fabric, infrastructure, services, plant and equipment cannot be effectively managed and recorded, this is particularly important on a project\property of this size, scale and complexity. It should be noted that the preparation and development of this level of data, maintenance planning and population of the CAFM system would take 18-24 months.

e) What concerns, if any, did you have about this?

**A** I was concerned the Asset Register was stand alone on Zutec, none of the assets in ether the Laboratory Medicine or the QEUH had been asset tagged, and that the PPM that had been produced on Zutec only included manufacturers maintenance requirements and did not include Statutory and NHS Mandatory PPM requirements. I was also concerned that the PPM data on Zutec did not appear to be in a readily manageable format. It was difficult to see how this could be utilised effectively. I was concerned that we would not be in a position to implement a fully functioning PPM programme for the new facility.

(i) Were you in a position to fully implement a fully functioning Planned Preventative Maintenance Programme in the circumstances? If not, what was the impact?

**A** No, we could not implement a fully functioning PPM, the impact of this was added pressure on the Estates managers to carry out key maintenance tasks manually. The impact being that it was difficult to manage and keep track of activity and that inevitably not all PPM requitements were addressed.

f) Did you escalate these concerns? If not, why not?

**A** Yes, I escalated these concerns via the project team, David Loudon, Peter Moir & David Hall Technical Advisor to the Board (Currie & Brown). I also advised Mary Anne Kane as Acting Director of Facilities.

g) Discuss any issues regarding asset tagging and how you managed this?

**A** Following hand over of the Laboratory Medicine I worked with our IT department, Pat McGrorry\Eugene Smyth, David Wilson (Multiplex), Zutec software team, & Asckey (FMFirst Platform team) to co-ordinate the preparation of existing data on Zutec for migration to FMFirst. The asset tagging element required me to work with Eugene Smyth (IT) to rationalise the asset schedule provided by multiplex into an asset register of tangible and maintainable items. Once the tangible asset register was completed, unique asset numbers needed be generated. Each asset number is made up of details of the asset location i.e. Site code\Block code\floor level\department code and room\space ID along with a final unique item code. This detail had to be extracted from Zutec for the coding structure to be developed by population of the FMFirst conversion template which was designed and developed specially for this task following joint working group meetings involving myself\Eugene Smyth\Asckey Data\ David Wilson & Zutec team. Extraction and conversion of this data along with an estimated number of assets allowed for the production of a set of unique asset tags by Asckey Data, these were issue to Multiplex for application to the relevant assets. This took a substantial period of time to complete from memory Multiplex did not complete the deployment of asset tags until near the end of 2016.

61. Was there a contractual requirement to provide CAMF?

**A** No: The CAFM system (FMFirst) was already being rolled out across by the Board across the existing Estate, The contract requirement under the Employers Requirements (ER's) was to provide a fully a comprehensive Asset register and PPM system integrated with a MiCAD as fitted drawing mapping tool and interface these with the Boards Labour Management System and CAFM platform. At the time the ER's were issued the Board were evaluating

which of the two legacy CAFM systems Apollo or Eclipse it would adopt Board wide, with the final decision being Eclipse (now known as FMFirst).

a) Again, what is the purpose of this and who was responsible for providing this?

**A** The CAFM system is the software platform that contains an integrated suite of Facilities Management tools (i.e. Asset register, Asset Tagging tools, PPM planning and flexible scheduling, Labour Management System (LMS), Electronic Task Assignment via PDA, Asset documentation data links, ward\department electronic fault logging with automatic status reporting, interface with the Domestic Monitoring Tool & the National Health Environmental Inspection (HEI) programme for real time reporting of clinical environmental issues). This allows the Facilities management teams to manage, plan and coordinate resources to workload and automatically reschedule PPM\Defect tasks to meet demand and prioritise against resource, it maintains records of activity and prioritises task in relation to urgency. It also allows for direct electronic reporting of issues for wards and departments with real time electronic feedback on the status of their request. In addition the CAFM can provide performance reports in various modes and formats. This is an essential tool for the effective management of the Facilities Estate. NHS GG&C had already selected and rolled out the Eclipse (FMFirst) CAFM system across all its existing Estate, therefore NHS GG&C were responsible for this platform, Multiplex were responsible for its population with data for the QEUH.

b) How does ZUTEC differ from CAMF?

**A** Zutec is a document management system used for storing large amounts of data relating to a project, i.e. final PCD containing as-fitted drawings, commissioning documents, manufacturers data, system\plant operating data, all of information that is required as part of the Post Commissioning Documentation (PCD). CAFM is much more than this it is an interactive Facilities Management tool (see Item 60a above for CAFM functionality).

c) Should both CAMF and ZUTEC have been provided at handover?

**A** Yes: however the ER's specified MiCAD for the Zutec function, I am not aware if there was any agreed change to this requirement between the Board and Multiplex?

(i) Who was responsible for ensuring provision of CAMF and ZUTEC?

**A** The Board were responsible for providing the CAFM platform, Multiplex were responsible for populating it with the required asset register\PPM content. Multiplex were also responsible for providing the Zutec platform for PCD hand over.

(ii) What were the consequences of these not being provided?

**A** Multiplex did not adopt and populate FMFirst as required in the ER's (Contract) this was detrimental to the Boards ability to implement and carry out the required PPM plan from the outset. The adoption of Zutec as an ineffective version of a CAFM system complicated and severely delayed actioning an effective PPM plan. The adoption of Zutec as the Drawing register\PCD platform while this element also did not meet with the ER's\Contract requirement the PCD\drawing data was accessible depending upon if and where it was populated within the menu driven system. However it did not integrate with the LMS\CAFM platform as was intended under the ER's by the use of MiCAD.

(iii) What action was taken to remedy matters? Were Multiplex contacted?

**A** I am not aware of what contractual steps were taken to address this with Multiplex, However as described above with the support and agreement of the Project\FM Director, I lead the review\Integration of asset data\Tagging requirements in conjunction with Specialist systems where manufacturers or agents were required provided support and records for the Planned maintenance they carried out, a manual PPM process was implemented for critical systems such as Critical ventilation systems etc. A plan of action was taken forward by Alan Gallacher (Estates General Manager) to complete the migration of the refined asset register to FMFirst while working to develop the industry standard PPM protocols in partnership with FM First and (SFG20).

62. Provide information on any issues in relation to CAMF and ZUTEC

a) Operation?

**A** The Zutec PPM plan contained on Zutec was unworkable, After the PPM plan was made available on Zutec, I asked Darryl Conner and Paul McAlister (Duty Managers) to run a test on the software to establish if we could operate the system as provided after 2 weeks, they both came back and advised that the system was not suitable or workable for our needs.

b) User suitability?

**A** The Zutech Model was not automated and therefore would require excessive Supervisory Input to extract PPMs with no mechanism for feeding back on the plant\equipment status or records of works completed, actions taken, or further actions required. It also required technical staff to work with paper job lines and task specifications rather than the intended automated job transmission via electronic LMS PDA's (which the contract required Multiplex to supply). All in all we did not have the staffing resources to manage the non-compliant ZUTEC offering from Multiplex.

c) Any other matters?

**A** The system offered did not allow for and was not capable of integration with other systems required by the Boards existing LMS\CAFM platform and there was no mechanism to measure or monitor performance. I was also concern that the PPM provided was only related to Manufacturers recommendations and it did not cover the Statutory and NHS mandatory PPM requirements within the health Care settings. These issues were reported to the director (David Loudon) and remedial actions taken by the Board to convert and migrate the data available into the FM First LMS\CAFM platform, with respect to the Statutory & Mandatory PPM requirements Multiplex advised they would carry this out if the Board specified and detailed the statutory and Mandatory Requirements (this was not what was intended in the ER's or contract requirements. It was decided that the Board would seek to adopt an industry standard approach for the generation of Statutory and Mandatory PPM to meet our requirements via the SFG20 platform and integrate this with FM first, Alan Gallacher took this forward as the Board lead on the roll out of FM First.

63. Did your team or NHS IT develop a system for asset registration?

a) If so, when and how long did it take following handover.

**A** I worked with IT & Asckey Data to develop the data conversion templates Eugene Smyth and the IT team then converted the Zutec data via these templates for upload to FMFirst. I also worked with Eugene Smyth to rationalise the asset register provided by Multiplex to a register representing maintainable assets. This process took about 18 months of repeated iterations before it was agreed the asset register was ready.

**HEPA Filters**

64. Were HEPA filters installed in the relevant rooms at handover (January 2015)?

**A** Yes, Hepa Filters were installed in some of the CCU PPVL isolation room extract systems, Known as safe change units. The reason for these is that Multiplex design could not ensure extract discharge at 3m above the hight of the building, therefore HEPA filters were used as a protective mitigation to this requirement. However were no Terminal HEPA filters installed in any of the supply terminals of PPVL isolation suites at point of hand over.

65. What issues, if any, were there with HEPA filters? **Refer to Estates Team Bundle, document 22.**

**A** HEPA filters had not been installed in the terminal supply grilles of any of the PPVL isolation rooms across the Adults or Childrens Hospitals.

66. If so, what issues were you aware of?

**A** The above Document 22 is referring to the status of the chemical decontamination room with adult ED, as previously advised this room was not complete at handover and is recorded as incomplete defects on the stage 3 Adult & Childrens Sectional Completion Certificate defects items 5 & 16 regarding the separation tank install, If I recall the room was not complete at the time of the correspondence in document 22, the tank had been installed but there were issues with the control panel for the waste water diverter valve in the decontamination room itself. From memory I think if the control panel interfaced with the extract to create the -ve pressure. I don't have access to

records or drawings to verify this. I recall liaising with Colin Grindley M&E manager Multiplex to resolve this (as a recorded defect at handover).

67. Dr Gibson in her statement refers to HEPA filters not being in place at the point of handover in wards 2A/B.

a) To what extent, if any, do you agree with Dr Gibson's statement above concerning HEPA filters?

**A** I agree with Dr Gibson that ward 2A PPVL isolation rooms did not have terminal HEPA filters fitted to the air supply terminals in the positive pressured ventilated lobbies. Ward 2A Heamato oncology and TCT units were designed with general ward ventilation with Chilled beam technology did not have HEPA filter capability. The supply air in these rooms was introduced via chilled beams, filtration for these wards was housed in the central Air Handling Unit (AHU) and was rated at F7. Ward 2b was also designed general ward ventilation including chilled beam and no HEPA filters.

b) What was the impact of HEPA filters not being installed?

**A** The impact on the isolation room, was that the supply air was not of suitable quality, the PPVL individual AHUs had not been commissioned against the additional resistance of the HEPA for the intended patient group and the PPVL isolation rooms were not ready to house the intended patient group.

c) What was the potential patient impact of the absence of HEPA filters?

**A** The potential impact was that the isolation rooms could not be open to house the Neutropenic patients it was designed for and therefore the affected patients could not migrate from the Yorkhill facility until the HEPA filters were supplied, fitted and integrity tested.

d) What was done to resolve any HEPA filter issues?

**A** When I raised this issue with David Wilson (Multiplex Commissioning Manager) his response was that the PPVL facilities were designed with the option for Source or protective Isolation and it was the responsibility of the client to install these if required, I advised David that these Isolation rooms were designed to house Neutropenic patients and therefore should be fitted to

accommodate the intended patient group from the point of hand over. David Did not change his position. I escalated this to David Loudon who raised it with Alistair Fernie (Multiplex Project Director). I also tried to source HEPA filters from various manufacturers, however none of them held these as stock items due to their short shelf life, therefore they are only available on order with a lead time of 3 months. I also advised David Loudon of this. I then had feedback from David Loudon That Multiplex would address this mater and that they had the appropriate HEPA filters for a project in Ireland and these were being diverted to our project.

e) What filters should have been installed at handover?

**A** Please answer the above, question box provided below.
H12 HEPA filters should have been installed in isolation rooms designated as protective isolation rooms for Neutropenic patients (ward 2A, 8 off PPVL rooms.

f) Dr Penelope Redding tells us in her statement that you said there was 'no request for HEPA filters to be inserted in Ward 2A': To what extent is Dr Redding's statement accurate? Explain your understanding of the position relating to insertion of HEPA filters in Ward 2A:

**A** The requirement in line with SHTM 03-01 the HEPA filter should be of H12 standard (99.5% efficiency). I believe that this statement referred to above would have been in relation to the Haemato-oncology\TCT parts of ward 2A, as the ventilation for these parts of ward 2A were designed and installed as general ward ventilation with design intent of 3ACH due to the design selection of supply air temperature control via chilled beams.

(i) Did having 3ACH in the haemato-oncology/ TCT parts of Ward 2A comply with SHTM03-01? If so, how so?

**A** No.

g) Who was responsible for providing HEPA filters and ensuring that they were installed during the build?

**A** Multiplex were responsible for the supply, Install and commissioning of the HEPA filters within all rooms designed for the accommodation of Neutropenic patients.

h) Who signed off handover without HEPA filters being installed?

**A** I was not party to contract sign off, but from the Stage 3 – Adult & Childrens Sectional Completion Certificate (Document 3) John Redmond (Contract Supervisor) & Peter Moir (Project Manager) signed off on Handover.

i) Were infection control doctors and nurses consulted? If so, who?

**A** I was not party to contract sign off and am not aware if ICD|ICN were party to the contract sign off.

j) Why was handover signed off without HEPA filters?

**A** It should be remembered that the wards in the RHC were not ready on 26th Jan 2015 and therefore in my view could not have been assessed as complete at that time. However I note that Item number 35 of the completion certificate, Project Managers schedule of incomplete works states: Isolation room – HEPA Filters. Although there is no indication on the schedule of location or Defect completion date? I was not party to or aware of the content of this schedule of incomplete works at the time of addressing these issues.

68. Were HEPA filters missing from any other wards following handover?

**A** There are two PPVL isolation rooms in PICU, from Memory a HEPA was fitted retrospectively by Multiplex. This would allow for the housing of A Neutropenic Patient in PICU if they required ICU care, the other room was intended for source Isolation. There were also concerns raised by ICT regarding Placement of patients across the 10 PPVL rooms in adult ICU. Where there were no HEPA filters fitted.

(i) Describe any further action taken in respect of missing HEPA filters, that you have not already discussed in Question 67 above.
I recall HEPA filters being installed in some PPVL rooms in ICU Both Adult and children's hospitals to allow for protective Isolation of Immuno-compromised patients requiring intensive care. Also to assist in the appropriate patient placement.

**Chilled Beams**

69. Tell me about your understanding of the use of chilled beams in areas where immune compromised patients are treated with particular regard to SHTM03-01:

**A** From my experience at the QEUH, my current view on the use of chilled beams in areas where immune compromised patients are being treated is that they should not be adopted within these environments due to:

- The requirement to reduce to ACR to less than the recommended 10ACH for neutropenic patients (SHTM 03-01 Appendix 1).
- The risk of condensation should the chilled water hit dew point.
- The risk of regenerative dust\particles from the space building up on the surface of the heating\cooling coil fins.
- Increase cleaning \maintenance access requirements within the restricted ward environment.

SHTM 03-01 does not refer to the use of chilled beams in area's housing immune compromised patients.

70. Can the witness recall any specific events in relation to chilled beams?
For example:

a) Dripping chilled beams in critical care refer to Estates Team Bundle, document 63.

**A** The issue arose following repairs to failed chilled water pipe, following the repair the Chilled water circuit required to be recharged with inhibitor, hence

the reason I think the Plant room valve had been forced open electronically from the Building Management System (BMS) and then left open?

b) The impact on the ward areas affected would have been clean water dripping from the chilled beam cooling battery down on to the floor, due to the potential for infection risk and H&S risk in an open ICU bay the ward would have tried to move patients away from the location of the chilled beams where possible and cordon off and clean the wet floor.

c) These remedial works would have been carried out by Mercury Engineering (Project M&E contractor). The incident was responded to by ICT, ICD (Christine Peters), Estates (lead by David Brattey (Site Estates Manager), Domestic services team & ward staff.

d) Escalation process: Ward Manager to Estates 1st response & ICT\ICD, Estates to Multiplex. Estates (Ian Powrie) to Deputy Project Director (Peter Moir) and Contract Technical Advisor (David Hall).

e) External organisation input from Schneider Controls (Resident Engineer under support contract). Schneider advised that the plant room chilled circuit zone valve had been forced open and that there did not appear to be any dew point control in place. I then consulted SHTM 03-01 which advised that “The control settings should ensure that the external elements of the beam are always above dewpoint. I also consulted the chilled beam manufacturer data to establish that individual dew point control sensors and controls are available for inclusion in manufacture.

f) remedial action was undertaken by Multiplex (Julie Miller) to remove the fix from the chilled water zone valve and restore the zone to normal operating temperature. Estates cleaned the chilled beams of water and water marks and sanitised (David Brattey), Domestic Team cleaned the affected ward areas. This issue arose due to a defect repair therefore decision required over the remedial works. However the dew point issues were escalated to David Hall (Contract Technical, advisor Currie & Brown) & Peter Moir.

g) This incident was considered to be closed as it resulted from an error during defect repair.

h) I believe there would have been a job docket recorded on FM first as well as a Datix H&S

i) report. incident report logged and an ICT report. Both the H&S\ICT reports would have been closed off; I am not sure who would have signed these.

b) Issues with dew point controls refer to Estates Team Bundle, document 65.

**A** a) The issue relates to the removal of dew point control from the chilled beam design for the Adults and Childrens hospitals for all rooms provided with Chilled Beam Technology.

b) This was the first time I had been made aware that dew point control had been completely removed from the design, I was also not involved in the discussion\ design solution to address the overheating issues experience in the Laboratory Medicine and used to justify this change in control philosophy. I am equally not aware of who from the Boards project team was involved in this revised solution?

c) at this stage October 2015 I escalated the concern to David Hall as Technical Advisor to the Board & Peter Moir. Regarding this design omission.

d) there were no external organisations approached by me at this stage.

e) there was no opposing advise at this stage.

f) No remedial action at this stage.

g) The issue was not resolved at this stage.

h) No ongoing concerns from ward staff.

i) No

j) No.

c) Ward 2A cubicles 8-11 refer to Estates Team Bundle, document 106.

**A**

a) This issue occurred during a period of extremely high outside air temperatures, during this period the high outside air temperature holds higher moisture levels relative humidity (RH) under these conditions when this air hits a cold surface the moisture in the air condenses causing water droplets to form on the cold chilled beam finned coil, these droplets fall from the coil on the chilled beam cover plate and then to the floor. There was also a buildup of fibres on the finned coil of the chilled beam, the cause of this fibre buildup is due to the operation of the chilled beam air flow where a percentage of the room air is drawn (induced) into the chilled beam and recirculated into the

room along with the fresh air from the AHU to the room. The recirculated air contains fibres predominately from bedding, uniforms and sterile pack blue paper wraps. This fibre buildup caused the water droplets to turn black on contact. on this occasion and for the first time since handover the estates team received multiple calls from ward area's all over the Hospital experiencing the same issue simultaneously.

b) The impact for ward 2A was that due to the apparent risk of infection\H&S slip risk the patients were relocated to other rooms not affected and these four rooms closed.

c) Those involved included, Jean Kirkwood (ward manager), David Brattey (Site Estates Manager), Pamela Joannidis (ICN), Christine Peters (ICD), Teresa Inkster (ICD),

d) The issue was lack of Dew Point control on each chilled beam as this had been removed from the design of the Adults and Childrens hospitals by Multiplex. I had already escalated this to David Hall & Peter Moir during the CCU incident in Oct and therefore escalated the issue to David Loudon on this occasion due to the wider scale impact across the hospital and the omission of the required dew point control from the chilled beam design.

e) I consulted with Schneider Controls regarding the options to reintroduce dew point control into the control strategy:

f) Advice was software strategy could be developed to control all chilled beams by zone increasing the chilled water circuit temperature to above dew point on a real time bases thus designing out the risk of internal condensation discharge from the chilled beams.

g) We also considered internally the option to install the manufacturers dew point controls on each chilled beam, however this was discounted as these controls are normally installed during manufacturing process and retrofit would be complex and highly disruption to the ward environment.

h) Following a review of these options with David Loudon, I was instructed to proceed with the development of central control option. I delegated Paul McAlister (Estates Duty Manager) to work with Schneider controls on the full design solution and costing. On completion of the strategy I was authorised by David Loudon to proceed with implementation of the new universal chilled beam dew point strategy.

i) David Loudon made the decision to proceed with this strategy.

j) Yes this new control strategy addressed the dew point condensation issue, the control strategy was written up and distributed to all Estates manager\supervisors. With respect to the collection of regenerated fibres on the chilled beam finned coils, David Bratty was tasked to monitor the time scale for buildup to reoccur and develop a cleaning regime\frequency to address this issue, In addition samples were taken of the fibre buildup within ward 2A for Teresa Inkster to have analysed and the results confirmed that the fibre build up was inert.

k) I don't recall there being any ongoing concerns raised after this incident by Jean Kirkwood (ward manager).

l) There would have been ICT report and H&S Datex report submitted, these would have been signed off by the person raising the mater and the person allocated with management responsibility.

m) This would have been covered in the reporting systems detail in item "k" above.

d) Water samples being taken from chilled beams in Ward 6A refer to IMT Bundle, document 73.

**A** I am unable to respond to this question as I was not aware of or involved with this matter.

e) Leakage chilled beams Ward 6A refer to **Estates Team Bundle, document 138**.

**A** I am unable to respond to this question as I was not aware of or involved with this matter.

f) Leakage chilled beams Ward 6A refer to Estates Team Bundle, document 139.

**A** I am unable to respond to this question as I was not aware of or involved with this matter.

g) Leakage chilled beams Ward 6A refer to Estates Team Bundle, document 142.

**A** I am unable to respond to this question above here.as I was not aware of or involved with this matter.

h) Any other issues/ incidents not mentioned above.

**A** N\A

For each event please tell us:
a) What was the issue?
b)The impact on the hospital (include wards/areas) and its patients (if applicable)
c) Who was involved?
d) What was the escalation process?
e) Were any external organisations approached to support and advise?
f) If so, what was the advice?
g) Was there opposing advice and by whom, and what was the advice?
h) What remedial action was decided on and who made the decision?
i) Was the issue resolved – consider any ongoing aftercare/ support/ monitoring.
j) Any ongoing concerns witness had herself or others advised her of?
k) Was there any documentation referenced during or created after the event. For example, an incident report?
l) Did anyone sign off to say the work had been completed and issue resolved/area safe.

71. Tell me about your understanding of the use of thermal wheels in areas where immune compromised patients are treated:

**A** While SHTM 03-01 indicates that Thermal wheels may be used in healthcare settings provided they are fitted with Purge sections. It is my understanding from designers and manufacturers that they would not recommend thermal wheels for areas housing Immuno-compromised patients. I would note that on Supply systems with HEPA filters installed in the air stream there should be zero risk of cross contamination from the extract to the supply air stream reaching the patient environment.

a) What is your understanding of why designers and manufacturers do not recommend the use of thermal wheels in areas which house immune-compromised patients?

**A** My understanding is that there is a risk of cross contamination between the extract air deck and the supply air deck via the entrained air within the thermal wheel being released into the supply air stream, this is minimised using a purge sector, however there is still a small risk of cross contamination from this entrainment. In addition to this there is also a risk of cross contamination from air bypassing the seals between the wheel and the 2 decks. Therefore, the recommendation from the designers\manufacturer is to further protect immune compromised patient facilities by not employing thermal wheel technology.

**Note:** Where final HEPA filters are used in the AHU or terminal HEPA filters are employed in the air supply grilles in the ward space, this risk is controlled.

72. To what extent can you recall any specific events in relation to thermal wheels?

**A** I do not recall any specific events relating to Thermal wheels but would advise that the AHU's supplying ward 2A & B are general AHUs with thermal wheels fitted and without HEPA filter protection, rooms have circa 3 ACH, these wards housed immune-compromised Haemato-Oncology patients, therefore there is a theoretical risk of cross contamination from extract air to the patient.

a) Does the use of thermal wheels increase the risk of cross contamination when used without HEPA filers?

**A** Yes, HEPA filters would effectively contain any cross contamination from the thermal wheels, therefore areas supplied by AHU with thermal wheels and without HEPA filtration would have an increased risk for Immune compromised patients.

b) Did you expect to see thermal wheels used in a ward without HEPA filters, which was housing immune-compromised patients? Was this compliant with SHTM03-01 guidance?

**A** No, as I did not expect to see wards housing Immune-compromised patients to be designed without HEPA filters. however, that being the case I would not expect Thermal wheels to be used in this circumstance.

Yes, this is compliant with SHTM 03-01 guidance as it does not refer to areas housing immune compromised patients and the use of thermal wheels. Para 4.114 states that, “For systems in healthcare premises, a plate heat exchanger or ‘run-around coil’ system is suitable. Thermal wheels may be used providing they are fitted with a purge sector. The small amounts of air leakage across those devices are not considered significant”.

When answering consider the following:

a) What was the issue?

b) The impact on the hospital (include wards/areas) and its patients (if applicable)

c) Who was involved?

d) What was the escalation process?

e) Were any external organisations approached to support and advise?

f) If so, what was the advice?

g) Was there opposing advice and by whom, and what was the advice?

h) What remedial action was decided on and who made the decision?

i) Was the issue resolved – consider any ongoing aftercare/ support/ monitoring.

j) Any ongoing concerns witness had herself or others advised her of?

k) Was there any documentation referenced during or created after the event. For example, an incident report?

l) Did anyone sign off to say the work had been completed and issue resolved/area safe.

**Combined Heating and Power Unit**

73. Describe the Combined Heating and Power Unit (CHP)

a) What is the purpose of the CHP?

**A** CHP is a Combined Heat & Power plant, it is basically and Electrical Generator, with the coolant circuit output connected to the MTHW system enabling the unit to supply waste heat to the hospital this results in an improved energy performance of circa 80% (e.g. 40% electrical & 40% Heat). In comparison with standalone boilers and generators.

b) What condition was the CHP in at handover?

**A** The CHP plant was commissioned by the manufacturer but there were problems in meeting the designed intent of the plant with regards to sharing heat load with the boiler plant.

c) Describe your understanding at the time of the problems in meeting the design intent of the plant?

**A** The design intent was that the CHP plant would operate to provide heat to meet site base load supported in winter by the main boiler plant. The CHP plant would provide heat output into the MTHW system operating at 4 bar pressure with a flow temperature of 105ºC and a variable return temperature depending upon the heat demand of the site. Therefore, the CHP output was designed to meet these MTHW operating parameters. The control strategy was for the CHP to run continuously with the boiler plant automatically cutting in and out to meet increases in demand over and above the CHP capacity. However, when one or more boilers kicked in the return temperature would rise as the hospital demand was satisfied, when the return temperature exceeded 75ºC the CHP plant would ramp down to its lowest output setting and then cut out, leaving the boiler plant to supply the heat demand to the site with a resultant loss of the CHP heat and electrical output. Multiplex had problems reconciling the return temperature levels for the boiler plant with the limits of the CHP plant return temperatures.

d) What information do you have to support your view on the CHP's condition?

**A** I do not have any information as I have no access to records, however the Project team should have status reports on the progress of the CHP plant remedial works during the 2 year warranty period. I also submitted a paper to David Loudon late 2015 detailing the lost revenue as a result of the non-availability of the CHP plant for 1 year. I also believe that Innovated Design Solutions, carried out a technical report on the status of the CHP plant for Alan Gallacher (Estates General Manager). When I retired July 2019 the Board were still having meetings with Multiplex and the designers, Innovated Design Solutions etc to resolve these issues, in fact this was my last meeting on my last day.

74. Was commissioning and validation of the CHP carried out prior to handover?

**A** In part, the functional testing was complete but the actual commissioning was not complete until March\April 2015, this information was recorded within the SEPA "condition of permit" reports provided monthly by Multiplex.

a) What commissioning and validation documentation did you see, if any?

**A** I did see the commissioning paperwork and I shared these with SEPA under the conditions of the PPC permit application and with Zurich Engineering with regards to the PSSR\PED written scheme requirements. I cannot recall from memory the specific details of the commissioning paperwork but I believe that the commissioning paperwork ranged over a period of time from 2014 – well into 2015.

Refer to **Estates Team Bundle, document p90**

b) Who was responsible for ensuring that the commissioning and validation documentation was in place?

**A** Multiplex were responsible for providing the documentation and Capital Symonds were responsible for checking them.

c) Where were records of the commissioning and validation for the CHP kept?

**A** The records would have been kept on the Zutec document management system.

75. Who was responsible for ensuring that the CHP was operating correctly?

**A** Multiplex were responsible for ensuring that the CHP operated within the design parameters. In addition and in preparation for full hand over I had also adopted the Operation and Maintenance (Managed Service) contract with Edina, this was part of the scope of the Multiplex CHP tender package, for which I carried out a separate Managed service contract evaluation with the support of our procurement team. This ensured that the CHP was fully maintained after hand over Dec 2015, but did not cover system integration\design issues. However to my Knowledge the CHP design interface with the boilers and Absorption chiller were still not working as per design at July 2019.

a) How were the issues with integration and design being managed? What action was being taken, and who was dealing with matters?

**A** The integration issues of the CHP/Boilers with the MTHW system was managed by Multiplex with the support of the M&E consultants (Wallace Whittle), various actions were taken over the 3 years before I retired to try and integrate the systems, I cannot recall the detail of these actions. For the year that I was Sector Estates Manager for the QEUH and the CHP was brought online Jan 2016 – Jan 2017, I liaised Multiplex on the integration works and reported to David Loudon on the impacts, the overview and authorisation of these actions was handled by David Loudon at contract review meetings (which I was not party to) and latterly before I retired by Allan Gallagher.

76. If the CHP was not operating correctly, could this impact patients? If so, how? Refer to Estates Team Bundle, document p101

**A** The bundle document 101 refers to a local issue in the cardiac ward where 4 rooms were all over 26C with no local control, David Wilson confirmed that Schneider had left the local heater battery control valve on override. This was not related to the CHP. For the first year there was no impact on the hospital heating and DHW demands, however I believe that from circa 2017 Multiplex started to adjust the MTHW flow temperatures to ensure that the CHP plant did not cut out on high return temperatures, therefore increasing CHP uptime. This had a detrimental impact on the hospital heating & DHW services.

a) How, if at all, could the detrimental impact of the hospital heating and domestic hot water your referred to, affect/ impact patients?

**A** potential reduction of heat transfer at the DHW & LTHW plate heat exchangers due to temperature adjustments and or time lag for boiler initiation, potentially resulting in temperature variations to both systems and demand response issues impacting DHW and Heating systems recovery time.

77. **Estates Team Bundle, document 17:**

a) What is meant by labs flushing?

**A** When the Lab building was handed over 2012 it was fitted out with multiple LTHW boilers in each Pod, this was to allow the labs to operate independently until the energy centre was ready to provide the Labs building heat source. During the 2.5 years of the lab operation, the LTHW mild steel pipework exposed to LTHW water would have suffered an element of corrosion resulting in the conditions noted in Document 11, the flushing programme was needed to ensure that these contaminants did not affect the new Energy Centre pipework and equipment.

b) What issues, if any, arose from this?

**A** The works to flush the Labs LTHW pipework and associated equipment where scheduled to take place over several weekends ensure minimal impact on the lab function, in order to carry out these works and ensure that all parts of the system where flushed all control valves had to be electronically open and the boilers switched off. Apart from this minor disruption I do not recall any other issues.

c) What is the importance of this?

**A** The proposed flushing programme by Multiplex was to ensure that the corrosion contaminants found in the labs system would not be allowed to adversely impact on the new Energy Centre pipework and equipment. It should be noted that this would not have impacted the pipe work in the new hospital as the new LTHW circuit from the EC to the Labs was a dedicated secondary circuit from a new plate heat exchanger in the EC, and therefore isolated from the Hospital LTHW systems.

d) Discuss your knowledge of the reference to a '40-year-old system':

i) Explain what the 40-year system was:

**A** The INS building is the Institute of Nuro Sciences, the LTHW heating system in that building was run from 3 old boilers, however the contract had allowed for centralisation of energy production and as part of this the INS building LTHW was to be integrated into the EC heat distribution network.

ii) What was the issue(s)?

**A** Due to the age of this LTHW system, there was correctly some concern over the condition of the contents, hence the request for this to be sampled and the suggestion to install a dirt separator & deaerator, to separate and remove solid particulate and air from the system.

iii) What was the potential impact?

**A** The potential Impact would have been that a high level of mild steel corrosion and debris from the INS LTHW system could have contaminated and blocked the secondary circuit Plate Heat exchanger (PHe) and associated distribution pipework from the adults' plant room, potentially shortening the life of the new pipework and equipment within the Adults LTHW secondary loop.

(a) Did the '*high level of mild steel corrosion and debris from the INS LTHW system could have contaminated and blocked the secondary circuit Plate Heat exchanger (PHe) and associated distribution pipework from the Adults plant room'* have an actual impact on the pipework, as opposed to the potential impact?

**A** I cannot recall if the INS LTHW was if fact connected to the new adult plant room PHe or not due to the risk to the new system? The issue being that due to the age and condition of the pipework in the INS any flushing and chemical treatment to protect the new system could have adversely impacted the INS system resulting in system failures. However, if it was connected to the new system without treatment to address the system conditions it would have an actual impact, however this would be contained to the secondary circuit and secondary side of the PHe, it would not impact the primary circuit of new hospital the MTHW system.

iv) What actions, if any, were taken to address the issue(s)?

**A** I cannot recall if the connection to the INS went ahead Due to the risks involved. I would need to see the site records.

78. What was your understanding of how the CHP should be operated?

**A** The CHP was intended to operate 24/7 year-round by supplying heat energy to meet the hospital baseload demand of 3.6Mw (1.2Mw per CHP), in principle the winter heat demand would exceed the baseload and the CHP should have worked 24/7 with the boiler plant cutting in and out to meet winter fluctuations above the 3.6Mw base load. In the summer the hospital baseload would drop below the indicative 3.6Mw, the design allowed for this by including an absorption chiller to convert heat output from the CHP to chilled water output supplying the cooling load of the hospital, this would take the full heat output from one CHP unit, leaving the other two CHP units to meet the reduced summer baseload of the hospital.

79. What were the cost considerations for the operation of the CHP? What considerations impacted on its operation?

**A** The operating cost of the CHP related to the a). The gas consumption to run the plant and b). the lost revenue from the drop in electricity output as a result of the design operating failures, this resulted in the need to purchase more electricity at a higher cost from the grid. c). The Managed Service Contract cost which was a 15-year commitment and included for the full refurbishment\replacement of the CHP units twice during the life of the contract. I cannot recall the figures associated with these cost considerations, however I did submit a paper to David Loudon regarding the financial losses to the Board in the 1st year of lost operation from memory this was circa £1m. To my knowledge the Board did not restrict CHP operations on cost issue. Multiplex were allowed to manage the fine tuning of the CHP\boiler plant in an attempt to achieve design intent.

80. How was the CHP system being operated by GGC?

**A** While GGC were covering the cost of the Managed service contract with Edina, but Multiplex were having problems meeting the design intent, when a

boiler was brought online automatically to meet increased demand over the CHP output, the CHP plant would see this as a drop in demand and ramp its output down. With the boilers online the return temperature from the hospital would increase to exceed the CHP return operating limit causing the CHP to shut down. Multiplex were working to address this design issue for the duration of the defects period and beyond. To my knowledge this was sanctioned by David Loudon.

81. What operational issues, if any, were encountered by GGC with the CHP? Refer to **Estates Team Bundle document 12.**

**A** Document 12 is not related to issues regarding the CHP plant operation, Doc 12 relates to a heating zone valve being forced open via the BMS controls, this seemed to be related to works carried out by Multiplex and forgetting to reset the system to automatic control.

a) Without reference to document 12, what operational issues, if any, were encountered by GGC with the CHP?

**A** Issue with:

- Maintaining DHW at 60ºC
- Poor recovery times for DHW in time of peak demand,
- Maintaining heating via LTHW system capacity and demand response.
- Financial losses because of CHP down time\ reduced capacity etc.

82. Refer to Estates Team Bundle document 16:

a) Have you seen this before?

**A** Yes.

b) What is this document?

**A** This is a defect log generated from the FMFirst- LMS, these tasks would have then been passed on to the BAM or Multiplex defect logging systems, respectively.

c) Column 274 – ‘all CHPs cut out’ – what does this mean? How would this have impacted patients?

**A** This report refers to a G59 trip of all CHP plant, the electrical output of the CHP plant is synchronised to the national grid for frequency, phase sequence, phase angle and voltage if any one of these conditions vary from the grid the protection relay will drop the CHP units off grid and shut them down. This protection relay is known as the G59 relay. The CHP plant tripping out on its own should not affect patient area’s however this report advises that the boilers did not start up automatically after this CHP trip, this potential would result in the loss of MTHW supplying the LTHW heating and DHW, depending on how long the boilers remained offline. However this was reported by the Shift Duty manager Paul McAlister and he would have responded to this event quickly to reinstated the boilers manually until the situation was stabilised.

d) Refer to Estates Team Bundle, document 36 what was the incident referred to? Were you involved? How was this matter resolved?

**A** I don’t believe that this was an incident, It looks like this is an attempt to provide a sealed ceiling system using the existing suspended ceiling laying grid, within ward 4B Haemato-oncology or (BMT) ward single isolation rooms, instead of solid plasterboard ceilings with the aim to improve room differential pressure control to the corridor. I was not involved and was unaware of this meeting, Peter Moir was managing this project as part of the contract.

83. Refer to Estates Team Bundle, documents 19 & 20:

a) Provide any information about any concerns you had in relation to the building temperature and power.

**A**

(i) Building temperatures: Generally the room temperature issues recorded in documents 19 & 20 related to Schneider controls passing valves or wiring issues this is not unusual especially on a project of this size this level of reporting failures slowed down after the first few weeks of occupancy. The exception being ward 4b (Adults): overheating problems across all rooms turned out not to be passing valves but a control wiring issue, where the CY

control cables (unscreened) supplying the room heating control valves throughout the ward were inducing a low voltage from surrounding services causing the actuator control valves to be held slightly open. I took lead on this due to lack of progress with Multiplex and used the Boards maintenance support contract with Schneider to secure diagnostic support in identifying the problem. Once identified the cable replacement was carried by in-house staff during the Christmas 2016 holiday break, with the ward closed. No further problems with overheating were experience in this ward.

(ii) Power issues: Repeated loss of power within a section of plant room 31 caused issues with loss of plant items however resilient supply arrangement address most of these issues with the exception of the PTS impact. Loss of power to the PTS main adult transfer station & system server resulted in a total system crash, with sample carriers in transit being jammed ether in the transfer station or in the system pipework, the resulting effort to locate and remove these and reset the system took between 12 – 24hrs to recover. This impacting on patient sample results and portering services staffing pressures. I was involved with this issue and assisted in the monitoring of the power demand from the affected protective device, this proved to be overloaded at random times and required the plant served from this device to be split over two protective devices to reduce the load to meet the working capacity of the existing device. In addition, a second supply was installed along with an automatic transfer switch (ATS) to create a resilient supply arrangement for this essential PTS system, along with the provision of a Uninterruptible Power Supply (UPS) support the PTS server during short local or national grid power interruptions this protects the server allowing time for the ATS to operate or for the site standby generators to come on line. These works were carried out by Mercury Engineering under the contract defects process.

(i) Was lack of action by Multiplex something you frequently encountered, please explain?

**A** Generally, Multiplex would respond to emergency issues quickly and supportively, however in the defect process the Board had the burden of proof that an issue was a contractual defect before they would take ownership of it. This became more prevalent the further into the defect and liability period we

went and was more evident when Fergus Shaw took over the site support for Multiplex.

b) What was your involvement?

**A** I assisted with the monitoring of the protective device causing the problem, identified the random overloading and agreed the solution to be implemented. I also coordinated internal communications and updated staff as to the remedial works and service impact while putting in place contingency arrangements, where required to maintain service.

c) Was this recorded on Zutec?

**A** The defect would have been formally reported via the Capita Symond defect logging system, the alterations to services would have been recorded on the as fitted drawings and the system operating instructions, which should have been updated on Zutec by Multiplex.

d) What was the impact of these issues on patient migration?

**A** While these power failures where disruptive to the laboratory services, FM portering services and time taken to report patient test results from the labs, these issues were generally managed without any impact on the migration plan.

e) Were matters resolved? If so, how? If not, what was the consequence?

**A** Yes the issue was resolved by redesigning the electrical services to the PTS server and Main transfer station and introduction of a server Uninterruptible Power Supply (UPS) and resilient dual electricity supply with automatic change over. This resolved the issue and improved the protection of the PTS from impact from local and national grid power outage.

30. Refer to **Estates Team Bundle, document 91, page 754:**

a) Look at column 78 – what does debris within the AHUs mean?

**A** This means foreign materials that should not be in the AHU.

b) Is this something you would expect to see?

**A** No, this should be addressed within in the pre-commissioning checks & AHU\duct work cleaning requirements.

(i) Does the presence of debris indicate to you that the pre-commissioning checks and AHU ductwork cleaning requirements had either not been fulfilled or carried out to an adequate standard? Who as responsible for carrying out pre-commissioning checks and AHU/ductwork cleaning?

**A** Yes. Mercury were responsible for the pre-commissioning checks, this would have been carried out by the M&E contractors, witnessed by Multiplex/Capita possibly on a sample basis.

c) What was the impact on the AHUs?

**A** I would need to know what the debris was, it could be inert or could be a contamination risk?

d) How was this matter resolved?

**A** I can't answer this question as I was not aware of the Wallace Whittle Observations inspection or the report in Document 91 or of any actions taken to address these issues.

e) What happened in respect of Zurich?

**A** I commissioned Zurich at the point of hand over as the Boards Competent Persons (CP) Pressure Systems to review the pressure systems within the QEHU, RHC and Energy Centre to assess and prepare a Written Scheme of Examination for these properties as required under the Pressure Systems Safety Regulations 2000 (PSSR). Brian Baldasara (CP, PSSR) was duly appointed by Zurich and I provided him with site access for survey, as well as access to Zutec for records etc. As part of his assessment the CP needs to confirm that all pressure equipment is CE marked and review all of the associated certificates of conformity required under the Pressure Equipment Directive (PED) for equipment manufactured to operating under pressure, these are usually provided by the manufacturer and the equipment is usually labelled with the CE mark indicating a certificate of conformity was in place.

However Brian reported back to me that some items of plant were not labelled as compliant and that the MTHW pipe work being manufacturer on site was not CE marked and there was no recorded certificate of conformity for the pipe work installation across all three buildings. Brian advised that it was the responsibility of Multiplex to ensure that the pressure system pipe work manufactured on site had been assessed and CE marked with a certificate conformity as compliant with EU PED regulations, this would need to have been issued by a Notified Body, and to do this retrospectively would require full records of materials used, names and certificated evidence of coded welders who worked on the system, sample weld test results and system validated pressure test certificates and compliance with sound engineering practice guidance. Without this detail and CE marking the system could not be added to the written scheme and should not be put into service. This level of detail was not on Zutec, I therefore asked David Wilson for the information required, which he did not have available. I escalated this issue to David Loudon and a series of meetings were held with David Loudon, Multiplex, Mercury, Brian Baladasara (Zurich CP) for advise on how this could be addressed. Brian advised that Multiplex where responsible for placing the MTHW system on the market (Hand over to the Client) and that under EU PED regulations this was illegal without the required CE mark of conformity. He advised Multiplex that they could address this with retrospective certification by employing a Notifying body to assess and certify & CE mark the system however this will require access to all the evidence detailed above. Multiplex insisted that they could produce the relevant information and records for this process and would engage a Notified Body. David Loudon accepted this and gave them time to provide the data and have the system CE marked. In the meantime Zurich recommended that in order to allow the system to continue to operate that the boiler plant should be derated to less than 110C\10bar to take the system out of the scope of PSSR on a temporary basis until the pipework system had been CE marked. This was implemented through Multiplex\Mercury and the boiler manufacturer. After some time and several meetings multiplex provided the CE certification data and had new rating plates fitted where required for the pressure equipment and plant manufactured off site. However in June 2016 I provided David Loudon with an

option appraisal paper advising of the expert consensus that it was unlikely that Multiplex could meet the MTHW pipework conformity assessment for CE marking, I included options from Multiplex to address this matter , however I also advised that my preferred option for the Board to meet its legal obligation would be to take the advice from Zurich Steve Williams (Senior Engineer PED) & Brian Baldasara (CP, PSSR) and appointment of Zurich Engineering to undertake a Fit for Purpose Examination of the MTHW pipework and associated fittings with the view that once successfully complete Zurich Engineering could underwrite the pipework system and associated accessories deeming them Fit for Purpose as a notified body. Zurich would then be in a position to add the system to the Written scheme of examination thereby allowing the Board to meet it legal obligations under the PSSR regulations. David authorised me to proceed on this basis and the Fit for Purpose survey was carried out, several points of concern\defects were identified, tabulated, and issued to Multiplex for rectification. Following final inspection\assessment of these remedial works by Zurich and they were satisfied the system was Fit for Purpose, they added the Fit for Purpose assessment report to QEUH records on their system and to the Sites Written Scheme of Examination, as well as providing the Board with a final report confirming the system status. The Board had now met its legal responsibilities under Pressure System safety Regulations 2000 (PSSR) and the boilers were reset to the design operating temperatures & pressures by Multiplex\Mercury & the boiler manufacturer. It should be noted however that the system remains non-compliant with regards to compliance with the EU PED regulations and as such was placed on the Market illegally by Multiplex\Mercury. The Board carry no responsibility for this.

(i) Explain how the system remains non-compliant with EU PED regulations.

**A** Multiplex\Mercury should have complied with the requirements of the EU Pressure Equipment Directive (PED) and maintained records of the onsite manufacture of the MTHW pipework system and associated fittings carrying a relevant fluid (temperature above 111.4ºC) ensuring that all elements carried a certificate of Conformity and have a CE mark affixed to each item of equipment/pipework, then produce a global certificate of conformity for the full

system. Mercury had failed to keep appropriate records for the onsite manufactured pipework which should have included schedule of materials and their rating certificates, Name and appropriate qualifications of coded welders and the work they produced, certificates of conformity for the onsite manufactured pipework. The Certificates of conformity & CE marking of following issues remain outstanding:

- All on-site manufactured pipework.
- All Expansion Joints.
- Main basement manifolds.
- Global Certificate of Conformity for the full system.

Therefore, Multiplex did not comply with EU-PED requirements and placed a non-compliant system on the market, despite protracted attempts to unsuccessfully apply for retrospective certification.

(ii) Explain further what you mean by 'placed on the market illegally'? Should the system have been selected by Multiplex? Please explain your answer.

**A** Placed on the market illegally, means that the system was put into service by the contractor without the legally required certificates of conformity and CE markings. The error was not in the design or selection of an MTHW system the error was in not following the statutory requirements of EU-PED, I believe that this was due to a misinterpretation of the definition of a relevant fluid by the designers and Mercury, who thought that as the system was operating at 105ºC it was not included in the scope of the PED regulations, however as the safety devices are set for 120ºC (safety margin above the operating temperature) the system is deemed to be a relevant fluid above 111.4ºC and falls within the remit of the Directive.

31. Refer to **Estates Team Bundle document 113:**

a) What is this?

**A** This appears to be the final defects certificate report from Capita Symonds. Prior to the end of warranty period 2017

b) Why was it issued in 2017 and not earlier?

**A** I can't answer that question as I was not involved in the contract sign off process.

c) What was the consequence of this?

**A** It would appear to me that there were many outstanding defects that required to be closed before contract retention sums could be released.

d) On what basis did Multiplex carry out the work?

**A** On the basis of warranty, I believe that Multiplex were eager to close outstanding issues to claim the contract retention monies.

32. Refer to **Estates Team Bundle, document 135:**

a) Please explain what this email was about.

**A** Multiplex were seeking partial payment against withheld retention monies from January 2017, "in connection with hospital works" I am not sure what hospital works includes.

b) was the money released or not?

**A** I don't know, as I was not party to the retention money payments.

**<u>Water Guidance and Obligations</u>**

33. What guidance applies to water? How did you/others ensure that guidance was complied with? What contractual documents, if any, would you consult to ensure guidance was complied with?

**A** SHTM 04-01 Water safety for healthcare premises Guides (Parts A – G).
L8 - ACoP - Legionnaires' disease: The control of legionella bacteria in water systems (L8).
HSG 274 – Control of Legionella Bacteria (Parts 1 – 3).
Water Regulations Guide & Water Byelaws 2000/2004 (Scotland). At the time of hand over, I commissioned DMA Water, to carry out a water risk assessment of the QEUH buildings and for the risk assessment to include a written scheme. In addition Multiplex continued with the routine flushing

programme for the 6-week soft landings period when GG&C took over this function up until the final occupation of all areas. As well as implementing a water quality monitoring and disinfection programme for each area 6 weeks prior to occupation of each area.

The contractual documents that should be consulted for are detailed in SHTM 04 01 (Part B) and are:

- All commissioning and testing activities is compiled and handed over to be incorporated within the operation and maintenance manuals.
- Results of temperature checks on the cold-water supply and hot water circulating systems.
- Commissioning and in-service test data for Type 3 TMVs.
- Identification of, and test results for, sentinel taps.
- Where continuous water treatment is installed, the commissioning records should include details of settings of the equipment, dosing rates and requirements for testing.
- Operation and maintenance manuals should be in accordance with BSRIA's (1990) Application Guide 1/87: 'Operation and maintenance manuals for building services installations.
- Full manufacturing details, including batch numbers of all pipes and fittings.
- Full records and certificates of pressure tests for all sections of pipework.
- Settings of all balancing valves, with readings of flow rates where applicable.
- Full details of each item of plant, including arrangement drawings and appropriate test certificates.
- As-fitted drawings clearly showing the location of balancing valves, flows and settings, isolation valves, drain valves.
- Schematic drawings for installation in plantrooms showing all valves and items of plant.
- Full details of water treatment parameters and operating modes and settings.

  Full details of maintenance requirements.
- Detailed confirmation of disinfection procedures to BS6700: 2006, BS EN 806-1-5: 2000-2012 and BS 8558: 2011, and results of post-disinfection microbiological analysis.

- Full records confirming that all materials and fittings hold WRAS or equivalent accreditation.
- As previously discussed, the commissioning documents were intended to be held on Zutec however the contract allowed Multiplex a 2-month window for population after hand over, I do not recall having reviewed these documents at that time due to the focus of works on the operational commissioning and migration plan.

a) Were you aware of all the of the contractual document having been consulted to ensure SHTM04-01 compliance?

**A** No, I was not involved in the monitoring, witnessing or verification of the commissioning and compliance of the system.

88. Who was responsible for ensuring a safe water supply following handover?

**A** The Board carried responsibility for water safety following hand over, My post job description included the role of Responsible Person water, although I was not formally appointed to this role for the QEUH.

(i) Who was the Responsible Person for water?

**A** My Job description included Responsible person for Water, but I was not formally appointed in writing.

89. What water safety training was provided to all maintenance staff, estates officers and contractors?

**A** At the point of hand over we had limited staff (6 off including myself) on site to support operational commissioning and Migration, of the 5 Estates Duty Managers, two were from a plumbing background where they held water management responsibilities at their previous sites this was Melville McMillan and Jim Guthrie, I cannot recall their water safety training credentials? I had been previously received a 1-day training course for Legionellosis the role of the responsible person (BS1), Carried out on site at the Glasgow Royal Infirmary. I cannot recall training status of all the staff who were scheduled for redeployment to the QEUH. With respect to contractors generally they would

be vetted as to their competence and awareness of water system safety by the appropriate estates manager and provided with the local knowledge and awareness of the systems to be worked on as required. The NHS do not train contractors as this is seen to be buying in the services, competence and the required expertise.

90. What was your knowledge and understanding of Health and Safety regulations on control of legionella at the time?

**A** I was generally aware of the regulations but not fully conversant with the detailed day to day requirements.

91. What legionella training was provided to all maintenance staff, estate officers and contractors?

**A** Up until the time of the water incident 2018, there had been no legionella training, I had allowed for training needs within the maintenance strategy for development and implementation after migration was completed. However this role was taken over by the newly formed central compliance management team under the newly appointed General Manager (Alan Gallacher), I therefore no longer held training budget responsibility for my staff at this stage. I did raise training requirements for water management with Alan and was advised that the Compliance team were working on the programme, and it would be rolled out when ready.

92. What water borne pathogens (other than legionella) training was provided to all maintenance staff, estate officers and contractors?

**A** There was no training provided on other water borne pathogens, the Board policy on other such pathogens was that Estates would be led by advice and guidance from the ICT\ICD on other pathogens.

93. Who was the Duty holder?

**A** The Duty Holder would have the CEO, Robert Caulderwood and David Loudon DoF.

94. Were you aware of obligations to appoint an authorised person or the like to discharge water supply safety? If so, who was appointed? When, for what period? If not, why not?

**A** It was my understanding that under both SHTM 04-01 Part B and the Boards Water Policy that it was the duty of the Designated Person to appoint the Authorised persons for each site. During preparation of the Water Risk Assessment DMA asked for confirmation of those with responsibility for legionella control. I prepared a schedule of those who should be formally appointed to these roles and e-mailed Mary Anne Kane (Corporate General Manager\Designated Person) to confirm that this schedule of roles and responsibilities was correct and when they would be formally appointed for inclusion in the Risk assessment. Mary Anne confirms the list was correct and if memory serves me correctly, she would take this to the next Board Water safety group for ratification. I passed on this schedule on to DMA, but they could not enter the details without confirmation of appointments.

a) Did you escalate DMA not being able to enter to the details? If so when and to whom?

**A** No, as I expected Mary Anne to get back to me on the appointment of these duty holders.

95. Commissioning of water system prior to handover/ patient migration to QEUH:

a) Requirements

**A** Requirements for commissioning of the water systems prior to hand over are detailed in SHTM 04 01 (Part A) namely:

(i) Designers Commissioning Brief.

(ii) Pre-commissioning checks & commissioning of the cold-water system

(iii) Pre-commissioning checks & commissioning of the hot-water system

(iv) Pressure testing must be carried out before disinfection.

(v) Temperature testing cold-water cisterns, hot water calorifiers, distribution pipe work, flow & return, hot and cold temperatures at outlets and inlets to mixing valve.

b) Who was responsible for this?

**A**

(i) Responsibility-of-ZBP/Wallace Whittle.

(ii) Responsibility-of-Multiplex.

(iii) Responsibility-of-Multiplex.

(iv) Responsibility-of-Multiplex.

(v) Responsibility-of-Multiplex

c) What checks were carried out to ensure that the water system had been commissioned. Refer to Estates Team Bundle, document 132.

**A** The witnessing of commissioning and sign off was the responsibility for Capita Symonds (Contract Supervisor) I am not aware if there was a Public Health engineer involved in this process or not? As required by SHTM 04 01 (Part A) section 16.1 “The design and commissioning procedures should be signed off on behalf of the client by a suitably experienced public health Engineer.” I was not included in the commissioning programme and was not invited to attend. I believe from a discussion with Mary Anne Kane (Acting DoF) after the water incident 2018 that David Loudon had told her that Multiplex had requested of David Loudon, that I be held at arm’s length from project matters as each time I was involved it cost Multiplex money? This would fit in with my lack of inclusion throughout the project. From document 132 above, it’s difficult to interpret what Frances Wrath was responding to from Jackie Barmanroy (detail not included) but the response is indicative of the project team belief that “All areas have been commissioned in line with contract ER’s and legislative requirements”.

d) Was SEPA/ the Water Board involved? Describe their role and involvement.

**A** SEPA were not involved with the potable water system, SEPA’s involvement with the site was related to the management control of the Environmental impact from site activities under the authority of the Pollution Prevention & Control (PPC) permit.

Scottish Water were involved on several issues, namely:

(i) Scottish Water were commissioned by the Board to install two new resilient water mains to the campus from separate distribution networks, Hardgate Rd & Govan Rd each capable of supplying the total campus demand. This work was commissioned by Peter Moir (Project Manager).

(ii) I wrote to Scottish Water to request a copy of their letter of consent to Multiplex to proceed with the Campus water distribution installation and any conditions applied under this consent, as required under Regulation 5 of the Water Bylaws 2004. Scottish water advised that they had not received formal notification of the intent to commence works and indeed not been contacted by Multiplex regarding the project up until the request for connection to the new water mains was received.

(iii) As a result of a Fire main hydrant blowing off, Scottish Water were contacted for support in Isolating the main line on Hardgate Rd, to allow repair of the damaged hydrant. From this several issues were identified.

- The Fire main had been connected to the main upstream of the hospital potable water supply with only a single check valve fitted, this created for potential contamination of both the Hospital supply and the Scottish water supply from the potentially stagnant water held in the fire hydrant line. The fire main connection should be down stream of the potable water connection and both the fire main and the potable water supplies should be fitted with a Double Check Valve to protect against back flow in the event of a loss of pressure.
- Scottish water should have adopted the water main on site up to and including the 1st isolation valve. However Scottish water refused to adopt this line as Multiplex had used non- standard Barrier pipe for the supply lines and non-standard Isolation valves (opened in the opposite direction to Scottish water specification valves) when Scottish water was contacted by Multiplex regarding the mains water connection to the distribution network, the site underground pipe had been back filled and they was not available for inspection, however they identified the Barrier pipe anomalies at the point of the main connection ground works.

(iv) Scottish water contacted me regarding pressure fluctuations being experienced on the Hardgate road water main local distribution network, affecting both commercial and domestic customers. I requested the Melville

McMillan (Estates Duty Manager) investigate this. After his initial investigation Mel found a faulty Keraflo valve on the inlet to one of the break tanks in the QEUH basement tank room. This was replaced and the issue resolved. However, Mel established that the valve had failed due to excessive pressure on the main supply. This was reported to Scottish Water, who investigated and found that the as part of the new water main installations for the campus (see item “a” above) they had installed new Pressure Reducing Valves (PRV) to supply the campus with the nominal supply pressure, however the PRV on Hardgate Rd had not been commissioned by Scottish water at the time they connected the campus to site. Scottish Water commissioned the valve at this point and the supply water pressure was returned to nominal pressure.

(v) As part of my work with Scottish Water to review the joint Emergency contingency plans for loss of the water supply network internal or external to the campus, it was established that we had no means of delivering emergency tanker water to the underground potable water storage tanks. I worked with Scottish Water and their nominated specialist sub-contractor to develop a solution to the issues raised in item “e” & “c” above. These works were funded by GGC under a capital allocation, providing resilience for tanker water deliveries via both Hardgate Road & Govan Rd supply main lines.

e) Which teams (such as infection control) were involved in the water system sign off, who would have signed it off on behalf of those teams?

**A** I was not party to the commissioning sign off as such I am unable to answer this question.

f) Were L8 testing requirements complied with?

**A** I commissioned the Water Risk Assessment this included preparation of a Written Scheme which detailed the testing required under L8. on receipt of the Risk Assessment and Written Scheme from DMA, I held a briefing meeting with DMA, David Bratty & Jim Guthrie to review the document and discuss the way forward. At that meeting I tasked David Brattey & Jim Guthrie to work with DMA to develop an action plan and address issues arising from the Risk assessment and to populate and implement the written scheme. I believe that

elements of the Written scheme were implemented records of which would be held by Jim Guthrie.

g) Were there any legionella concerns at handover? Is so, what was done to deal with these?

**A** From Memory points of concern at the time were:

- The system had been filled early in the commissioning period and had been controlled via a routine flushing programme, which was continued after handover by Multiplex for a 6-week soft-landing period after which GGC staff continued the programme until Migration of all area's was complete. This was supplemented by a testing sanitisation programme for all wards\departments 2 weeks prior to their migration.

(i) How, if at all, did this contribute to legionella concerns at handover?

**A** I raised concerns prior to hand over regarding early filling of the system and was advised that due to the size of the system Multiplex need this time scale to complete all the required testing and commissioning and that this was being managed via a full flushing programme as pre SHTM requirements. This was accepted by the project team and the technical advisors. There were no concerns raised at the point of hand over regarding this as the water test results were approved by Professor Williams.

- Jim Guthrie also found that the design included end of line flushing valves per zone for activation when the line temperature exceeded a set temperature (i.e. 18C) in order to ensure end of line temperatures did not exceed the Max of 20C, Jim found that several of these had not been connected or were not functioning. This was reported as contract defects by Jim however I believe the response to this was slow and Jim resolved the issues himself.

(ii) What impact did the end of line flushing valves not being connected have on the water system/ raise concerns about legionella?

**A** Where these valves were not functional there was a potential for the cold-water temperature on the affected lines to be sitting above the dump

temperature set point (circa 18ºC) due to ambient temperature heat gain. Cold water temperatures above 20ºC have the potential to support the proliferation of microbial activity in water.

- The renal dialysis Reverse Osmosis (RO) filtration (please define RO system) system did not have a duty\Standby line and therefore when the RO line was under routine thermal sanitisation there was no emergency renal RO connections available for renal dialysis. From memory 6 emergency renal connections were installed on the Potable water system, these were installed by Multiplex under PMI from Peter Moir\ David Hall. I advised that it was not appropriate to connect these to the potable water system but was informed that there was no other option at this stage. Later on circa 2016/17 I submitted an application for capital funds to address this issue by installing a backup line fed from the RO plant which would allow for alternate emergency RO source. Funding was not approved.

(iii) What was the impact/risk, if any, with connecting to the portable water supply?

**A** Potable water is defined as: Safe to Drink. The impact of connecting Renal dialysis connection stations to the potable water supply is that they are automatically classed as seldom used outlets introducing the potential risk of stagnation and regressive contamination of the supply line it is connected to. These points were therefore added to the routine flushing and water sampling programme by Jim Guthrie.

h) What concerns, if any, did you have about water sitting in the system before the hospital opened?

**A** I was concerned over the risk of water stagnation and build-up of biofilm especially in a system of this size and complexity. I believe the system was filled approximately 9 months before hand over, although I was not aware of this at the time of filling, however when I became aware I raised my concerns with the project team and David Wilson and was advised that the system needed to be filled early due to the scale of the system to allow time to carry out the commissioning checks and that the system was under a water flushing control regime as per SHTM guidance. I recall suggesting chemical treatment

but was advise guidance states that new well engineered system should not need chemical treatment.

(a) What impact, if any, did water stagnation/ build-up of biofilm have on the integrity of the water supply?

**A** In principle the routine water flushing programme should have turned over the water volume in the bulk storage tanks, however I am unsure of how long it would have taken to have turned over the full volume of these tanks? therefore the potential for stagnation. Stagnation would allow for the multiplication of microbial activity in the system; however, the water sampling regime did not indicate this at the time.

(b) You state that the water system was filled approximately 9 months prior to handover. Would this have been done bypassing the filters? If so, was a full flush to drain the water system have been carried out before the filters were put in place/ put back on, and then the system filled with eh filters in place? If this was not done, should it have been done? Please explain your answer.

**A** I believe that the system was filled before the filters were installed, although I did not know this at the time. I do not believe that the system was drained\flushed after the filters were installed. The reason for the filters is to remove suspended solids from the supply, therefore It would be expected for the system to have been drained and filled via the filtration plant and flushed.

i) Were you aware of any issues with the testing of the water system?

**A** I was aware of the sanitisation programme Method statement, indeed I asked if this had been shared with the ICD? Which it had not, I then advised that Craig Williams should have access to this and sign off his approval for the proposed methodology following which he should be witness to the implementation of the method statement and sign off on the micro-biological test results. Following this the Method statement was approved by Craig, and I believe the test results signed off by him although I was not party to this. However not all areas pasted the microbiological test first time, some area's required re-sanitisation and retesting until the results were within acceptable limits.

(a) Which areas required re-sanitisation?

**A** I cannot recall that level of detail.

j) What was your understanding at the time of the SHTM guidance, particularly SHTM 2027 and SHTM 04-01, in respect of water?

**A** My understanding was that STHM 04 – 01 superseded SHTM 2027 as part of the overall update of the SHTM suite, Therefore SHTM 04-01 was the relevant document under the contract Hierarchy.

k) Was the QEUH/ RHC water system SHTM 2027 and SHTM 04-01 compliant at the date of handover – if not, what was outstanding? Who was responsible to ensure that the water system complied with SHTM guidance?

**A** I believe that the water systems installation should have been compliant with HTM 04-01 which was live and in place at the time the contract date moving to SHTM 04-01 Scottish version published 2011. I was not aware of any outstanding compliance issues with SHTM 04-01 at the date of hand over. Capita Symonds would have been responsible for SHTM guidance compliance.

(a) Did you therefore consider, at the time, the water system was compliant with SHTM04-01?

**A** Yes, I was under the impression that the system was fully compliant and approved by Capita as meeting the contract requirements.

96. Was a pre-occupation water test done prior to occupation? Refer to Estates Team Bundle, documents 14, 14.1, 14.2:

**A** Yes preoccupation water tests were carried out.

(i) Please direct us to these tests, within the bundles you have seen, or advise where this information would be stored?

**A** I have not seen these test results in the evidence bundles, but these would be accessible on the Al-control Laboratories services portal under the GGC\QEUH account. Jim Guthrie or Melville McMillan would have access to this.

a) Who carried this out?

**A** Jim Guthrie (Estates Manager).

b) If this was not done, should it have been done and why?

**A** N\A.

c) Consequences of not doing it.

**A** The patient groups would have been moved to accommodation with an unknown water system condition.

97. What was the post occupation water testing regime at QEUH?

a) Was carried this out?

**A** Yes.

b) Who carried out testing?

**A** Jim Guthrie and Melville Mcmillan (Estates Duty Managers)

c) Your involvement with the testing?

**A** I was not involved in the testing.

d) How frequent was testing?

**A** Where positive results were found following sanitisation, these tests would be repeated weekly until 3 consecutive sets of clear results were achieved, then the test would have been discontinued. NHS GGC policy.

e) Did this comply with L8 and SHTM 04-01 guidance? If not, why not?

**A** Yes, as this would comply with the requirement to carry out testing.

f) What happened to the results?

**A** The results were provided by e-mail to Jim Guthrie, Melville McMillan as well as on the Accredited Laboratory service providers portal (Alcontrol Ltd) and Jim\Mel should have kept electronic copies.

g) Your role in connection with the results of water testing?

**A** My role would have been to review out of spec results with the ICD as and when notified by the AP, to risk assess the situation and develop action plans.

**(l)** Do you recall carrying out risk assessments and actions plans? If so, when? Describe any events that caused you concern.

**A** Sorry, I cannot recall receiving notification of out of spec results from the AP for review.

h) Where were the results stored?

**A** In the online portal and electronically on-site Jim & Mel would have access to this.

i) Does GGC have a policy for addressing water testing results? If so, describe this policy and confirm whether it was followed.

**A** Yes, where a water sample exceeds permitted legionella levels, routine control measures to eliminate the legionella will be applied. If there is still Legionella detected in a follow-up sample, then a record of this incident will be recorded on the Boards Datix reporting system. With the key duty holders copied into the report, i.e. The Authorised person, Responsible person & ICD. I have no recollection of any reports being made via Datix.

i.) What action was taken in response to results?

**A** I believe that some of the areas were resanitised and retested.

j) Was there an escalation process?

**A** There was an escalation process in the NHS GGC policy, but I cannot recall the detail.

98. We understand that there were positive legionella results in Ward 2A in around June 2015. Dr Christine Peters tells us that you 'did not want to put this in writing':

a) What concerns did you have about the positive legionella results?

b) Why did you not want to put the finding of positive legionella results in writing?

c) What action did you take in response to this?

d) Was legionella found in any other areas of the hospital? If so, where, and what action was taken?

**A** Unfortunately, I do not recall these results nor Dr Peters statement that I "did not want to put this in writing" I would have no reason not to put these in writing.

99. In around June 2015 Dr Christine Peters requested the risk assessment for waterborne infection in the QEUH from Estates, the Project Team and Mary Anne Kane. Did you provide this information? If not, why not? why?

**A** I do not recall being asked for this by Dr Peters, she may have made this request via the project team or Mary Anne Kane, but I don't recall ether of them asking for this from me. Although I had the Risk Assessment from DMA at this point, I had not escalated it to David Loudon or Mary Anne Kane, If I had been asked for the report by anyone, Dr Peters, Mary Anne or David Loudon this would have prompted me to share it.

100. How many positive tests, if any, came from Ward 4B? Could you recall how many positive tests at the time?

**A** Sorry I cannot recall the result from any of the tests from that far back, remembering I do not have any access to records.

(a) Were you ever concerned about the number of positive tests from Ward 4B? If so, did you escalate these concerns and to whom?

**A** I don't recall being involved in the water testing results for ward 4B. I am not sure of the timeline for these tests it could be I was redeployed to my new post by then in Jan 2017.

**<u>Water - Commissioning and Validation (C&V)</u>**

101. What commissioning and validation documentation did you see before handover in 2015 – if not, who would have had sight of this?

**A** The only Documents that I had sight of at that time were the water sanitisation method statement and the water microbiological test results following

sanitisation. I would expect that Capita Symonds would have had witnessed the C&V elements and had access to the records.

102. Where is this commissioning and validation documentation ("C&V") stored generally on the hospital system?

**A** These would be stored in the Zutec document management system, 60 days after handover.

103. What is the purpose of C&V?

**A** The C&V is required to ensure that the installation has been completed as per design \specification and the materials and equipment installed comply with the Scottish Water Byelaws and other British Standards and are not otherwise unsuitable and all the requirements of current legislation are met in order to ensure that the system and the water quality is safe.

104. What are the consequences of it not being carried out?

**A** Failing to carry out the C&V process correctly risks the safe operation and management and control of the system.

105. Were records kept of the cleaning and testing regime? Where were the records kept and what was the retention policy? What concerns, if any, did you have about record keeping and retention?

**A** Assuming this is in relation to the C & V pre-hand over the records for cleaning and testing should have been held on Zutec document management system, it is unclear to me at this stage if these actions were fully recorded, the retention policy for the Board would follow L8 requirements with a minimum retention of 5 years.

106. What concerns, if any, would you have If the water system were to have no C&V before handover in 2015? Why were you concerned?

**A** If there was no C&V I would be concerned that the system was not fit for purpose and unsafe to take into service. At the point of hand over 2015, I was under the impression like the rest of the project team that the system had been Commissioned and Validated before acceptance of practical completion

and handover, therefor I was not concerned that there were any problems, however I was concerned at the lack of access to records due to the 60 day grace period for the population of Zutec with PCD\records under the contract T&C's.

a) Do you now, with the benefit of hindsight, believe that C&V was carried out prior to handover in respect of the water system?

**A** I have seen no evidence to support this, other than the water sampling results.

107. Describe the same in respect of verification and the cold-water supply system.

**A** I don't think my response would be any different from my response to question 105.

108. What C&V of the water system was carried out post-handover?

**A** 1). Risk assessment by DMA supported by Jim Guthrie.
2). Written Scheme framework for further population by David Brattey (Site Estates Manager) and Jum Guthrie (Estates Duty Manager).
3). Central Plant and Distribution systems Temperature monitoring and data logging (Melville McMillan\Jim Guthrie).
4). System pre-migration Microbiological Tests, e-coli, TVC's & Legionella, (by ward\department\zone).
5). System pre-migration Sanitisation (by ward\department\zone). System Post sanitisation microbiological retest (as detailed above)
6). Cold water end of line dump valve remedial works & tests (Jim Guthrie).
7). Cold water incoming supply remedial works for issues detailed in my report (Eastes Bundle, document 14.1).

a) Who was responsible?

**A** GGC were responsible most of this except where defect liability applied.

b) How was the C&V recorded?

**A** There should be records of all of these activities ether electronically or paper copies via the Estates office (Jim Guthrie\Melville McMillan) or in the Capita defect log.

c) Any concerns arising from post-handover C&V? If so, why did these concerns arise?

**A** The DMA, Risk assessment highlighted multiple areas of concern.

**Water System – General**

109. What testing and maintenance protocols and regimes were in place? What should have been in place. If it wasn't, why wasn't it? What did you do about that?

**A** I believed that David Brattey was managing this through Jim Guthrie\Melville McMillan (nominated AP's) and had implemented Testing and maintenance protocols but I do not recall the detail of these Jim & Mel would be better able to answer this question. These protocols were detailed in the Written Scheme included within the Risk Assessment from DMA, where I had asked DMA to prepare the Written Scheme in line with the new draft SHTM 04-01 Part G "Operational procedures and Exemplar Written Scheme" Following receipt of the Risk Assessment and Written Scheme from DMS, I arranged a meeting with David Brattey & Jim Guthrie, Melville McMillan(I don't believe Mel was available for this meeting), myself & DMA to review the RA and Written scheme, where I had tasked David & Jim at the meeting to work with DMA to develop and implement an action plan to address the points raised and populate and implement the written scheme of maintenance.

110. What concerns, if any, did you have about the temperature and movement within the water system? How was this recorded and measured? Who was responsible for this? If Schnieder did these were these reports forwarded to yourself or other GGC employees? How were these reports responded to, what did they tell you? How were issues flagged in these reports dealt with/ resolved?

**A** From **Estates Bundle, document 14.2** referenced above, there were concerns raised in the DMA RA (Circa: April 2015) regarding commissioning temperature anomalies lack of records and evidence of temperature measurement\monitoring during commissioning, I was also concerned over the volume of stored water being circa 650,000 ltrs and the ability to turn over this volume in a 24hrs period. These issues were recorded by e-mail to Multiplex and included David Loudon, Peter Moir and David Hall. The temperatures for the cold water tanks, DHW calorifiers, DHW flow and return cold water flow were trend logged on the BMS with the support of Schneider, these logs were monitored and actioned by Melville McMillan & Jim Guthrie (Duty Estates Managers), I have seen the print out records of the temperature trends shown to me by Melville but did not monitor them personally. I believe that temperature issues were raised as defects via Capita by Jim & Mel who could provide more detail on this and would be better placed to advise how they responded to temperature issues as they arose. I don't recall them raising any specific ongoing temperature issues with me. With Regards to water movement\stagnation the flushing programme would have maintained system turnover on the filtrate tanks and the raw water tanks, I was not aware of any stagnation evident on these filtrate tanks, although I believe there was an issue with a raw water tank (Jim & Mel would have more detail on this). From memory, I think that with Mel\Jims support we carried out a drop test on the filtrate tanks to establish the turnover during peak time once hospital was occupied.

111. What concerns, if any, did you have about testing and stagnant water being in the system following testing? Please describe and provide information on how this was dealt with.

**A** Jim Guthrie managed the testing protocol pre-migration and carrying out pre-migration sanitisation with the support of specialist sub-contractors followed by re-testing. Jim confirmed each ward department test results were within set limits prior to their occupation. Concerns over the potential for stagnation were highlighted by the DMA RA, my expectation was that David Brattey & Jim Guthrie would address these issues under the action plan being developed with DMA support.

112. Did you have any concerns about dead ends/ legs in the system? Please describe and provide information on how this was dealt with.

**A** Not at the time of hand over, the DMA's Risk assessment highlighted risks relating to dead legs, I recall Melville McMillan being tasked to implement a flushing programme to manage these as well as preparing and implementing a plan for their removal.

113. To what extent could the water system in QEUH/RHC have been more comprehensive?

**A** Due to the system being filled with water so early, the design should have included a suitable continual water treatment system to maintain water quality, This would have addressed the continuity of water quality control of the system pre & post-handover\migration. Although SHTM 04-01 (Part A) V1. Section 15.1 indicates that "The introduction of chemical treatment to the potable water supply is an admission that the physical installation and/or the management process is incapable of maintaining that water supply in a wholesome condition." In my view a system of this size, scale and complexity should have been designed with water treatment included from the day the system is filled with water and SHTM 04-01 should be updated to recognise this and provide advice and guidance for its inclusion in the design, as this statement would deter designers from including water treatment in their designs.

114. If the water system as installed had been operated correctly, would it have achieved the system objectives? In your answer set out what the system objectives were and how these were/ could have been met.

**A** With Hindsight, if the as installed water system had been operated correctly it could have achieved the system objectives as detailed in HSG 274 (Part 2), namely:

- Comply with legal duties.
- Identifying and assessing source of risks.
- Preparing a scheme to prevent or control Risk.
- Implementing Managing and Monitoring Precautions.

- Keeping Records of Precautions
- Appointing a manager responsible for others.

In order to have achieved system objectives with the system as installed, due to its size, scale and complexity the following measures would have been necessary,

a) Introduction of a suitable automatic water treatment system.

b) Bring the Authorising Engineer Water on board from point prior to handover to support and guide the RP\AP (Note NHS GG&C did not have an AE (Water) at the time of hand over) b)Formally appoint a Responsible person (water), with experience and knowledge of water management.

c) Formally Appoint 2 off Authorised person with experience and knowledge of water management and dedicated to the post contract water management\control & maintenance and to remain in post dedicated to managing the system going forward.

d) Formally appoint appropriate dedicated staffing resource prior to hand over for full training and familiarisation of the water systems and to support the routine monitoring, control, maintenance, and PPM tasks required of a system of this scale, to remain in post dedicated to maintaining and controlling the system going forward.

e) Formally appoint an Infection Control Microbiologist ICD (water), with experience and knowledge of water management to advise and supporting the management and Monitoring of water quality.

f) On the basis that the “water system as installed” The staff detailed above should be in-post at least 6 months (preferably longer) before hand over with access to the site design team, installers, and commissioning team, with full system training and familiarisation, as well as Commissioning and Validation approval status & witnessing of the C&V process and sign off rights.

g) detailed PPM with methodology training for all key items of plant\distribution system.

h) Formal certified training in all relevant aspects of water management and control for each staff group.

i) Preparation and interface of the PPM schedule\task data with the FMFirst LMS by Multiplex as required by the contract in advance of hand over.

j) All contract PCD, Commissioning and Validation records, as fitted drawings, manufacturers data, manufacturers maintenance requirements as well as statutory & mandatory Maintenance schedules available on FM first LMS, before handover.

k) Appointment of water risk assessors to carry out pre-occupancy risk assessment and Written scheme of management, working with the dedicated Authorised Person Water to development and implementation of the RA action plan and Written Scheme of Maintenance, and implemented prior to hand over to allow effective management control from the point of handover, (however this may not be practical under contract law?)

l) Allocation of an appropriate budget for the required resource covering, staffing, contract support, Laboratory services, consumables etc.

m) Staffing to be trained and in post from point of hand over.

115. Describe any ward/area specific water systems used?
a) Detail the individual ward water specification
b) What were/ are your thoughts about this
c) Why, if applicable, did certain wards have different water systems
d) Was there a standard protocol for sanitising water systems?

**A** Item a&b). Unfortunately, I am not close enough to the system to describe and comment on the ward water distribution (5 years retired). Item
c). the only wards I can recall with different distribution arrangements were the renal wards with dedicated RO loops for patient connected Dialysis machines. From memory all adult ward distribution was the same and all Childrens ward distribution were the same for the ward layout.
d). The sanitisation protocol adopted by GGC for the local sanitisation programme was adopted from Multiplex for the use of Sanosil as recommended by the manufacturer, I believe this was selected to address the risks to the main Membrane water filters feeding the raw water tank as well as the minimising the risk of chemical impact on the Horne TMT.

116. To what extent were the standard protocols for sanitising water systems used on a system of the size and complexity of this one?

**A** Under normal circumstances this would not be our preferred mode of sanitisation as the recommended strength of sanosil for normal sanitisation is 500ppm for 6 – 12 hours, however if we had adopted that strength of sanitant Multiplex\Horne may have voided the warranty on the Optitherm TMT. I believe that Jim Guthrie adopted the Multiplex protocol for this reason and the fact that the Manufacturer recommended this protocol to Multiplex for the QEUH system.

117. Were consultants brought in to advise on sterilisation of the water systems?
a) Who were they?
b) Had you worked with them before?
c) Describe and comment on the methodology used.
d) Who decided to accept it or not.
e)Did it work?
f) What paperwork or records were kept in relation to their installation, maintenance or flushing?
g) How were these kept on paper or electronically?
h) What equipment for recording work was used by employees doing day to day tasks?
i) How was that then reported back and checked?

**A** Jim Guthrie would be better placed to answer this question, however from memory

a) Jim utilised the company used by Multiplex, H&V commissioning, I believe Jim used them again for consistency of process.

b). We have worked with H&V many times, mainly on Ventilation commissioning and validation.

c). I do not have access to this methodology Jim could answer this.

d). Jim Guthrie approved this methodology.

e). at the time I was advised that the individual system zone was successfully sanitised and tested ready for migration.

f). Jim Guthrie should be able to provide this detail.

g). Jim Guthrie should be able to answer this detail.

h). for in-house staff they would have used PDA data loggers for the task recording and at that time paper record forms, but Jim could provide more detail on this.

i). The log sheet would have been returned to the planning supervisor who would have shared this with Jim Guthrie for checking\action.

**Water Maintenance**

Refer to Estates Team Bundle, document 10.

118. Explain the cleaning and maintenance of the water system, taps, drains, shower heads etc. When doing so consider:

a) What is the cleaning regime?

**A** The cleaning regime detailed in Estates Bundle Document 10, related to the Domestic Cleaning regime under Domestic Monitoring Tool guidance and should be carried out daily and include a 3-minute flush of all tap and water outlets in the room\en-suite. Cleaning and maintenance of shower heads requires 1). Showers heads and hoses should be descaled, cleaned and disinfected or the shower head & hose replaced with a new assembly on a quarterly basis. 2). Thermostatic Mixing Taps (TMT's) should have a quarterly functional test and replace the outlet flow control device. As well as a 6 monthly TMT service exchange maintenance programme including thermal sanitisation as per the Boards Optitherm Risk Assessment following the HPS SBAR recommendations.

i) Can you provide further details on the cleaning regime for taps; when it was implemented, who implemented and why? Was any particular process ever instructed in respect of the cleaning of taps and why?

**A** The cleaning regime for taps was not implemented prior to the water incident 2018, although I had worked with Horne to develop a service exchange model for functional testing, cleaning and thermal sanitisation of the TMT's and had purchased the equipment to facilitate this, I had delegated the creation of a workshop facility and heat sanitisation facility to David Bratty. I also issued David with a copy of the TMT risk assessment developed by John Green, Sandra McNamee and myself in response to the HPS SBAR. Due to workload

pressures and staffing resource issues David did not deliver on this before he retired, Paul McAllister took over David's post and I requested Paul complete this work which he did. However he also moved on before implementing the maintenance programme and by the time his post was filled the water issue had arisen. The TMT maintenance facility was then operated by DMA under instruction of Andy Wilson\Colin Purdon. The reason for this process being instructed was that it was the only sanitisation method approved by the TMT manufacturer Horne. I had raised my concerns several times that this was not a practical method for maintaining the TMTs to Alan Seabourne\Peter Moir at the TMT selection group. Also, to David Loudon following the HPS SBAR recommendations. I was not consulted or party to his decision to proceed with the existing TMT's with a maintenance regime, against the recommended option within the HPS SBAR.

b) What is the importance of this?

**A** These programmes are required to ensure that there is no buildup of nutrients\biofilm on the on shower heads & flexible hoses and that the TMT's preform their safety anti-scald function as well as ensuring the complex internal TMT tap configuration and the complex structure of the outlet flow control device do not support the build-up of nutrients or biofilm.

c) What responsibilities did you have a result of this?

**A** My responsibilities were to ensure that the management structure was in place to deliver monitor and control these requirements. In hindsight given the lack of staffing levels it would have been more practical and effective to introduce continual water treatment following hand over.

d) What did you do to ensure these responsibilities were executed?

**A** I sought clarification and confirmation from the Corporate General Manager (Designated Person) of the management structure and formal appointment of key post holders.

(i) Who was the Designated Person?

**A** Mary Anne Kane

e) What issues, if any, did you have fulfilling these responsibilities?

**A** The shower head\hose assembly sanitisation\replacement programme is a standard procedure, the senior estates manager David Bratty should have implemented this under the RA\Written scheme requirements delegated to him and Jim Guthrie. The TMT (Taps) was more complex to address, during the selection process for the TMT's Multiplex arranged for a product presentation from various manufacturers on TMT products for contract selection the project team were represented by Alan Seaborne, Peter Moir, David Hall and myself. During the presentations of the Horne Optitherm, Horne suggested that their TMT should not be exposed to chemical sanitisation as this would adversely affect the materials used in the TMT and the preferred sanitisation was thermal at system temperature 60C. I challenged this and advised that Thermal sanitisation at system temperature of a system of this size and complexity would be impractical and unsafe. This was further discussed during the final selection of the preferred option however at that time the Horne optitherm was the only TMT with full WRAS approval, the others were all pending approval hence the Honre TMT was selected. I later worked with Horne to develop a service exchange maintenance model for the full maintenance, inspection and manual cleaning, mechanical service, functional testing and finally thermal sanitisation. Jointly we developed a cleaning and thermal sanitisation station which I commission Hornes engineer to manufacture. This also required a workshop and connection to a hot water source with variable temperature control. I also asked Horne to confirm the exposure time for the thermal sanitisation at system temperature (60C), eventually Horne provided a thermal sanitisation curve for Temperature against time were at system temperature the exposure time was 20 minute (again impractical, unsafe and unmanageable in a live ward setting) the curve did however indicate that thermal sanitisation at 70C would be effective after 3 minutes. It should be noted that I worked with Horne to design and develop a sanitisation station for the introduction of a service exchange model this equipment was procured before hand over for development of a suitable workshop and installation of a heat sanitisation loop, after handover\Migration was complete circa June\July 2015. Without knowing the state of the water system before handover. Following Migration I

provided David Brattey with information regarding the proposed Service exchange model and instructed that he create the workshop within a central location of level 3 plant room close to the DHW heat station and develop install the required PHE\controls for this facility. Due to the unprecedented workload and pressured placed on David, although the procurement of the works package was complete the works had not started when he retired, Paul McAlister Who took over the role of senior Estates manger completed these works. This all lead to delays in implementing the service exchange model leading up to the water incident date. In addition this was always going to be a labour intensive procedure, In hindsight given the lack of staffing levels it would have been more practical and effective to introduce continual water treatment following hand over. With regards to Drainage cleaning and maintenance to my knowledge there were no current or historic Estates related cleaning protocols for this element. Following the water and related drainage issues in ward 2A, I recall Mary Anne discussing that domestic staff had previously cleaned drains as part of their remit, however with the introduction of the DMT and associated guidance this requirement had been removed due to the risk of aerosolization of the drain contents.

f) Were there ever concerns raised about cleaning practices? **IMT bundle, document 22**. Detail these concerns. Refer to **NHS GGC SBAR Bundle, page 112** when providing your answer.

**A** The Documents referred to do not raise issues of water system cleaning practices, the issues raised in Document 22 relate to the decontamination room not being complete, with no hot water, the drainage issue relates to the outstanding defect of the contaminated drainage separation tank etc, unfortunately I cannot recall what the solution to the lack of hot water issue was? Doc 112 Refers to capital works to create a new entrance for the INS building, my interpretation of this e-mail is that there are existing capped water services connections in the INS building at the link corridor that require to be removed. (May have been vending machine connections?).

(i) Were there ever concerns raised regarding cleaning practices?

**A** Yes; latterly at the ICD meeting chaired by Dr Jennefer Armstrong as recorded later in this statement. Prior to this the issue had not been raised with me by ICT.

g) What, if any, matters regarding the maintenance of the water system were escalated? If so, were they escalated BICC or AICC?

**A** I am unaware cleaning issues being escalated to the AICC or the BICC.

h) What is dosing?

**A** Dosing means treating the system or part of the system with chemical Sanitant. This can be a shock dosing (one off local or system shock treatment) to address out of spec water tests or continual dosing (Continual water treatment) to maintain water quality over time. i.e. Use of Chlorine Dioxide

i) Why was chlorine dioxide used in the cleaning regime. IMT bundle, document 30.

**A** I don't see any reference to cleaning regime or chlorine dioxide in IMT bundle document 30? However, Chlorine Dioxide was proposed as a sanitising agent by water specialist water consultant Tim Wafer (Water Services Group) who was brought in to support the Board to develop a water management solution to the water contamination issues. Chlorine Dioxide is well established in the water industry as effective in controlling organic materials and micro-organisms in both hot and cold-water systems and is supported in HSG 274 guidance and SHTM 04-01 Part A, as an effective means of control. It should also be noted that safe introduction of continuous chlorine dioxide water treatment design, procurement, installation, commissioning process system was planned and managed over an extended period of time, not just a single event.

j) Clearing of drains in June 2018 following water incident -relevance and purpose. **IMT bundle document 27**. Did this resolve the issue? IMT bundle, document 38 why was expert advice required?

**A** From memory, the water TMT, Taps and showers were all fitted with Pall point of use (POU) absolute filters, but the ICT were still recording patients positive blood cultures this then pointed attention to the drain outlets on the clinical wash hand basins (whb), there had also been black material noticed by staff on a whb drain orifice. The drains were tested for micro bacterial activity and then physically cleaned and sanitised. This had a short term impact but the issue reoccurred and therefore did not resolve the matter. The drainage expert from Germany, I had carried out some research on similar issues and found that a hospital in Germany had experience a similar issue, they found that by chemically treating the whb drain connections on a regular basis (weekly) controlled the situation. However is this regime was not maintained the issue returned . contact with this expert was to learn from their experience.

k) What happened in response to concerns about on-going maintenance and cleaning? What further action did you take personally? For example taps, refer to **Estates Team Bundle, document 121.**

**A** Document 121, My interpretation of this document is that Mary Anne seeking guidance on the definition of patient high risk areas, but my interpretation is based on this short e-mail exchange. At this stage Point of Use (POU) absolute filters had been deployed pending the introduction of the water treatment strategy. I sourced and implemented the rolling programme of POU filter replacement with DMA support. I also developed and managed the water treatment strategy with the support of Tim Wafer (WSG).

l) What further steps could have been undertaken?

**A** It is now my belief the application of POU absolute filters was effective in controlling exposure to the water risk, this combined with Chlorine Dioxide continual water treatment to bring the water quality and connected equipment back under control, in addition the chlorine dioxide discharge from TMT to drain would help to control bioburden in the CWHB drain outlet connection. The remaining steps that could improve the situation would be, a) replacement of the CWHB complete with new smooth drain connection design

and b) New TMT complete with bio-guard copper lined  open orifice flow control device would minimise the need for intense maintenance cleaning.

119. Were you involved in the decision to proceed with a drain survey? If so, can you explain your role in this decision? What was the purpose of the drain survey?

**A** I was not involved in this decision but it would have been discussed WTG meeting, the survey was led by Andy Wilson\Colin Purdon, however my understanding was that the survey was to verify that the drainage configuration was in line with that of the as fitted drawings and that these were compliant with the design requirements for Public Health. In addition to establishing if there was any indication of cross contamination between areas connected to the common drainage system.

120. What were the results of the drain survey?

**A** I do not recall the outcome of the survey, Andy Wilson\Colin Purdon would be able to advise in this.

121. Debris, including sponges, were found in the water tanks; what is the significance of this, if any, in relation to the wider issue of water contamination?

**A** The debris found in the water particularly the sponge would have become a source of nutrient for micro-organisms and indeed would have supported the formation of a bioburden, this would potentially become a source of system contamination. I believe that this debris was left in the tank following the replacement of the water tank roof supports from hollow pipe supports to solid H section supports as advised under an HFS A Hazard Warning Notice (HAZ). At the time of the notice warning of the risks of hollow pipe support containing stagnant water, the tanks had been filled, I escalated the notice to Peter Moir who issued a PMI for the hollow pipe supports to be replaced. The tanks would have been drained, replacement works carried out, cleaned and sanitised under the supervision of Multiplex. However it should be noted that the debris referred to is quite small in size compared to the volume of the

tanks and would be hard to spot if the inspector did not enter the tank prior to cleaning\sanitisation.

122. Concerns have been raised regarding the hospital design and the increased risk of water contamination; what is your view on the increased risk of water contamination in relation to the following:

a) Having a single barrier approach water system, resulting in fluctuating water temperatures?

**A** The preferred barrier control regime within the NHS is temperature control, however this is vulnerable to temperature fluctuations on both Domestic Cold Water Services (DCWS) and Domestic Hot Water Services (DHWS). The ideal conditions for microbial activity in water are between 20 – 45C, The DCWS requires to be maintained at below 20C and not rise by more than 2C above the incoming mains temperature in summer this can exceed 24C, leading to a loss in single barrier temperature control. Likewise DHWS should be maintained at 60C flow and minimum 50C return, however issues with CHP plant\Boiler plant, Calorifier stations and controls problems all can all have a detrimental impact on the ability to maintain the single barrier temperature control, which is exasperated further by the lack of staffing resources required to effectively monitor and respond to these fluctuations and failure to maintain the required temperature control regimes. From the experience at the QEUH\RHC, I am firmly of the belief that a dual barrier system should have been included in the original design to maintain double barrier regime of temperature and continuous chemical (Chlorine Dioxide) control. Providing a more reliable approach to maintaining system control. This would have also addressed concerns over the use of TMT's with flow regulators fitted. Finally it would also be appropriate to add a 3rd Barrier approach by including POU filters in the original design for designated high risk wards. with potential for this 3rd barrier being withdrawn once the efficacy of the double barrier system has been proven.

b) Ensuite bathrooms attached to each room?

**A** Single room design is intended to provide a higher degree of infection control between patients, which for a standard single room, requires en-suite shower,

WC facilities and WHb as well as a CWHb in the patients bedroom for clinical use. Due to the single occupancy these outlets potentially all become seldom used outlets potentially introducing a level of stagnation, which should be addressed by the daily flushing protocol, which is included within the DMT cleaning regime, this flushing regime would also be required to be maintained in order to ensure efficacy of the above double barrier proposal. It is difficult to see how to reduce the need for ensuite facilities while controlling the risk of cross infection between patients from shared facilities.

c) Overprovision of water outlets leading to sink removals?

**A** As per my statement above, the water services are essential for single room design, I am not aware of any patient room outlet removals, there were some ancillary areas in the basement where sinks were removed as non-essential and long pipework runs reconfigured to reduce the risk of dead legs.

123. How involved were you in the decision to use point of use filters?

**A** Following the concerns over the water quality being linked to patient blood work results, I was therefore asked by Mary Anne Kane to join a telephone IMT held on a Saturday (I don't remember the date. Peter Hoffman (Public Health England) was also on the IMT call as an environmental\public health expert. As part of the meeting we discussed the placement of POU absolute filters on to the outlets this would contain the system contamination and to control patient exposure, although it does not address the source of the problem it is an effective control measure for the patient environment. I was tasked from this IMT to quickly source and install POU filters in the identified rooms ward 2A. I managed to source these direct from Pall filters (industry leaders with high quality and integrity tested standards) for delivery on the Monday. I also arranged for DMA to manage and record the installation process for a rolling replacement programme.

124. Who was responsible for the effective management of and installation of the point of use filters?

**A** After initial sourcing Andy Wilson\Colin Purdon took over the management of the process with the support of DMA.

125. Did the point of use filters meet the water regulation requirements? Did they have an effective gap between the water level and the filter to prevent contamination?

**A** Yes, the POU filters are certified and meet with the water fittings regulations and there was an effective gap between the water filter and the CWHB water level. I had obtained an reviewed all Pal Filter certifications at the time of procurement.

126. Why were the point of use filters not introduced earlier?

**A** From memory I believe that the Blood cultures had not been proven to be linked to the water up until this point.

127. How often were you aware of the filters being changed? Were the manufacturer's recommendations followed?

**A** From memory the POU filters were changed after 25-30 days based Manufacturer guarantee of 31day working life and allowing for access issues etc.

128. How involved were you in decisions relating to water testing?

**A** I was involved in setting the test requirements pre-Migration with Jim Guthrie & Melville McMillan, ongoing testing was carried by Jim following the Board water testing protocol. Water testing during the subsequent water incident were instructed by ICD regarding the organisms they were looking to trace\link to cases.

129. If not, who was responsible for these?

**A** I was responsible for water testing up until Jan 2017, then Andy Wilson took on this responsibility as Sector Estates Manager.

130. What do you understand about management of water testing? What do you understand about decisions on when water testing should be undertaken?

**A** The management of water testing is delegated to the Authorised Person (water) under the NHS GGC water policy, who should maintain records of

tests and formally report to the Responsible person (water) and the ICD of any repeated out of spec results, whereby an IMT may be formed to respond to and address the out of spec issues. Water testing Standard water testing should be undertaken:

- On newly commissioned systems.
- Before occupation by patients.
- Change of use of the ward\area
- Change of system configuration.

Other Pathogen tests as instructed by ICD.

Routine testing should be undertaken:

- High risk patient area's
- Engineering risk area's
- As Instructed by ICD\ICT

a) Please name relevant place and title holders for water i.e. Authorised Person etc

**A** Designated Person: Mary Anne Kane.
Responsible Person: Ian Powrie
Authorised Person: Jim Guthrie, Melville McMillan, Tommy Romeo
To my knowledge none of the above were formally appointed in writing or trained prior to hand over.
ICD: Dr Terresa Inkster.

131. In her statement Dr Teresa Inkster states *'there was a direction from Mary Anne Kane, who was at senior director level, not to give microbiologists access to water testing results'*:

a) What is your reaction to this statement?

**A** I don't recall any direction of this nature coming from Mary Anne to me.

(ii) Do you recall such a direction coming from another member of staff, if so, whom?

**A** No, I was never asked to withhold test results from the microbiologists.

b) Why did estates direct that microbiologists should not have access to water testing results?

**A** I don't recall Estates making such a direction.

c) Have you ever been advised not to contact someone/ not to provide water testing information? If so, when? By whom? and why?

**A** I don't recall ever being directed to withhold water test data.

d) Have you ever refused, or directed others to refuse to provide water testing information requested by microbiologists or infection control? If so, why? Provide as much information for your rationale and the consequences of withholding information.

**A** No I have never refused or directed others to refuse to provide water testing information requested by ICT or ICD's, I worked closely with the ICT and ICD's and supported them in whatever data they asked me for.

e) Provide information on how you dealt with requests for water testing results from microbiologists and infection control - was all the information requested provided? If so, what was provided? If not, why was paperwork not provided?

**A** When ICD requested water testing result, directly to me, I would pass this on to the Estates manager responsible for testing, to arrange for the sampling and provide the ICD with the results of the tests requested. Q130F). From HSG 274, the Legal requirements that must be complied with are COSHH, Management Regulations & HASW . Q130g). Microbiological monitoring of domestic hot and cold water supplied from the mains is not usually required, unless the risk assessment or monitoring indicates there is a problem. Q130h). I believe from feedback via David Brattey\Jim Guthrie that there were a small number of area's e.g. ward relative rooms and renal emergency connections that showed low level legionella results and that these were being treated and managed, this was not provided to me in writing. Q130i). I suspect that this relates to a leak that occurred around that time in ARU2, the leak was found to be a corroded and pin holed carbon steel pipe installed as a link pipe on the cold water stainless steel system between two modular service units. This pipe should not have been installed on the domestic cold

water service and was reported as a defect and escalated to David Loudon regarding the potential for similar issues across the DCWS system. The zone affected was isolated and patients relocated to allow remedial works to be carried out over the weekend by Multiplex\Mercury with sanitisation of the zone carried out by H&V. the system was then sampled after sanitisation. I am not sure if we had the results when Christine Peters asked for them however they would have been made available when they were received.

f) What legal and regulation requirements must be complied with to carry out regular water testing?

g) What situations would water testing not be carried out?

h) What are the consequences of regular water testing being carried out?

i) Dr Christine Peters tells us that in April 2016 water testing results or ARU2 were not available. To what extent is this accurate? If it is accurate, why were results not available, and should they have been?

132. Both Dr Penelope Redding and [redacted] tell us that they asked for information which was not forthcoming. To what extent do you agree with their recollection of events? If you agree, why was testing information not provided to clinical staff, microbiologists and infection control?

(i) Do you agree with the above statement? You can refer to your previous answer in 131 if you feel that this is of assistance.

**A** I am not clear as to what information Dr Redding and [redacted] are specifically referring to so cannot agree. However, this issue was raised at the Jennifer Armstrong meeting, and I think my response was that this could be due to changes in personnel in both the infection control and Estates teams. I was not aware of such issue being raised in the day-to-day operations and believe I had a good working relationship with the ICD\ICT and therefore would have expected someone to discuss these concerns with me before they were escalated.

a) Who was responsible for dealing with these requests for information?

**A** I not sure what this request is referring to and who the request was made to? But this would normally be the Authorised Person (Water).

b) What was your role in dealing with these requests for information?

**A** I would only be involved if the request was made directly to me or if I was asked to follow up on a request, generally the request would go directly to the Authorised Person (water) or via David Brattey as senior Estates Manager.

c) How were these requests for information managed by your department? What steps did you take?

**A** The request was usually by telephone or e-mail (depending upon the urgency) to David Brattey or Jim Guthrie or on some occasion myself (usually from Dr Inkster), If I received the request I would pass it the AP to arrange collection of the samples and processing via the accredited lab services. On receipt of the results the AP would copy them to the ICD\ICT that requested them.

d) What concerns, if any, did you have with how matters were being handled? If so, what steps did you take in response to these concerns?

**A** I am not sure of what time frame we are referring to here, but during 2015 – 2017 I was not aware of any issues with tests not being processed as requested.

e) In her statement Dr Teresa Inkster tells is that on 8th December 2015 she contacted you and William Hunter '*In this email, I requested back dated water results for the QEUH to the date when sampling commenced. I did not receive these water results until much later at the Water Technical Group ("WTG") in around April 2018.*'

i. To what extent is this statement accurate?

**A** I do not recall this request but have no reason to doubt Dr Inkster recollection.

ii. If it is accurate, why did you not provide the information?

**A** Unfortunately, again due to time lapse I do not recall this but cannot see any reason for not providing this detail.

**DMA Canyon Reports**

Refer to **Bundle 6 – Miscellaneous documents – documents 29 and 30.**

133. Was this the DMA Canyon 2015 report (Bundle 6 – Miscellaneous documents, document 29)?

**A** Yes.

134. Can you confirm that you ordered this report?

**A** Yes.

135. Who else knew that you had ordered the report?

**A** David Loudon, Mary Anne Kane, Billy Hunter, the project team, David Brattey, Jim Guthrie, Melville McMillan.

a) can you clarify whether this was at the time the report was ordered, or whether the awareness was retrospective?

**A** This was at the time the report was ordered.

136. Where was the report delivered to?

**A** It was delivered to me at my office.

137. Who received a copy of the report from DMA Canyon in 2015?

**A** David Brattey, Jim Guthrie.

138. Who signed off on payment?

**A** I did.

139. How was this report signed off or payment processed?

**A** Payment process via e-mail to Estates office clerk (Angela Jackson).

140. What did you do when you first received the report?

**A** I arranged a briefing meeting with DMA, David Bratty, Jim Guthrie, Melville McMillan (I don't think Mel was available to attend this meeting) & myself. The report was tabled by DMA at this meeting, following a brief overview from

DMA, I tasked David & Jim to work with DMA to develop and implement the action plan to address the issues raised in the Risk assessment as well as populating and implementing the Written Scheme of Management within the Risk Assessment.

141. Did you read it?

**A** No.

a) Why did you not read the report? Should you have read it?

**A** I had intended to read the report, but I didn't manage to fit it in. Yes, I should have read it.

142. Then what did you do with the report?

**A** David & Jim each took a copy and I held a copy.

143. Did you store the report in your office? If so, where? If not, where was it kept?

**A** Yes I kept a copy in my office file rack. (Q143). No I did not show it to anyone at the time but DMA later advised that following on from meetings with David\Jim that they needed the schedule of formally appointed staff to populate the Risk Assessment\written scheme and David\Jim could not provide this detail. I wrote a schedule based on who I expected to be appointed and e-mailed it to Mary Anne Kane, advising that DMA required this for inclusion within the Risk Assessment\Written Scheme as well as confirmation of the formal appointment. Mary Anne advised that the schedule was broadly correct and she would have this ratified at the next AICC.

144. Did you show it to anyone else or discuss it with anyone else at the time?

**A** No

145. Did you send a copy of the report/ show the report to your line manager/ superior? If yes, please confirm who you sent it to and what action they took. Showed the report to and what action they took. If not, please explain why not.

**A** No I did not share the report with my line managers, (was reporting to 3 different managers at this time), from memory my intention was to submit the

Risk assessment and Written scheme along with the action plan and populated written scheme of management.

a) Did you, or anyone else at the time of the 2015 report escalate any matters realised within eh report with Infection Control colleagues? If not, with the benefit of hindsight should you have? What, if anything, would sharing the report with Infection Control colleagues have achieved?
I did not share the report with infection control and to my knowledge neither did David Bratty or Jim Guthrie. Yes, in hindsight this should have been shared with infection control. Sharing this report would have opened a dialog where the action plan could have been fully developed.

146. What was the purpose of the report?

**A** The purpose of the report was to comply with the requirements of L8, HSG 274 & SHTM 04-01 (part B) by risk assessing the water system and developing a written scheme of maintenance for the management and control of the water system.

147. How long were DMA Canyon present at QEUH/RHC site between 2015 and 2018?

**A** I believe that DMA Canyon were on site throughout 2015 but not constantly, working with David\Jim on the RA action plan, and Written scheme. I also understand that they were on site during 2017 /18 although I was not party to the further iterations of the RA, I was involved commissioning their support for the placement and management of the POU filters.

148. How many times did DMA Canyon mention the report during their time on site between 2015 and 2018? If so, when and what was mentioned?

**A** I recall having one meeting with DMA regarding the schedule of formally staff, other than that I had very few meetings with DMA, David Bratty & Jim Guthrie were working with them on the RA\Written scheme action plans, I know these meetings were on going as they would use my office.

149. The report made several recommendations, what did you do to follow up on these recommendations between 2015 and 2017?

**A** I delegated the development and implementation of the RA action plan and Written scheme population to David Brattey and Jim Guthrie, I asked DMA to support them with this at our initial briefing meeting. I did not spend much time on this as I was heavily committed to other major problems and ongoing defects.

a) What follow up or check-ins did you put in place to follow up on the work being carried out? If you did not put follow-ups/ check-ins in place why not?

**A** I did not formally follow up on progress, I should have done so. The reason for not doing this was the sheer volume of issues requiring my input and pulling on my time. Again, I would refer to the extended hours I and my team were working. I did receive verbal feedback from David Brattey that works were on going to address the report, I know that the meetings with DMA were ongoing because David used my office to hold these meetings.

150. When were the works suggested in the 2015 report actioned?

**A** I believed at the time David\Jim were pushing on with this and received verbal confirmation from David that this was in hand.

151. Did you create an Action Plan?

**A** Q151). No, I had Delegated that task to David Brattey\Jim Guthrie who should have been appointed as Depute RP and AP water, respectively.

152. Who was tasked with carrying out the necessary work detailed in the Action Plan?

**A** Q153).David Brattey & Jim Guthrie were delegated the task to develop and manage the works required in the action plan.

153. If you created an Action Plan who else was aware of the plan?

**A** N\A

154. If you did not create an Action Plan, why not?

**A** I had delegated this to David Brattey & Jim Guthrie and expected that they were working on it, I did touch base with David on this verbally and he advised that they were making progress.

a) Did you see any evidence of progress having been made?

**A** I had verbal feedback from David Brattey that progress was being made with the action plan and that meetings with DMA were ongoing, but nothing tangible about actions being taken.

155. What is your own view of the findings of the 2015 report? Do you agree with it or not? Explain your rationale.

**A** Having read the report retrospectively 2018, I would have agreed with the report and would have been concerned with these findings. Having worked on the water system from 2018 to 2019 to address the systemic issues, I was involved in addressing many of the issues raised in the 2015 DMA report.

156. Refer to the **Estates Team Bundle, document 14:**

a) What is this email about?

**A** This is an e-mail to David Wilson Multiplex Commissioning Manager regarding issues identified by DMA as part of their risk assessment survey.

b) To what extent was this email connected to the DMA Canyon 2015 report?

**A** This is almost entirely related to issues identified by DMA in the preparation of the DMA report and written scheme.

c) At this point did you refer to the 2015 DMA Canyon report? If so, why? If not, why not?

**A** Looking at doc 14 date and the wording of the e-mail, I would say that this e-mail was to clarify commissioning issues in order to complete the written scheme. The DMA Canyon Risk Assessment\written scheme had not been issued at this time therefore they were only referred to as our risk assessors.

157. What concerns, if any, did the water testing raise? To what extent did these concerns feature in the DMA Canyon 2015 report?

**A** My understanding at the time from Jim Guthrie was that the results were generally within expected parameters and where results were out with expected parameters the sanitisation programme addressed these. From my retrospective review of the DMA RA provided within these documents under the Microbiological sampling, DMA confirmed that there was a microbiological sampling regime in place, testing prior to patient migration, with Legionella & potable samples included. DMA confirmed that the sampling regime adequately reflects the complexity and scope of the water system. They also note that there were a number of out of specification legionella and potable results with a responsive programme of daily flushing and local disinfections under way in affected area's

a) The Inquiry understands that DMA Canyon identified a lack of PPM. Did a lack of PPM impact on operational Estates? What caused the lack of PPM? How did this in turn impact the operation of the water system at QEUH/RHC?

**A** Yes, the lack of PPM would have a detrimental impact on the requirements of the operational estate's maintenance. The contract required that Multiplex provide the full asset register, PPM programme, detailed work schedules and populate these into the NHS GG&C CAFM system (FMFirst). This was not provided as required under the ER's. What was provided was an asset register and list of PPM schedules in a manual format within Zutec. This was difficult to extract and utilise affecting the delivery of Planned maintenance. Operational Estates did not have the resources to generation PPM and populate our CAFM system to address this issue in an appropriate time scale, especially as the data required to be reformatted for migration to FMFirst. I have addressed my input to this elsewhere in this statement. The rationalisation and formatting of this data was carried out by me with the support of IT under instruction from Mary Anne Kane, and ultimately added to Allan Gallagher's role for implementation under the adoption of a SFG20 maintenance strategy.

158. DMA Canyon prepared another report in 2017 **(Bundle 6 – Miscellaneous documents , document 30)**. What works, if any, recommended in the 2015 were carried out prior to the 2017 report?

**A** I had no role in the 2017 report or action plan, I have not seen this report until now. Although I see my name is recorded as having an input, I did not. It would appear that there was no significant works carried out from my reading of the gap analysis, the Estates Team advised that works had been carried out but did not provide evidence. DMA advised that "Corrective actions are as a matter of immediate urgency to ensure an accurate & compliant Written Scheme is compiled and appropriate PPM schedule implemented" Looking at the Estates team response to the GAP analysis questions, there is a lack of understanding regarding the policies and responsibilities for the water system.

159. What happened with DMA Canyon in 2017 – discuss and provide as much detail as possible. Who dealt with matters, what was your role and when did you become involved? Who sanctioned the works in 2017 report?

**A** I cannot answer this question as I was not aware of or involved at any stage with the 2017 Risk Assessment.

160. What was the impact, if any, of the failure to implement the 2015 recommendations on patient safety?

**A** The failure to implement the 2015 recommendations was a missed opportunity to attempt to manage and control the condition of the water system as delivered by Multiplex under the contract, potentially exposing patients to contamination risk

161. In her statement Dr Teresa Inkster states that you told her 'you felt like you were being made a scapegoat for them, and that it had been suggested that it might be time for you to retire'

a) To what extent is this statement accurate?

**A** I do not recall this discussion, but I may have said that I felt like a scape goat.

b) If it is accurate, why did you feel like you were being made a scapegoat and for whom?

**A** I was under investigation over my failure to escalate the 2015 Water risk assessment, and I felt that the organisation had not provided me with the resources or support to allow me to specifically focus on this issue against the size and scale of other managerial issues I was faced with during Operational Commissioning, Migration, and the operational requirements of the campus, incomplete contract works etc, as well as the scale of and complexity of defects, addressing contract permit omissions, etc it should also be noted that during that extended period I was working 12 - 14hrs days 7 days per week.

i) What was the outcome of the investigation? Was any further action taken? Was anyone else within the Estates team or otherwise investigated?

**A** I did not see the investigation report and I was not aware of the outcome other than being verbally advised by Tom Steele (Director of Facilities) that the investigation was complete and there would be no action taken against me. No one else was investigated but others were interviewed as part of the investigation.

c) Who suggested that it might be time for you to retire?

**A** I don't recall anyone suggesting I should retire, this was a decision I made personally with my wife who was concerned for my health.

a) How did you feel about suggestion?

**A** N\A

161. We understand that Infection Control were only advised about the 2015 DMA Canyon Report in 2018. Why were they not told sooner? What happened?

**A** I did not escalate the report, at the time I believed I had initiated works to address the issues raised in the report, with the intent that I intended to submit the report with the action plan prepared, however events and workload overtook me and distracted my attention from this matter.

162. Whose responsibility was it to be satisfied that the risk assessment had been carried out? Explain how you were satisfied that the appropriate risk assessment had been carried out prior to patient migration to QEUH.

**A** From SHTM 04-01 (Part B) The responsibility to be satisfied that the risk assessment had been carried sits with the Authorising Engineer (it should be noted that NHS GGC did not have an Authorising Engineer at this time) and the Water Safety Group. I was satisfied that the pre-occupancy risk assessment was carried out by a competent company "DMA Canyon" with relevant training & experience and accreditation for water risk assessment within the healthcare environment, with particular previous experience within NHS GGC.

163. Dr Christine Peters also states that she asked for *'asked for risk assessments for waterborne infection in the QEUH and they were not forthcoming from the Project Management Team, Estates, or Mary Anne Kane.'*

a) Do you recall being asked for this information? Did you provide the information requested? If so when and by what means? If not why not?

**A** I do not recall being asked for the Risk Assessment from Dr Christine Peters nor the project team, David Loudon or Mary Anne Kane. If I had this would have prompted me to share the report.

**<u>February 2016 – Sinks – Ward 2A</u>**

In early 2016 a PAG took place regarding the *'Contamination of aseptic pharmacy unit at RHC water supply with Cupriavidus pauculus'* a subsequent investigation linked the infection to sink within the Aseptic Pharmacy Unit:

164. What was your understanding of this incident?

**A** Form memory, patient blood works indicated positive for Cupriavidus pauculus, this was traced to a product produced in the aseptic unit. Following which I believe that Dr Inkster requested water sampling of the aseptic unit. Jim Guthrie carried out the sampling requirements\working with Dr Inkster. The results tested positive for Cupriavidus pauculus from the Thermostatic Mixing Tap (TMT) on the wash hand basin (whb) of the aseptic suite air lock\changing area. As far as I am aware none of the other tests were positive. Dr Inkster's conclusion was that this was a seldom used outlet and had been contaminated externally, not from the system. Dr Inkster indicated that this whb was not required within the changing room and requested it be

removed. Jim Guthrie arranged for the removal of this whb removing the pipe work back to the main branch.

165. What was your involvement with this matter?

**A** I was the 1st point of contact from Teresa and I instructed Jim to provide support to Teresa.

166. Do you recall anyone taking action, if so what, in relation to this incident?

**A** Dr Inkster's conclusion was that this was a seldom used outlet and had been contaminated externally, not from the system. Dr Inkster indicated that this whb was not required within the changing room and requested it be removed. Jim Guthrie arranged for the removal of this whb removing the pipe work back to the main branch, ensuring that there was no dead leg pipework remaining. The pipe work would have then been sanitised locally.

167. Do you recall any further issues in relation to sinks? If so please discuss, confirming your involvement and action taken in response to any issues.

**A** I don't recall any other issues at that time.

**Water Incident 2018**

168. Walk through the concerns as they emerged in 2017 into 2018 in respect of the water issues. Initially focus on your recollection of events as they happened. In relation to the concerns:
a) When did the concern arise?
b) Nature of concern?
c) Possible cause of concern?
d) Action taken in response to concern?
e) What actions were taken in response to concern?
f) How sufficient were these actions?

**A** Jan 2017, I was redeployed to the Depute General Manager Estates post and was not involved or aware of water related issues raised from then on until March 2018. March 6th, 2018, I was asked by Mary Anne Kane to attend a water related IMT for ward 2A. (please note I am using the IMT bundle to

establish the dates detailed here). I can't respond to any issues arising during this time.

169. The following IMTs have been highlighted to assist with this. If you are also able to respond to the questions raised in respect of the IMTs below when considering your recollection of events.
Refer to **IMT bundle, document 13: Cupriavidus bacteraemia in ward 2A at the end of January 2018**

a) What do you recall of this incident/ issue?

**A** I recall this incident, although I was not at the IMT referred to in Doc 13. The concerns were initially related to one patient tested positive for Pseudomonas and that this was linked to a positive test result from a water outlet (TMT) this developed over the next few weeks to patients testing positive for other Blood stream infections and further evidence of multiple positive tests for organisms on the TMT's\Shower heads. Initial thoughts were that the flow control devices were contaminated, and the contamination was being transferred by to patients by personal contact.

b) When did it begin?

**A** March 2018

c) How did it come to light? Who first reported the incident?

**A** I am not aware of who first reported this incident, my first knowledge of the incident was when I was asked by Mary Anne Kane to attend the IMT on the 6th March 2018 where I believe Dr Inkster was investigating the source of a patient's blood infection from Cupriavidus.

d) What was your involvement?

**A** I was involved in providing technical support and advice in assessing and addressing the control measures as they developed.

e) Did you ever ask about replacing all the taps within Ward 2A? What did you do? Did you discuss this with anyone else? What was the outcome?

**A** Yes, there are two issues here, first of all as part of the initial response to the TMT contamination the taps were replaced with the same make and model. Secondly further down the line through the Technical Water Group (TWG) review, I suggested as part of a ward refurbishment that the plumbing services be reconfigured to accept a different Markwik 21 TMT which did not have a complex structure flow control device but had an open orifice bioguard outlet reducing the risk of biofilm developing on the outlet. This proposal was accepted, and a ward refurbishment arranged to support this proposal.

170. Refer to **IMT bundle, document 16: Multiple positive results Cupriavidus and now Stenotrophomonas,** Dr Inkster states that the test results are from taps which have not been replaced in rooms 15 and 26. Shower head in room 12. At that IMT no cause for patient concern.
What was done as result of this meeting and why?

**A** I was not at this meeting, Estates were represented by Alan Gallacher, Colin Purdon & Paul McAlister, Mary Anne Kane was also in attendance. Manpower was increased to complete the service exchange programme of TMT's in the remaining rooms, 20 of TMT's completed by Wednesday 14th March and shower heads replaced by disposable shower heads over night Tuesday 13th March, this allowed for system sanitisation by end of play on Wednesday 14th, allowing 48 hours for resampled water cultures.

171. Refer to **IMT bundle, document 17:**

a) Your involvement and what measures were taken?

**A** I was involved in arranging a). sourcing procuring and managing the installation of POU water filters. b). Arranging for water samples from - QEUH bulk water storage tanks. – DSR water samples from the wards identified at the IMT. – Water samples from the Maternity and INS independent water supplies.

b) Did you discuss this with David Loudon?

**A** From memory, I discussed these issues with Mary Anne Kane who was acting DoF, as David Loudon had left NHS GGC.

c) Do you recall anything about how matters were managed?

**A** I recall receiving a telephone call from Mary Anne Kane on Saturday (I think the 17th March) asking if I could join a teleconference being held with Dr Jennifer Armstrong, Dr Teresa Inkster, Mary Anne Kane, Peter Hoffman, Public Health England. (I can't remember if anyone else was involved in this meeting) The focus was to accelerate the actions to bring ward 2A back under control and take specialist advice from Peter Hoffman on the issues we were experiencing and the deployment of POU filters. From here over the weekend I managed to make contact with the Pall filter sales Representative for Scotland, (I think Peter Hoffman recommended Pall filters) and secured sufficient Aqua safe filters to meet the targeted outlet on a first pass, with the filters on site ready for deployment from Monday 19th March.

d) How were costs managed?

**A** I produced a cost model spread sheet to monitor and forecast the materials and support costs going forward, I worked with the Facilities finance manager to keep track of costs and funding requirements, these reports were shared with MAK.

e) Who carried out the work?

**A** DMA Canyon, filter installation and replacement programme (in line with the stated filter expiry date), water sampling programme as well as the disposable shower replacement.

f) How was this reported and managed?

**A** This was reported via the IMT and ongoing management taken over by Andy Wilson\Paul McAlister.

g) How involved were you in the decision to use bottled water for handwashing and drinking? Discuss your knowledge and involvement surrounding this matter.

**A** This was an infection control\soft FM Management issue I did not contribute to this discussion.

172. Refer to **IMT bundle, document 18:**

a) As above, what was the outcome of this IMT, your involvement, actions and how you followed it up.

**A** The outcome indicated several areas for consideration as a way forward namely:

a). Baby Feed could have its supply transferred to the Maternity which already has a Chlorine dioxide water treatment system installed but would the production process would need protected from the chemical treatment by Carbon filter media, Proposed by me, Colin Purdon to verify.

b). I also suggested that we should consider the replacement on the TMT's with Markwick 21 complete with open copper line orifice rather than a complex flow control device.

c). Mobilise the supply and fitting of POU filters for ward 4B when confirmed by ICD (Colin Purdon. I Confirmed that POU filters are currently 31 day life expectancy but we could consider 61 day POU, I also carried out cost modelling on these options plus an alternative 91 day filter from another Manufacturer, if I remember correctly I later produced an option paper for this.

d). I communicated concerns over accuracy of pre and post sample labelling to DMA for inclusion within the sampling protocol.

b) What concerns, if any, did you have about Stenotrophomonas impacting patient safety at this point?

**A** I do not have a clinical background to interpret the impact of this organism over any other organism on patient safety, however given the patient group being immunocompromised I would be concerned that any microbiological exposure be identified and controlled as a matter of urgency.

173. Refer to **Estates Team Bundle, document 121;** how does this link to the IMT? Was this as a result of what was being discussed? What happened following this email?

**A** My interpretation of this e-mail is that Mary Anne Kane was seeking guidance of what patient areas should be deemed high risk. The ICT\ICD should define the high-risk patient groups for each hospital site. I am not aware of the outcome of this mail chain.

174. Refer to **IMT bundle, document 19:**

a) As above - the fitting of water filter – discuss – why were these filters not on the taps initially?

**A** I am not aware of POU filters being considered as part of the system design parameters. With regards to Operational arrangements, POU filters had not been fitted to high-risk areas previously as there had been no indication contamination from routine water sampling within these area's and therefore no perceived need from the ICD for POU filters until the water incident. POU filters were not recommended as part of the HPS Pseudomonas Guidance.

b) Do you have any knowledge of dosing the system with silver nitrate? How did this discussion come about?

**A** My interpretation is that silver nitrate was misquoted in the minute and should have read Silver Hydrogen Peroxide or Sanosil.

(i) Please explain the use of Silver Hydrogen Peroxide or Sanosil in dosing the system, your understanding of why this was done, and your involvement.

**A** Silver Hydrogen Peroxide (Sanosil), is a sanitising agent used as a shock treatment in water systems to kill microbiological activity. This was carried out in an attempt to bring the local ward system back to a baseline free of microbiological activity. I was not involved in the arrangements or the delivery of this procedure.

175. Refer to **IMT bundle, document 20:**

a) This was scored HAIIT red – why?

**A** As I understand it, the HIIAT was scored Red as per the HAIIT protocol, because the ICD\clinicians deemed the need for patient intervention to be high.

b) What were the concerns?

**A** From this and previous minutes it looks like 3 patients were on treatment for Stenotrophomonas. Concerns that although multiple organisms were identified from samples taken, the patient Stenotrophomonas organism was not linked.

c) You were asked to look at the historical water results during the commissioning of QEUH/RHC, what did you find out as a result? What concerns, if any, did the historical water results raise?

**A** I was not at this meeting, from the minute Mary Anne Kane was tasked with taking this forward, I do not recall being asked by Mary Anne to assist with this. I am not aware of the outcome of this review.

d) You emailed on 26th March 2018 – **(see Estates Team Bundle, document 124)** seeking information regarding the commissioning – what response was received? What did you do in response to this?

**A** This document is not from me and does not relate to commissioning?

(i) Do you recall providing the information requested by Mary Anne Kane?

**A** Yes, I provided the DMA Risk Assessment and Written Scheme as requested by Mary Anne.

e) Why was this not discussed at the next IMT?

**A** I am not sure as I don't have the correct e-mail to reference.

f) Refer to **Estates Team Bundle, documents 125 and 133** what was the relevance of these document to the water incident?

**A** Document 125: seems to relate to a question raised by Annette Rankin to Mary Anne Kane regarding the routine cleaning protocols for drains, Mary Anne confirmed the drains themselves are not part of the cleaning protocol, the surface of the drain is cleaned by domestics, with Estates dealing with blocked drain issues. This question I think has come out of the IMT meeting of the 27/3/2018 where one hypothesis tabled by Dr Inkster that the outlets could be contaminated from back flow from the drain, but with no evidence of this the hypothesis was discounted at this time by Dr Inkster. Document 133: The relevance of this document to the water issue revolved around the potential contamination of the outlet from erratic water flow from the POU filter hitting the CWHb and causing aerosolization from splash contact from the surface of the CWHb which may have been contaminated from water contact\backflow from the clinical drain connection.

176. Describe any other issues or matters arising from the water incident:

**A** This is difficult to recall without any point of reference

**Taps**

177. The use of Horne Taps was discussed in the IMTs relative to the water incident. IMT Bundle.

Please confirm:

a) Your understanding of use of Horne taps.

**A** The use of the Horne tap was required to provide a tap for clinical use that delivers water at a safe discharge temperature for vulnerable patients to protect them against the risk of scalding from a DHW service running at 60C, this is known as a Thermostatic Mixing Tap (TMT).

b) Who authorised the use of Horne taps?

**A** Peter Moir\David Hall would have formally approved the Horne TMT on behalf of the Board.

c) Why were Horne taps selected?

**A** The Horne tap was deemed to cover all of the functional requirements and it was the only TMT from the options proposed that held full Water Regulations Approval Scheme (WRAS) certification all of the other options were pending approval.

d) How involved were you in the decision to use Horne Taps - **SBAR Bundle, document 1** - please discuss your involvement and understanding.

**A** I attended the TMT product presentation\selection meeting where Multiplex had sourced 3 or 4 TMT's from different manufacturers for consideration for use on the project, once these options were proposed to the Board project team a joint selection panel was convened with representatives from the Project team and from Multiplex, each manufacturer was scheduled over the day to present their respective offerings, to allow for the panel to assess and determine which product suited the needs of the project best. At the Horne presentation the panel was advised that it was Hornes recommendation that

their TMT should be thermally sanitised and not exposed to chemical sanitants as chemicals adversely impacted on the materials used in the TMT manufacture. Thermal sanitisation could be achieved at system temperature (60C). I raised concerns that thermal sanitisation of the TMT insitu on the system in a working hospital environment would be impractical and unsafe give the size of each DHW distribution zone. (Note I cannot see the relation of SBAR document 1 with this question on the selection of Horne TMT?).

e) What is your recollection of the use of Horne taps.

**A** I believe that the Horne TMT was easy to use and popular with the clinical staff, unlike other TMT's it allowed for individual cold or blended operation. There were no indications at this time that this TMT had any issues.

f) At the time, were you aware of the incidents in Northern Ireland with Horne Taps?

**A** No I was not aware of the Northern Ireland incident at this time, HPS Guidance in response to this incident was not published at this time.

g) If so, why did you decided to proceed with the installation of these throughout QEUH/RCH? What was the deciding factor?

**A** N\A

h) In her statement Dr Teresa Inkster tells us that following the 2014 taps SBAR a meeting took place *'which was chaired by Ian Stewart from HFS and attended by Lisa Ritchie, Jimmy Walker, Ian Storer, Ian Powrie, and Alan Gallagher from the Board, is that the tap manufacturers (Angus Horne and John Horne of Horne Engineering) were allowed to be present at a meeting at which they were risk assessing patient safety in light of the issues with Horne Engineering's product'.*

To what extent did this meeting influence the decision to use Horne Taps? Please explain you recollection of the meeting, and any actions taken following the meeting and the extent of your involvement:

**A** Following the publication of the of the HPS Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in

Scotland to minimise the risk of Pseudomonas aeruginosa infection from water, regarding the removal of flow straighteners, I contacted Horne to seek advise on how this could be achieved, Horne advised that this could not be achieved on their TMT's. I escalated this to David Loudon who asked me to seek advice from HFS. These discussions and communications lead to the above meeting, there were also a representative from HPS present at this meeting. This meeting was to allow Horne to present the reason why the flow Straightener could not simply be removed from their TMT and to allow the experts at the meeting to assess Horne's position against the above guidance recommendation. Following this meeting HPS issued an SBAR concluding that despite Hornes argued position, HPS remained of the opinion that the Flow straightener presented a risk and should be removed, the SBAR provided 3 options for NHS GGC as a way forward on this issue. David Loudon was of the opinion that the QEUH had already installed the Horne TMT's and should be treated as an existing site like other hospitals where the above guidance advised that there was no need to replace existing outlets under this guidance. David raised this with HFS who updated the SHTM 04-01 to allow for such contract situations. David Loudon then decided to proceed with the Horne TMT's as agreed under the contract due the risk to the project programme. David did not discuss the implications for maintenance of these TMT's as a result of this decision.

i) Discuss **Estates Team Bundle, document 121** explain the situation and your involvement.

**A** **I** was not aware of this e-mail, but my interpretation would be that Mary Anne was seeking definitions for High Risk patient groups. I was involved in the IMT support arrangements at the time of this e-mail, but don't recall discussing this question raised in this e-mail.

j) Refer to **Estates Team Bundle, documents 127 and 128** explain the situation and your involvement.

**A** My understanding is that Horne were consulted via HFS for support on how to address the situation currently found with the taps and flow straightener (flow control device) and alternative options for sanitisation. From memory Hornes

position regarding thermal sanitisation being the preferred option did not change, supported by Hornes development of a Thermal disinfection unit, which required to be installed in line with the hot and cold supply to the every TMT (plumbing alterations required), which when placed into disinfection mode allowed water at system temperature (60C) to enter the TMT Hot & cold circuits with TMT open for a defined period of time to effectively sanitise the internal components and flow control device of the TMT. From memory at system temperature this would take approximately 20 min. I worked closely with Horne to assess our options and I was party to this meeting with HFS and key stakeholders to assess Hornes current position. My view remained the same as before (2014), opening up outlets in a distribution zone to 60C flow for an extended period of time in a working hospital is unsafe, impractical and unmanageable. This would not provide an effective solution to the current system challenges. From memory the stakeholders at this meeting were in agreement.

k) Flow straighteners – when did you become aware that they were non-compliant with SHTM 2027 and SHTM 04-01 guidance? Were they non-compliant at handover?

**A** I became aware of flow Straighteners being non-compliant with SHTM 04 -01 when version 2 was issued late 2014 (SHTM 2027 had been superseded 2011) updated in line with “Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of Pseudomonas aeruginosa infection from water”. Yes the flow straighteners were non-compliant at the time of hand over. But subject to the clause in HPS above guidance that there was no need to remove TMT’s as a result of this guidance and as amended in SHTM 04-01 to accommodate this contractual situation. (I cannot see the link to this question from IMT Document 27?)

l) In her statement Dr Teresa Inkster tells us that in 2016 she raised the issue of flow straighteners with you, HPS advice was sought and that you helped her roll out testing in high risk areas. Please explain the issue(s), what work or action was involved and your role:

**A** I cannot recall this conversation, however I did work closely with Dr Inkster. the issue of flow straighteners was covered in the HPS guidance on Pseudomonas which included the water testing protocol of pre and post flush sampling, I liaised with Colin Purdon\DMA to confirm that this protocol was formally documented and implemented for sampling in high risk areas.

m) Were new taps replaced in January 2019? If so, why were they replaced? Was the replacement related to the use of chlorine dioxide? IMT Bundle, documents 29 & 30.

**A** Yes the TMT's were replaced in ward 2A BMT, Haemato-oncology and TCT as well as ward 2B. The taps were replaced to allow for the removal of the Horne TMT flow control device (Flow Regulator). By installing a new TMT (Armitage Shanks, Markwik 21) complete with a copper lined bioguard open orifice outlet in order to meet SHTM 04-01 guidance. It should be noted that the Bio guard outlet was not installed at this time as the POU filter was installed in its place. No, the replacement was not specifically related to the use of Chlorine Dioxide, the replacement was to remove the risks associated with the Horne TMT flow control device and the volume of water held in the Horne TMT rough internal casting, this was established from my investigations and sectioning of a Horne TMT. I am sure I prepared a replacement proposal paper on this for the WTG, complete with illustrated photos of points of stagnation within the tap itself..

**<u>Water Technical Group</u>**

178. The water technical group (WTG) sat between 2018 and 2019. **Estates Team Bundle, page 938:**

a) What is the purpose of WTG?

**A** The water technical group was formed of key personnel to contribute the ongoing management control issues relating to the water incident and to develop, agree and implement long term solutions to the issues arising from the incident.

b) What issue/ event prompted the setting up of the WTG?

**A** The water incident of March 2018.

c) What was your involvement with the WTG?

**A** I was tasked with assessing issues arising from the water incident, develop & propose solutions for consideration and approval by the WTG.

d) Detail specific work which you carried out in respect of your involvement with WTG, why did you carry out this work, what was the impact? **Estates Team Bundle, page 939**

**A** From memory, Details of specific works I carried out (this may not be exhaustive) for the WTG are:

1. Identify a suitable chemical for continuous water treatment to bring the system under control for consideration and approval of the WTG.
2. Develop WTG a strategy for application of continuous water treatment.
3. Develop Technical proposals to the WTG for engineering works to support the installation of water treatment systems.
4. Develop proposals for modification of filtrate storage tank level controls to support water treatment and improve water level control and monitoring to the WTG, For implementation with the water treatment contract.
5. Develop WTG proposal for addition of a 3rd memcor filtration plant to provide capacity resilience based on a single unit failure (3 units at 50% capacity instead of 2). For implementation with the water treatment contract.
6. Procurement process for the supply and installation of the water treatment systems.
7. Manage the installation, commissioning and go live process.
8. Consider the impact of water treatment on special services (i.e. Renal Dialysis), consult with Renal Management and Medical Physics team on the safeguards required, develop specification\procurement for protective measure for the RO plant.
9. Integrate RO plant safety measure with the water treatment plant for fail safe shutdown.
10. Develop communication strategy for wards and departments affected by the installation works and introduction of water treatment.

11. Sourcing and specifying replacement flow-through calorifiers for the DHW services for inclusion in the above engineering works.
12. Laise with Scotomas (Chlorine Dioxide provider) on the H&S requirements for safe transport and storage and operational requirements for Chlorine dioxide and develop a suitable risk assessment.
13. Oversee Water treatment plant Commissioning and implementation.
14. Assess tap replacement options and produce a options proposal for WTG.
15. Develop proposal for refit of ward 2a\b plumbing service pipework for:
a. Horne TMT replacement (Markwik 21),
b. Whb replacement complete with new smooth flow drain spigots. C.
WC replace cisterns with direct flush valves.
16. Develop and implement a monitoring and testing plan following the introduction of Chlorine Dioxide.
17. Develop and implement the water treatment managed service contract arrangements with Scotmas for the supply of chlorine dioxide chemicals, monitoring and management of the treatment regime, maintenance and repair water treatment plant and monitoring equipment.
18. Review and assess plant, TMT, and drainage failure issues for WTG. I carried out these works to support the development of a solution to the on-going water incident as tasked by the WTG, to allow the group to consider and authorise the appropriate course of action. The impact of the continuous water treatment programme and associated engineering works was that by the time I retired July 2019, the water quality test results were coming back within set limits. I believe that the package of works introduced were successful in bringing the water system back to  where it should have been.

e) Was this within your remit within estates?

**A** My remit as Depute General Manager Estates would require me to focus on technical issues \challenges\solutions as required. I was dedicated to the above task from Mid-2018.

f) Who was in the WTG, what were their names and their roles within WTG?

**A** Mary Anne Kane (Interim DoF & Chair)
Dr Teresa Inkster (Consultant Microbiologist, ICD)

Susie Dodd (Infection Control Nurse RHC)
Iain Kennedy (Consultant Public Health)
Alan Gallacher (General Manager Estates, Technical lead)
Ian Powrie (Depute General Manager Estates, Technical lead)
Andy Wilson (Sector Estates Manager, operational management)
Colin Purdon (Site Estates Manager, operational management)
Eddie McLaughlin (Ass Director HFS, national guidance, and support)
Annette Rankin (Consultant Infection Control Nurse, HPS, national guidance\support & Government report)
Ian Storrer (Principal Engineer, HFS, National guidance & support)
Dennis Kelly (Authorising Engineer, Water, compliance guidance & support)
Tim Wafer (Water Solutions Group, Water specialist consultant, water treatment) Monthly Meeting.
Dr Tom Makin (Makin & Makin, Water specialist consultant) Monthly Meeting.

g) Why was the WTG set up?

**A** The WTG was set up to provide a steering group for development and implementation of appropriate solutions to the water incident.

h) What qualifications were required in order to be chair of WTG?

**A** The Chair required overall management experience of incident control at a senior level supported by suitably qualified and experienced ICT\Technical members & external advisors to the group.

i) Discuss focus of WTG – what was the purpose – why was WTG required – what issues came to light as a result and what action was taken. What were the concerns of the WTG and how did this impact on patients? Refer to **Estates Team Bundle, document 127, 128, 129 and 130** to assist and confirm how these relate to issues before WTG.

**A**

a) The focus of the water group was to provide a management structured approach to deal with the ongoing water incident.

b) To ensure effective governance arrangements were in place to focus on developing solutions to the systemic issues identified, as well as supporting

external agency requests for data in relation to independent reports to Government (HFS & HPS).

c) I cannot recall the detail of the HPS\HFS reports so will focus on the issue faced at the time of the on-going incident, namely: The inability to effectively sanitise the Horne TMT's insitu despite Horne's insistence that this was the way forward. In addition the solution offered by Hornes new patented thermal disinfection valve proved to be overly labour intensive, would require a constant work force to implement, as well as introducing Scald risks to the patient environment requiring supervision at all outlets as well as requiring to be repeated with undefined frequencies. This also did not address how to thermally sanitised the main risers which was already exposed to 60C. These issues all lead consensus and conclusion that chemical sanitisation was the only viable systemic approach to resolving the issues identified from the water incident data. In addition continuous water treatment will draw treated water from the outlets into the CWHB with the treated water having a beneficial impact of the drain spigot of Chlorine Dioxide exposure.

d) Actions taken : Are described in my response to question 176d. The final solution identified had a minimal impact on patient services, the only direct impact of implementing this solution was the overnight down time for each area affecting hot and cold water supplies in each zone, one zone per night over a 9 day programme. impact was the mitigated by the deployment of portable whb's and bottled water.

j) How did clinical staff and estates get along at these meetings?

**A** From my perspective Clinical ICD's, ICT, Public Health and Estates staff had a good working relationship with a collaborative and supportive approach to developing appropriate solutions to the current water incident.

k) Refer to **IMT Bundle documents 39 onward**, and any other IMTs as a result of WTG. Go through and discuss issues – impact of patients – what was cause of these issues.

**A** I was not on site during these IMT meeting as I was on A\L from 12 sept – 1 Oct 2018 Inclusive. The issue of concern at this point was that the water system in ward 2A RHC was under control by the full deployment of POU

filters on all water outlets and showers but patient positive blood infections were still occurring The drains were the point of focus with on-going cleaning sanitisation procedures. Concern from the clinical staff over the disruption to patients from the frequency of access for drain cleaning\sanitisation and more regular access to isolation rooms than would be desired. The drain issues were a result of a). A build-up of foreign debris in the drain spigot. b). unexpected disposal of liquids other than water via the CWHB, providing a source of nutrients, c). Break down\decay of the rubber spigot seal. d) build-up of bioburden in the spigot orifice and spigot connection.

l) Refer to **Estates Team Bundle, document 129,** why were NSS involved, guidance issued, actions taken.

**A** NSS, HFS were tasked by Scottish Government\NHS GGC to investigate and review the circumstances around and leading up to the water incident at the QEUH\RHC. I am aware of the report being issued and that the recommendations were to be reviewed and addressed at the WTG but do not recall this happening.

(i) Why were the recommendations not followed up? Who was in charge of following up on the recommendations? What was the consequence, if any, of not following up on the recommendations?

**A** I cannot say that these recommendations were not followed up or actioned, these may have been addressed by Mary Anne\Allan Gallacher and\or Andy Wilson\Colin Purdon? Mary Anne Kane was leading on the HPS data collection and the outcome of the report. I cannot comment the consequences of not actioning the recommendations as I was not involved with the review of the report or the associated actions.

m) Refer to **Estates Team Bundle, document 131,** explain the background, your involvement, the purpose, guidance issued, actions taken.

**A** Dr Teresa Inkster reached out to Dr Susanne Lee for expert advice on the conditions surrounding ward 2A water incident, when Dr Lee arrived on site she was escorted by Dr Inkster to review the issues that she needed advice on. If I correctly recall Dr Inkster then brought Dr Lee to a pre-arranged meeting with the WTG (I recall that I was in attendance as well as Mary Anne

Kane, I cannot recall the other attendees) to provide any further detail required by Dr Lee and take advice from Dr Lee. The report in the above Document 131, details the issues raised by Dr Sussane Lee. Dr Inkster and I reviewed Dr Lee's report and developed the action plan detailed in document 131. My recollection of the actions against my name\Alan Gallacher are. Recommendation 2: Alan Gallacher and the compliance team developed and delivered a training programme, and I attended the Responsible Persons (Water) session. Recommendation 3: Although my name is against this with Alan Gallacher I was not involved in preparing this protocol (I believe Alan managed this issue). Recommendation 6, I had already reviewed the Asset Register provided by Multiplex and worked with I.T. colleagues to standardise the asset register for migration to FMFirst, Allan Gallacher was already leading on developing links with SFG20 PPM protocols with FMFirst . Recommendation 9: Board design should exclude the use of outlets with inserts & opt for more hygienic single bore demountable TMT's. and consideration should be given to replacement of these outlets in high risk areas, I reference Dr Susanne Lee's recommendation in my option paper for TMT replacement. All other actions identified were to be reviewed and address by the SLWG (WTG) HFS\HPS or the Board Water safety Group over.

**Review of Issues Relating to Hospital Water Systems' Risk Assessment 26th September 2018**

Refer to **Estates Team Bundle, document 134.**

179. Why did you commission/order the report? What issues prompted the instruction of this report?

**A** I did not commission this report, the report was commissioned by Jane Grant CEO.

180. What concerns, if any, did you have about the water system?

**A** I can't answer with respect to the concerns leading to this report.

181. When did these concerns arise? Was anyone else in estates concerned? Why?

**A** N\A

182. What was the impact on patients?

**A** N\A

183. Did you flag/ raise your concerns with anyone?

**A** N\A

184. What happened in response to the report?

**A** Up until this point I had not seen this report, I am not aware of any actions as a result of this report.

185. Did you escalate any matters arising from this report? If so, to who, and if not, why not?

**A** As per response to Question 182.

186. What works, if any, were carried out in response to any findings in this report?

**A** As per response to Question 182.

**Tap Water- Ward 3C – 2019**

187. What were the issues in relation to tap water?

**A** I was not involved in day-to-day operational issues at this time and would not have been party to this issue, I have no recollection of this issue, as I have no point of reference or access to records to jog my memory.

188. What was your understanding and involvement with these issues?

**A** As per response to Question 185.

189. What action was taken?

**A** As per response to Question 185.

190. How were matters resolved?

**A** As per response to Question 185.

**Other Water Incidents**

191. What other specific events do you recall in relation to water? Do you have any recollection of debris in the water tanks, If so, please explain:

a) What the issue was.

b) The impact on the hospital (include wards/areas) and its patients (if applicable)

c) Who was involved.

d) What was escalation process.

e) Were any external organisations approached to support and advise.

f) Detail role and function of HPS and HFS, advise if they were involved and any reports prepared by them.

g) Detail advice given from external organisations; what was the advice, did you agree with it, how was any advice managed/ communicated with others in your team and your superiors?.

h) Was there opposing advice and by whom.

i) What remedial action was decided on and who made the decision.

j) Was the issue resolved – consider any ongoing aftercare/support/monitoring.

k) Detail any ongoing concerns you had, or which you were made aware of.

l) Was there any documentation referenced during or created after the event? i.e. an SBAR/ minutes from a meeting – use the bundle provided to assist.

m) Did anyone sign off to say the work had been completed and issue resolved/area safe?

**A** There was an issue early in the migration programme (circa April 2015), where:

a). We lost the water supply to the QEUH\RHC (RHC was not occupied at this point) at approximately 18:00 hrs

b). resulting in there being no water for drinking\bathing\hand hygiene across both buildings. This was due to the failure of both water filtration plants.

c). All estates staff had left site with the exception of Tommy Romeo (Duty Estates Manager) and myself, we therefore responded to the situation but

could not establish the cause of the filtration common failure (Note: training had not yet been provided for the filtration plant by Multiplex). We could not secure support from the manufacturer until next morning as there engineer was not in the area. We therefore had to no option but to bypass the filtration plant and feed one of the tanks with mains water in order to return to normal services in the morning.

(i) Was the system flushed and drained after the bypass the filtration plant? If not, why not? Should this have been done and what are the consequences, if any, if not doing this?

**A** No, the system was not flushed and drained after the emergency refill of the tanks bypassing the failed filters. The logistics of fully draining, filling and flushing the whole campus was out with the existing staffing resources available at this time, bearing in mind we only have 6 estates managers including myself. I did prepare and provide David Loudon with a written report on the matter. With no further response from him on the issue. The consequences of not carrying out a drain\fill\flushing process is the potential for suspended particulate and micro-organisms to enter the system from the water main, however water mains have been tested numerous times and proven to be within acceptable parameters.

d). Once the arrangements were in place, Tommy supervised the manual fill process and I escalated the issue to the on-site out of hours nursing manager and appraised her of the situation and likely duration before we would return to normal water services, she communicated this to the limited number of wards that were occupied and I notified the site Facilities duty manager and arranged for the delivery of bottled water to all occupied wards.

e). I arranged for the service engineer from the manufacturer to attend site 1st thing next morning.

f). HFS/HPS were not notified or involved in this incident at the time.

g). Next day the service engineer identified that the prefilters on both units were blocked and recommended that these be changed on a weekly basis.

h). There was no opposing advice.

i). Immediate remedial action was to replace the prefilters, put in place a routine replacement SOP and notify Multiplex of the issue and the need for urgent training. After a 26 hour shift I also prepared a report on the incident and submitted this to David Loudon before leaving site for a rest period. (Tommy Romeo had been on site for 24 hours before he went home for a rest break).

j). Yes, this resolved the cause of the plant failure filters.

k). As a result of this incident I also identified that, as we did not have the staffing resource to man the BMS control room and that we needed an alternative critical alarm escalation process. I commissioned Schneider to programme a group of predefined critical alarms into the BMS for automatic escalation to the duty Estates managers Page. I worked with Schneider to create the critical alarm schedule and this was developed and implemented by the time the full migration process was complete and the Estates duty managers moved to their shift rota providing 24/7 site presence. Yes, I was aware of the debris in one of the water tanks, this was discovered during the routine water tank cleaning & sanitisation works, the debris was a sponge and some metal washers, this would have created a bio-burden source in the tank and likely the distribution system. It is my view this was left in the tank by the contractors working for Multiplex carrying out the tank lid support replacement works required under PMI issued by Peter Moir following receipt of a HAZ warning notice from HPS to the risks of using hollow pipes for tank supports.

(i) Why were HPS/HFS not notified at the time? Would you have expected them to have been notified?

**A** To my knowledge there is no requirement or procedure for notifying HFS\HPS of this type of event. I would not have expected them to be notified.

(ii) Was the system flushed and drained completely after it was filled with water which bypassed the filtration plant? If not, why not? What was the potential impact?

**A** I have answered this question in the supplementary question 191m.

(iii) Who fitted the bypass pipework initially? What was the purpose of doing so?

**A** Multiplex fitted the bypass pipework as contingency for such events.

(iv) Why do you think the sponge and metal washers were left in the tank?

**A** I think this was poor housekeeping and supervision of the works carried out by Multiplex prior to handover to replace the hollow tank roof supports with solid core supports.

192. What were the NHS procedures for raising concerns about water or water infections.

a) How were these dealt with by you?

**A** From memory If legionella is identified within in water system, routine precautions and control measures should be applied. If there is still legionella bacteria detected on the follow up tests then a record on the incident should be recorded on datix, the AP and RP (water) and ICD must be copied in. When it has been confirmed that legionella bacteria from water is the source of an outbreak then the AP must carry out an investigation and formally report his findings to the RP and ICD for inclusion in the IMT. I had not been made aware that there was any cause for concern or escalation, my understanding that the routine sampling results were generally returning good results and did not trigger the requirement for formal reporting escalation. (note that routine tests did not include the range of microbiological organism that were identified during the water incident.)

b) How was it confirmed they had been dealt with.

**A** As these had not been escalated to me I was under the impression that the results were within acceptable parameters.

(i) In general terms, once a concern had been raised about water or water infections, how would it be confirmed generally that the matter had been dealt with?

**A** If a water test shows out of spec legionella results the affected area would be subject to routine control measures to eliminate the legionella. If this was successful, no further actions would be taken other than monitoring to ensure that the sanitisation was successful. If there were repeat positive samples then this should be reported via Datix and once resolved signed off via the

Datix procedure. If there was a water related patient infection, an IMT would be set up to address the issue including notification to HPS, once the issue was addressed it would be formally closed out by the IMT.

c) Do you recall specific ones and in particular any that gave you concern.

**A** No, I do not recall being consulted on out of spec results that may have been cause for concern other than issues raised directly with me by Dr Teresa Inkster and these tended to be unusual organisms.

(i) Can you recall any specific concerns save for the ones you have discussed in this questionnaire, raised to you by Dr Inkster?

**A** Sorry I don't recall any other concerns being raised with me by Dr Inkster.

(ii) What is your understanding of an unusual organism?

**A** The estate's routine water monitoring only looks for legionella or Pseudomonas (defined high risk areas). Anything out with these organisms would be unusual and would only be brought to our attention if ICD raised concerns over the source of a patient infection requiring specific water analysis, looking at water as a potential source for this other organism. e.g. Cupriavidus, Serratia etc,

**Ventilation - Commissioning and Validation**

193. Describe the commissioning and validation process in respect of the ventilation system in the QEUH/RHC.

**A** I was not involved in the commissioning and validation process for the ventilation system and cannot describe the commissioning and validation works carried out at the QEUH/RHC. However the requirements for this commissioning and validation are set out in STHM 03-01 Part A.

a) Who was this carried out by?

**A** There are various stages to the commissioning and validation process, these would have been carried out by different designers\manufacturers\installers

and commissioning engineers, I believe that the final validation was carried out by H&V commissioning.

b) Who signed off?

**A** I believe that Capita Symonds signed off on behalf of the client.

(i) Can you confirm who the client would have been? Would the client have been involved or aware of the sign off?

**A** The Client is NHS Greater Glasgow and Clyde, represented by the Project Director (Allan Seabourne or David Loudon) I am not aware of the reporting arrangements between the Project Director and the Board, but would assume that they would have been briefed that the project was approved ready for sign off.

c) To what extent, if any, did infection control have input prior to sign off? Refer to **Estates Team Bundle, document 22.** For reference in this email Christine Peter's states that Craig (Williams) has not seen anything in writing about the ventilation.

**A** I was not involved in the commissioning process, My understanding was that Craig Williams, was the lead ICD interfacing with the project, with Jackie Barmanroy as the project ICN however I am not aware of ether of them signing off on the ventilation commissioning requirements.

d) If so, who?

**A** Not sure.

e) When should this have been done?

**A** This should have been reviewed and witnessed prior to hand over see SHTM requirements below in Q191f.

f) Were you involved?

**A** No, I was not involved in the ventilation commissioning or validation process.

g) Were you aware of any concerns raised at any point about the ventilation system and its commissioning?

**A** Not until after hand over, working with Infection control on several fronts regarding points of concern, Namely. 1).Theatre shared layup prep rooms no inter-locking doors to control the risk of cross infection, (Dr Christine Peters). 2). Adult CCU, 10 of PPVL isolation rooms with various issues (Dr Christine Peters). 3).Ward 2A PPVL isolation rooms air permeability integrity, Hepa filtration (Dr Craig Williams\Dr John Hood). 4). Ward 2A Heamato-oncology\TCT ventilation designed as a standard ward complete with chilled beam technology and 3 ACH. (Dr Teresa Inkster) 5). Ward 4b BMT ward non-compliance with isolation room design requirements (Dr Teresa Inkster).

h) What commissioning and validation documentation did you see before handover in 2015?

**A** None: I was not included in the client witnessing process.

i) If not, who would have seen commissioning and validation documentation?

**A** Capita Symonds, Contract supervisor.

j) What is your understanding of the SHTM guidance in respect of ventilation?

**A** Ventilation system commissioning/validation report Para 8.64: Following commissioning and/or validation a full report detailing the findings should be produced. The system will only be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life. Para 8.65 The report shall conclude with a clear statement as to whether the ventilation system achieved or did not achieve the required standard. A copy of the report should be lodged with the following groups: • the user department.• infection control (where required);• estates and facilities.

k) How important is SHTM guidance in respect of ventilation?

**A** SHTM guidance is especially important as it sets out the importance of 1). design and designer responsibilities, 2). The option for independent validation

of system performance on behalf of the client, 3). Installation, pre commissioning requirement, 4). Witnessing of the standard installation tests, 5). Cleanliness requirements for the installation, 6). System equipment certification requirements, 7). Equipment test witnessing requirements, 8). Dynamic commissioning requirements, 9). Specific Performance Standards, 10). Bacteriological sampling requirements, 11). Ventilation system Commissioning\Validation report. all of which should be in the Post Commissiong Documentation (PCD).

l) What is your understanding of the importance of SHTM compliance in infection control and prevention?

**A** SHTM compliance is very important for infection control with respect to providing the correct and relevant environmental controls for the requirements of the specific occupants, ensuring that the correct air dilution, filtration, temperature and condition is provided along with the appropriate safeguards for safe operation and placement of patients providing source or protective isolation where required.

m) Was the QEUH/ RHC ventilation system SHTM compliant at the date of handover – if not, what was outstanding? Who was responsible to ensure that the ventilation system complied with SHTM?

**A** From the issues that I have been involved with I would say that the ventilation systems were not SHTM compliant, it is difficult to say what was outstanding due to the lack of accessible information on Zutec, generally I can only remember seeing the H&V system Validation reports.

(i) What was the potential patient impact of the ventilation system not being compliant with SHTM?

**A** The potentially patient impact from not complying with SHTM is the risk of infection whether it’s due to lack of appropriate filtration\patient placement or air volumes resulting in a lack of single room air dilution and room negative pressure differential to the corridor leading to the increased risk of cross infection. As well as the lack of plant resilience.

n) Refer **Estates Team Bundle, documents 34, 34.1, 34.2:**

(i) Please explain the content of this email

**A** My understanding of the background to this Ward 4b issue is, the ward was originally designed as a general ward and services were being installed to meet this standard, however NHS GG&C requested that this ward be converted to accommodate Haemato-oncology patients from Gartnavel as part of a revised clinical strategy. Multiplex provided a proposal to the Project Manager to deliver on this, which was accepted and implemented as a variation to contract. After hand over several concerns were raised about the standard of protective accommodation provided in this ward not meeting SHTM 04-01 or SHPN 04 supplement 1 standards. This e-mail confirms that although HEPA filters were fitted, they had not been Dispersed Oil Particulate (DoP) challenge tested at commissioning.

(i) Is the reference to SHTM04-01 – for ventilation, the Inquiry understands for ventilation that the SHTM applicable is SHTM 03-01.

**A** Sorry my error, reference should be SHTM 03-01.

(ii) Please see the documents attached to the email – what are these documents, and have you seen them before?

**A** Yes, I have seen these documents before, Document 34.1, is the schedule of PPVL Isolation rooms that was produced at my request to David Wilson (Multiplex, Commissioning Manager) to facilitate familiarisation and understand what Multiplex thought the status of the PPVL rooms were across the site, this document became a live working document and was updated each time the status of a room changed. Document 34.2 is the H&V proportional balancing commission of the air volumes through the supply system and commissioned volumes in to each room.

(iii) What does this relate to?

**A** It relates to what was handed over as a supposedly suitable facility for accommodation of the Haemato-oncology patient group ward 4B.

(iv) Why was Professor Williams asking for this information?

**A** From memory I believe that there was concerns raised by Clinical\ICT staff about the apparent lack of compliance with SHTM\SHPN guidance for these facilities and their unsuitability to accommodate the intended patient group.

(v) When did Professor Williams ask for this information?

**A** I cannot recall when this information was requested.

(vi) When was this information provided to Professor Williams?

**A** From the e-mail in document 34, it would appear that I sent this to Professor Williamson on the 7th July 2015, I am not aware if he had seen this document before as it was created at my request.

l) Discuss the concerns about Ward 4B. Refer **Estate Team Bundle, document 30 -** What was the purpose of the SBAR?
Refer to **Estates Team Bundle, documents 30, 31, 32** to assist with your answer.

**A** It is clear from the communication that the clinical team and the ICT were advised they were moving in to a fully compliant, commissioned and validated accommodation for the BMT patient group, and they were concerned that ward 4b did not meet this requirement and was not fit for purpose. From memory the issues identified in consultation by Dr Inkster are : 1). Low\zero pressure differential between the isolation room and the corridor (should be +10 pascals). 2). Low air change rate 6 ACH, (should be 10ACH), 3). Rooms was not sealed, fitted out with suspended ceiling tiles. 4). Room had not been air permeability tested (to confirm air tightness\Sealed). 5). The HEPA filters had not been DoP Challenge tested. 6). The room pressure to corridor did not have local Differential pressure monitoring nor central monitored\Alarm facilities at the nurses station. 7). The Supply Air Handling Unit (AHU) was a single standalone unit (single point of failure potentially affecting all rooms simultaneously. As was the extract. 8). There was no facility to allow for annual maintenance\verification of the ward ventilation system which requires

the plant to be shut down and tank out of service during these works. s The SBAR contained within Document 30

(i) Were the concerns raised in the SBAR addressed? If so, how and what was your involvement if any. If not, why not?

**A** Yes, the concerns were addressed by Peter Moir (Depute Project Director). Peter developed a specification of works carried out by Multiplex to address these issues, I was not involved in the specification or delivery of these works. This was defined as a project issue and as such I was not included in the process until the end when I was invited for a familiarisation session on the operation and management of the room pressure monitoring and alarm system. However, this was only betterment toward the required standards and still did not meet the full requirements of SHPN 04 supplement 1.

m) How does commissioning differ to validation?

**A** I was not party to these communications, but my interpretation would be that the SBAR was prepared to justify the request to return the patients to a safe environment pending a review of the status of ward 4B.

(i) How does commission differ to validation?

**A** From SHTM 03-01 Part A:

Commissioning - Commissioning is the process of advancing a system from physical completion to an operating condition.

Validation - A process of proving that the system is fit for purpose and achieves the operating performance originally specified. It will normally be a condition of contract that “The system will be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life.”

n) Was there a validation document to accompany this for handover?

**A** I do not believe so, the only commission documents I had seen were the H&V documents.

o) What is the purpose of Commissioning and Validation (C&V)?

**A** Commissioning allows for all of the system components to be inspected, tested and commissioned in their own right before the air distribution balancing is carried as the final stage of commissioning. Validation provides confirmation that the overall performance of the whole system meets design intent.

p) What are the consequences of it not being carried out? What concerns did you have, if any, that the QEUH/RHC had not been signed off without C&V?

**A** If validation is not carried out then there is no way to confirm that the design requirements have been achieved. At the point of hand over I believed that the ventilation systems had been fully Commissioned and Validated and witnessed and accepted for hand over on that basis. Bearing in mind that at handover information of Zutec was not complete as the contract allowed for a 60 day period after practical completion for the Post Commissioning Documentation to be handed over. It was only once we started to occupy the building that issues started to arise.

q) What concerns, if any, would you have if there were no C&V of the ventilation system?

**A** I would be concerned that there would be no way to know if the system was operating as per the design intent, or if the building was safe for the intended purpose.

(i) Did you become concerned following handover that commissioning, and validation of the ventilation system had not been carried out?

**A** Following handover I was under the belief that the systems had been commissioned, validated and accepted under the contract sign off process,

therefore I was not concerned at this stage. My concerns with regards to commissioning and validation only arose after migration when we started to observe problems in various areas over time with what had been provided and with the Post Commissioning Documentation records available.

r) Why would no C&V of the ventilation system give rise to these specific concerns?

**A** Because there is insufficient data to carry out annual verification of the system performance.

194. In her statement Dr Teresa Inkster discusses concerns regarding Ward 4B states *'The concerns with regards to air quality, specification and lack of commissioning and validation data were disclosed to Tom Walsh, Ian Powrie, Peter Moir, Gary Jenkins and attendees of the initial meetings which were held in June and July 2015. There are no minutes available for these meetings because of the issues I have outlined above with record keeping.'*

a) What commissioning and validation data did you have in June and July 2015?

**A** From Memory, I had access to the H&V commissioning reports for the proportional balancing of the air distribution requirements against the design air distribution requirements.

b) Did you provide the commissioning and validation data to Dr Teresa Inkster?

**A** I share the data I had access to with Dr Teresa Inkster, I worked with her to demonstrate the ACR and Pressure differentials in various wards and marked up drawing to help demonstrate the intended system operations etc.

c) Is it correct that there are no minutes from these meetings?

**A** The meetings were chaired by Peter Moir, I do not recall seeing minutes for these.

d) Why were no minutes taken of these meetings?

**A** I am unable to answer this question.

e) What actions were taken following these meetings?

**A** I believe that Peter Moir issued a PMI to Multiplex to implement the changes discussed at the meetings detailed above.

195. What testing and maintenance protocols and regimes were in place?

**A** At this stage there were no testing and maintenance protocols in place as the system was not deemed fit for purpose, from memory the system was derated to provide general winter ward accommodation while arrangements were made to carry out the remedial works identified.

196. Refer to **Estates Team Bundle, document 47 page 5/18** of document: This states that air permeability tests were not carried out to 36 isolation rooms:

a) Were you aware of this? If you were not aware, who would have been aware?

**A** I was not made aware at the point of hand over nor was I made aware of the content of the contract supervisors report. However became aware of this issue as I uncovered this as part of my ongoing review and investigations with the ICT team (particularly for Ward 2A isolation rooms). Indeed I believe that I brought this matter to light with the project team.

b) What was the consequence of this?

**A** The air permeability test confirms that the Isolation room\rooms are sealed and that extraneous air cannot enter or leave the room from an unexpected source, minimising the risk to air transfer contamination of the protected space. The air permeability test should be carried out at 2 stages of the isolation suite construction: 1) when the room shell is constructed and all service penetrations have been sealed, this confirms the integrity of the shell space. 2). Once the room fitout has been completed, commissioned the air permeability test should be repeated to verify the overall air tightness of the final protective accommodation. The consequences of placing patients into protective Isolation in a facility that has not been Air Permeability tested has a risk of Patient infection from an unidentifiable source.

c) Why did handover take place in these circumstances?

**A** I am not able to answer this question, as I believed that the Commissioning and Validation had been witnessed and verified by the Contract Supervisors prior to handover.

d) What happened following this report?

**A** I believe that Multiplex arranged for air permeability tests in all of the affected areas and provided air permeability certification confirming the rooms tested had passed. I witnessed some of the tests in ward 2A and ward 4B. particularly ward 2A the test failed due to the room 2nd fix services and IPS panels leaking. Multiplex proposed that they would employ silicone sealant specialists to seal all service penetrations, trunking, IPS panels\Patient entertainment system etc to ensure these rooms passed the Air permeability tests. These was accepted by the project team as an acceptable solution.

e) What concerns, if any, did the contents of the report give you? Why did the report give rise to these specific concerns?

**A** My concerns were around the fact that we could not establish that any the PPVL isolation rooms ventilation systems were operating as per design intend or that the rooms were safe for patient placement with regards effective air tightness requirements for these rooms. With respect to the CCU any commissioning\air permeability tests supposedly carried, out could not have passed where pressure stabiliser had been installed with the blades the wrong way round! Part of this air permeability test under SHPN 04 supplement 1 is “Close all internal doors and, using the test fan, check that the pressure stabiliser opens at 10 Pascal and that it will carry the design airflow without flutter.” Doors open against the lobby pressure without handle to assist in this . with regards to reduced pressure I reported on 8 of 10 CCU PPVL rooms, this was witnessed by both Doctor Christine Peters and I, but was not evident at the site review with Peter Moir\Multiplex? The failure of 5 PPVL rooms ventilation plant to shut down was the result of a BMS controls network fault, this was replaced by a new network controller, we never received a report on why? However my concern at this point was that we could not take manual control of the ventilation plant to secure room operating parameters in the short term without the support of Schneider. Hand controls

should be independent of the BMS controls to allow for such failures. All in all these issued demonstrated the lack of the systems being proven to meet design intent.

Have regard to the following emails when considering your answers to the above:

**Estates Team Bundle, documents 64, 67 and 68.**

197. What concerns, if any, did you have about the ventilation system at the point of patient migration to QEUH?

**A** In the adults I was not aware at the time of migration that we had any concerns, as I believed that the Commissioning and validation had been witnessed and signed off by the Contract supervisors (Capita Symonds), For the Childrens a few simple smoke tests to check ward 2A PPVL air tightness with Dr John Hood was sufficient for me to be concerned and review the SHPN 04 Supplement 1 requirements against what was fitted and the lack of commissioning data. resulting in identifying the following: 1). There having been no air permeability test carried out at room shell stage or final fitout stage, 2). In fact the room air tightness integrity was breached at multiple points around each PPVL suite. 3). HEPA filters had not been installed in the Lobby supply terminal. 4). The full extract was not installed in the en-suite as required under SHPN 04 supplement 1, it was installed above the patients bed therefore the patient environment did not have the correct air flow pattern as intended under the guidance. 5). The en-suite did not have an air transfer grille in the door. In addition to this Dr Brenda Gibson raised concerns that ward 2A Haemato-oncology\TCT were did not meet her expectations for her the patient group. I checked this for her and established that the ward ventilation was design as a general ward with chilled beam technology and 3 Air Changes per Hour (ACH). I escalated this concern to David Loudon.

198. Where was the documentation for C&V stored at that time?

**A** At the time of patient Migration the all documentation was meant to be available within Zutec.

199. Have you seen the ventilation system validation documentation as at handover (Jan 2015)?

**A** No, I had not seen the Validation documents at handover or since.

a) If yes – who carried this out, who signed off, who authorised?

**A** N\A

b) If no – should you not have sought this? Who is responsible for ensuring it is in place? Who should have chased this up? Would this not be part of ID remit?

**A** I did seek these and highlighted the issues around Zutec population, navigation and lack of data. I believe that the Contract Supervisor was responsible for witnessing and verifying the Commissioning and Validation was carried out and was responsible for reviewing and confirming that all Post Commissiong Documentation was provided and accessible. Under SHTM 03-01 Part A, requiring that : Para 8.64: Following commissioning and/or validation a full report detailing the findings should be produced. The system will only be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life. Para 8.65: The report shall conclude with a clear statement as to whether the ventilation system achieved or did not achieve the required standard. A copy of the report should be lodged with the following groups: • the user department. • infection control (where required); • estates and facilities. This should have been followed up by Capita Symonds and or Peter Moir, Contract Manager. I assume the ID is the Infection Control Doctor (ICD) if so they should have been supplied with this data from which they could have raised any concerns with the Contract Manager in detail.

200. Where would the paperwork have been stored/ Who would have been responsible for it?

**A** There was no physical paperwork, all Post commissioning Documentation should have been stored on Zutec,

201. If validation was not in place at handover, how did the hospital open? Who would have had the authority to allow the hospital to open without validation in place?

**A** I am not aware of the reason the hospital opened without ventilation validation, my impression was that the Project team believed that the commissioning and validation requirements had been fulfilled and as such they must have received this confirmation from Capita Symonds. I am not able to provide an answer to how the hospital opened or who allowed this to open without validation in place.

202. Were you asked by microbiologists or Infection Control to provide information regarding the ventilation system and validation? Refer to **Estates Team Bundle, document 27.** Who was supposed to provide this information? If it was not provided, why not? What action was taken to ensure that information was provided – if it was not, what was done to escalate this? Who was responsible for providing this information?

**A** Yes I was asked for this by Dr Christine Peters and I am sure Dr Teresa Inkster. This information should have been provided by the Peter Moir (Contract Manager) under the requirements set out in SHTM 03-01 Part A, Para 8.64: Following commissioning and/or validation a full report detailing the findings should be produced. The system will only be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life. Para 8.65: The report shall conclude with a clear statement as to whether the ventilation system achieved or did not achieve the required standard. A copy of the report should be lodged with the following groups:

The user department.

Infection control (where required).

Estates and facilities.

I believe that the ICT should also have had access rights to Zutec to allow them to access and review the Commissioning & Validation data as required. I am not sure why this data was not provided other than it was not available on Zutec. I meet with Christine and Teresa at various point to try and support their requests, and demonstrated the issues I was experiencing trying to

obtain this data and the lack of clarity on what was on record. I believe Dr Christine Peters escalated this to the Project team, I also raised concerns with David Loudon\David Hall\Peter Moir over the lack of data available on Zutec and the issues around system navigation. Multiplex should have provided all of the Commissioning and Validation documentation the terms of the contract.

**Ventilation System – General**

203. What testing and maintenance protocols and regimes were in place? Refer to **Estates Bundle, document 62.**

**A** Document 62 above refers to the re-commissioning of the ventilation for the refurbishment of ward 4B to make it suitable for BMT patients, this was not a testing and maintenance regime. Following these upgrade works on ward 4b, I was part of a working group made up of Clinical staff, ward management staff, ICT\ICD Estates and Facilities to address the requirements to support transfer of the patient group from GGH to ward 4b, as part of this group I developed a ventilation maintenance\annual verification plan and well as a contingency plan for AHU single point of failure affecting all rooms.

a) What testing and maintenance protocols and regimes were in place that you were aware of?

**A** I had developed a schedule of all ventilation systems classified has high risk patient area's as per SHTM 03-01 and shared this with Dr Teresa Inkster for review and approval, I then issued this to David Brattey to implement. I also believe that the routine inspection and testing requirements for general systems were being carried out as per SHTM 03-01 under David's management.

204. What concerns, if any, do you have relating to the ventilation? What concerns, if any, do you have relating to the water temperature? What concerns, if any, do you have relating to the movement within the water system? Refer to **Estates Bundle, document 123.**

**A** For general ward ventilation, single room accommodation design proposal was to adopted chilled beam technology, in order for the chilled beam design approach to work the Multiplex proposed the contract specified Air Change Rate be dropped from 6ACH to 3 ACH, Multiplex submitted a paper justifying this approach and I believe ICT were consulted on this, the Board accepted the proposal which was logged in the Clarification log with a proviso that the rooms be negative pressure to the corridor. In practice the rooms are neutral\0pa differential pressure although Multiplex claim the rooms are slightly negative (unmeasurable), Lack of individual chilled beam dew point control. With regards to water temperatures raised in the Estates Bundle 123, my concerns over the water temperature raised in this bundle relate to the CHP operational failure and Multiplex attempts to adjust the CHP control parameters to maximise efficiency. These on-going attempts resulted in boilers shutting down when they should have been on line with a resultant drop in MTHW temperature which impacted the DHW temperature control regime. It should be noted that this was not an issue until early/mid 2016 when Multiplex put the CHP into service (Jan 2016) and then tried to address the incompatibility of the design parameters with the operational issues. I am not sure if there were any issues about the movement of water in the water system?

205. Was it possible to incorporate a comprehensive ventilation system into the QEUH/RHC?

**A** Yes.

(a) Was the ventilation system incorporated into QEUH/RHC comprehensive? Was it adequate to meet the needs of the various patient cohorts?

**A** The systems were comprehensive, however there are anomalies in the design, capacity, ACR's, pressure control regimes, dew point control etc that

suggests that they were not adequate to meet the needs of the various patient cohorts.

206. Describe any ward/area specific ventilation systems used?

**A** General ward ventilation consists of separate supply and extract Air Handling units located in the associated roof plant room of the arm of the tower they serve, the supply and extract AHU's are linked together via a thermal wheel for heat recovery. The supply AHU houses primary and secondary filters, frost coil, heating coil and cooling coils for primary air treatment. The AHU's are then ducted down through the building to service the wards over four floors on the associated tower. Within the wards single rooms are supplied with supply air through a chilled beam (providing heating and cooling capability) at a volume allowing for 3ACH and there is no dewpoint control on these chilled beams. There is no extract in the patient room, the extract is pulled from an extract grille in the en-suite and via the extract in the main corridor, the rooms are neutral\0 pascals differential pressure to the corridor. Each room has its own dedicated room temperature controlled.

207. What are your thoughts about these ventilation systems that were used?

**A** The ventilation in single rooms with zero pascal of differential pressure creates a risk of cross infection between rooms, the rooms should have had a measurable negative pressure barrier to the corridor. The Chilled beams have a regenerative element to their operation, meaning that room air is induced into the chilled beam for mixing with the supply air as an energy efficiency feature to reduce waste heat, this results in regenerated room fibres\dust being drawing through the chilled beam settling on the surface to build up over time, this creates an unexpected maintenance\cleaning burden and is disruptive the functionality of the ward. The lack of dew point control presents issues during periods of high external temperature and high humidity, where the chilled beam controls are not configured to protect against dew point condensation, leading to condensate water discharge from the chilled beam into the patient environment.

208. Refer to **Estates Team Bundle, document 48.** Explain your concerns and actions taken.

**A** My concerns were that the PPVL design used for isolation ward 2A isolation rooms did not comply with the guidance design intent within SHPN 04 supplement 1, on the basis that this design was accepted as part of the contract proposal, specifically in relation to volume of extract being drawn from the patient room above the bed (0.185m3/s), with only a small extract from the en-suite. Guidance design intent states: Para 4.3: The ventilation system is designed on the basis that all its constituent parts, as described in Table 1, work together to form an integrated system. For example, air to the suite is supplied at high level in the lobby, with extract in the en-suite bathroom. This ensures good airflow through the entire isolation suite. Similarly, the volumetric airflow rate in the lobby is determined by the number of air changes required in the patient's bedroom. Modifying or failing to provide one element of the system will jeopardise the performance of the system as a whole. Basic design parameters: Para 4.4: The patient's bedroom is to have 10 air changes per hour. The entry lobby is to be at +10 Pascals with respect to the corridor. The en-suite room is to have at least 10 air changes per hour and be at a negative pressure with respect to the patient's bedroom. (this cannot be achieved with the main extract volume in the patient room) Table 1 gives nominal design values calculated for rooms of the size stated. The air change rates and pressure differentials below should be maintained when filters are dirty. Variable-speed control of fan motors would be an acceptable method of flow control, within the normal operating range of the fan's speed. Following discussion with Craig Williams, he requested that I contact Estates teams on other paediatric Transplant centres and he would also speak to his counterparts at these centre. The mail chain in the document 48 refers to these exchanges. The input from Darren Pike details a typical snapshot of the PPVL design layout from ZBP, however this layout does not represent what was installed. it shows an en-suite transfer grille which was not part of our install, and it does not show the en-suite extract rate required to achieve 10ACH set out in SHPN 04 supplement 1. it also shows a magnehelic gauge relay to the nurses station alarm panel, this was not included in out installation. I supported the works of the ICT\ICD and

I produced a position report for David Loudon detailing these concerns and deficiencies.

209. Refer to **Estates Team Bundle, document 86.** Were there any issues? Did you respond to Dr Peters? If so, what did you say? If not, why not?

**A** I believe that there were concerns from the ID consultant about containment of infectious diseases within general ward design single rooms. Yes I responded to Dr Peters and advised that form the information I had single rooms have an air change rate of 3ACH, the differential pressure from the rooms to the corridor was stated as being negative however this was not shown on the commissioning data, I don't recall obtaining or providing detail of the overall flow of air through the ward. I also arranged for onsite measurement of these values to demonstrate this to Dr Peters, this confirmed the ACR and that single rooms where generally zero differential pressure to the corridor. I also took Dr Peters through the as fitted ventilation plans to demonstrate how to calculate the ACR from the space dimensions and the volumetric supply and extract data from the drawings to determine if the space is positive\negative or neutral to the corridor.

210. Refer to **Estates Team Bundle, document 136.** Explain the concerns regarding latent defects and actions taken.

**A** With respect to ventilation, Tom Steel had requested that I look at the possibility of increasing the ventilation ACR and pressure control regimes using the existing plant aiming for a time scale for completion in line with the associated plumbing improvement refurbishment works for ward 2A. It quickly became clear that this was not possible, and I engaged Mark Lambert of Innovated Design Solutions to support a review and propose options to address the stated aims for ward 2A. Mark quickly identified that the system was not designed for the specified patient group indicating several failures which are detailed in my latent defect enquiry document 136. The latent defect generally relates to the failure to design and install a system suitable for the specified patient group. The water issues identified in my e-mail in document 136 arose from my works associated with the supply, installation and commissioning of the chlorine dioxide water treatment system, whereby

the distribution pipework had been ordered on the basis of 316L Stainless Steel from the as fitted records which we found was actually 304l Stainless Steel pipework installed . This caused delay to the roll out of the water treatment programme due to change of materials to suite as installed. I was aware for my previous request to Scottish Water regarding confirmation of their letter of regulatory approval and associated conditions for the QEUH project, that Brookfield had not notified Scottish Water as regulator of the intent to proceed with the project and there for no assessment or approvals had been given. This is both illegal and a potential latent defect for knock on complications\issues. As you will see from document 136, Tom Steele (DoF) advised me “Given Douglas’s thoughts hold back at present and make sure that our position is contractually and totally correct.” I do not recall Tom coming back to me to authorise me to issue these latent defect letters. I would expect that he would have used the Capital project team for this.

211. Explain your involvement with a review of specialised ventilation areas.

**A** I was involved in the review of Ward 2A Haemato-oncology\TCT ward supported by Innovated Design solutions, Matthew Lambert who produced a status report on the unsuitability of this ward for the patient group housed there, he also provided proposed option for improvement to meet the requirements of the patient group, this was reviewed by the senior management team\clinical team and ICT\ICD and approval given to proceed to tender, Matthew Lambert prepared a specification to deliver the required facilities and I worked with procurement colleagues on the tender process, the tenders had been returned evaluated and contract awarded by the time I retire July 2019, I believe that this project was taken over by the capital projects team for delivery. I was also involved in the user group review for the reopening of ward 4b to BMT patients from GGH. I reiterated my concern the risk of the AHU single point of failure affecting all isolation rooms simultaneously as well as the impact of annual maintenance and verification requirements without any robust contingency arrangements. To this end I developed the maintenance and access plan for agreement with the SLWG, procured and deployed mobile heap filtration units for use in the event of plant failure or maintenance requirements . I also developed an SOP for these

arrangements all approved by the SLWG. I was not involved in any other specialist ventilation reviews before my retirement July 2019.

212. Dr Teresa Inkster tells us that there was little progress with this matter. To what extent, if any, is this statement accurate?

**A** I am unaware of this review and cannot answer this question.

**Specific Events in Relation to Ventilation System**

213. Can you recall any specific events in relation to ventilation?
For example:

a) In 2015 prior to patient migration there were checks to the ventilation in Ward 2A in particular, with there being issues in relation to breaches around the trunking, ceiling lights etc with the extract grills not being compliant with SHPN

**A** The issue was related to the lack of room air tightness potentially allowing air ingress from undefined extraneous areas. Impact was that the ward 2A PPVL isolation rooms were not fit for purpose to allow patient migration. Dr John Hood (Consultant Microbiologist), Prof Craig Williams (Lead ICD, GGC) and myself. The issue was escalated by me to the Project Director David Loudon, and by Dr Williams via the Infection control committee & clinical management team. Work was on-going with Multiplex as a contract defect. Multiplex proposed appointing an expert silicone sealant company to seal up all of the service penetrations, trunking\IPS panels etc. Dr John Hood and I raised concerns over future access requirements for maintenance and the risk of for example IPS access not being properly sealed again after maintenance work. Multiplex's proposal was accepted by the project team (Not sure if Peter Moir or David Loudon) and all ward 2A rooms were silicone sealed. Following this work I had advised that the rooms should be Air Permeability tested to prove that the rooms were now ait tight to the tolerance required, the rooms passed these tests and were certified by the test engineer (RSK) This was seen as contractual commissioning and was managed by Multiplex under the contract (Capita Symonds should have signed off).

b) Lack of HEPA filters and general concerns ward 2A/B refer to Estates Bundle, documents 35 and 37. Detail how the issues managed, what was your responsibility, outcome. Highlight any concerns you had with regards to work/ testing being carried out.

**A** The issue over the lack of HEPA filters, on first accessing ward 2A PPVL isolation rooms with Dr John Hood and Prof Craig Williams(there are no HEPA filters in ward 2B), to review the rooms suitability for migration, I noticed that there were no HEPA filters fitted in the terminal grills in each of the 8 PPVL rooms, This meant that the rooms could not be used to accommodate Transplant patients, I raised this with Multiplex (David Wilson) in the first instance to be advised that the HEPA filters were optional and it was a client responsibility to fit these where required. I did not agree with this and therefore escalated to Peter Moir\David Loudon, David raised this as a contract requirement with Alisdair Fernie. During this time I approached several HEPA filter manufacturers to seek stock to find that they all worked on a 3 month lead time. Alisdair Fernie responded to David Loudon to advise that Multiplex had HEPA filters in Ireland for another project and that these were being diverted to the QEUH for use in ward 2B, these HEPA filters were delivered within a few days and installed followed by DoP challenge testing which they all passed. Multiplex loaded the HEPA challenge test into Zutec. These tests should have been witnessed and signed off by Capita Symonds under contract defect. Prof Williams the issue with poor environmental test results arose after the HEPA filters and Air Permeability tests had been completed and passed, from memory this was related to unsealed light fitting breaching the patient room to ceiling space. These were replaced by Multiplex with sealed light fittings and from memory I believe that the environmental monitoring result stabilised. This was an omission by Multiplex during the room retro fit silicone sealing process, where the Air Permeability test would have past due to the 20pa pressure test causing the light fitting shade to seal on to the fitting during the test, with a gap reintroduced after the test.

(i) Are you aware of the challenge testing being witnessed by Capita? If not, why were these tests not witnessed?

**A** I believe that Capita witnessed a sample of the challenge testing, but not all of them.

c) Dr Brenda Gibson raises concerns refer to Estates Team Bundle, documents 17 & 18.
Describe your involvement and any actions taken in respect of this matter?.

**A** The issue over the lack of HEPA filters, on first accessing ward 2A PPVL isolation rooms with Dr John Hood and Prof Craig Williams(there are no HEPA filters in ward 2B), to review the rooms suitability for migration, I noticed that there were no HPA filters fitted in the terminal grills in each of the 8 PPVL rooms, This meant that the rooms could not be used to accommodate Transplant patients, I raised this with Multiplex (David Wilson in the first instance to be advised that the HEPA filters were optional and it was a client responsibility to fit these where required. I did not agree with this and therefore escalated to Peter Moir\David Loudon, David raised this as a contract requirement with Alisdair Fernie. During this time I approached several HEPA filter manufacturers to seek stock to find that they all worked on a 3 month lead time. Alisdair Fernie responded to David Loudon to advise that Multiplex had HEPA filters in Ireland for another project and that these were being diverted to for use in ward 2B, these HEPA filters were delivered within a few days and installed followed by DoP

d) Air permeability tests not carried out refer to **Estates Team Bundle, document 47 Capita NEC3 Supervisor's Report (No 53)** - dated September 2015.

**A** The issue was related to the lack of room air tightness potentially allowing air ingress from undefined extraneous area's. Impact was that the ward 2A PPVL isolation rooms were not fit for purpose to allow patient migration. Dr John Hood (Consultant Microbiologist), Prof Craig Williams (Lead ICD, GGC) and myself. The issue was escalated by me to the Project Director David Loudon, and by Dr Williams via the Infection control committee & clinical management team. Work was on-going with Multiplex as a contract defect. Multiplex proposed appointing an expert silicone sealant company to seal up all of the

service penetrations, trunking\IPS panels etc. Dr John Hood and I raised concerns over future access requirements for maintenance and the risk of for example IPS access not being properly sealed again after maintenance work. Multiplex's proposal was accepted by the project team (Not sure if Peter Moir or David Loudon) and all ward 2A rooms were silicone sealed. Following this work I had advised that the rooms should be Air Permeability tested to prove that the rooms were now ait tight to the tolerance required, the rooms passed these tests and were certified by the test engineer (RSK) This was seen as contractual commissioning and was managed by Multiplex under the contract (Capita Symonds should have signed off).

e) Issues with rooms 18 & 19 Ward 2A **Estates Team Bundle, documents 46, 67 and 68.**

**A** There are two issues here 1). Document 46 refers to me handing back of ward 2A PPVL isolation rooms 18 & 19 to Craig Williams 31/8/2015, following final deep clean ready for microbiological testing before placement of patients. Following a report by the ward Manager Jean Kirkwood that room 19 had gone negative pressure that morning. Peter Moir Escalated this to David Wilson Multiplex who had this check out to find that and advised that this room was in manual off mode and suggested that Estates\ICT team s had been adjusting these? I am unaware of any such adjustment by the Estates\ICT Teams, however the AHU was return to Auto by Mercury on behalf of multiplex and Craig Williams was able to commence his Micro-biological testing.

The second issue is related to the loss of supply AHU's for two off PPVL isolation rooms 18 & 19 in ward 2A. On investigation AHU 18 filters were changed the AHU reset and returned to operation (an AHU trip on filter alarm is not normal). These units could not be reset in Auto or Manual mode, Julie Miller (Multiplex) attempted to assist but also could not restore the AHU. I mobilised Schneider controls who arrived on site run diagnostics on the controls but during his investigation a further 4 units tripped out including AHU 18. The Schneider engineer eventually managed to return all units to manual mode and set the system to operate at 10 – 15 Pa pending further investigation next day. Ultimately the Schneider engineer identified the

network controller was at fault and this was placed on order and replaced after a few days. During this time Estates monitored the plant and PPVL room status every 2 hours. Following replacement of the network controller the system was returned to normal auto mode, issue resolved.

f) Dr Christine Peters raised issues with the air change rates in Ward 2A. Were you aware that Dr Peters had raised issues with the air change rates in Ward 2A? If so, what were the issues, what was your involvement with any work carried out to remedy any issues?

**A** I believe that Dr Peters along with Professor Brenda Gibson raised concerns about the ACR within ward 2A oncology\TCT wards. I supported Dr Peters to establish the ACR in the patient bedrooms and establish that the rooms did not have positive pressure protection to the ward corridor, there was also no positive pressure protection between the general ward and the hospital corridors. This ward seemed to have been designed as a general ward (including the use of Chilled beam technology, which limited the ACR to 3ACH.) with no recognition of the patient group to be housed in the ward. I advised David Loudon of this as well as consulting David Wilson of Multiplex. The response was that this was the spec requested by the clinical teams, who requested that the facility replicated that of Yorkhill oncology ward. I believe that there was correspondence between Dr Peters, Prof Gibson and David Loudon, but I am not aware of the content or that there was any outcome.
At that time, I was asked by Dr Peters\Prof Gibson what could be done to improve the ventilation ACR and I advised that in my opinion the Ventilation would need to be completely redesigned and replaced as the ductwork was not of an adequate size to supply the required ACR and pressure control regime. It was not until Tom Steele took over as Director of Facilities that I was asked to formally establish if the ventilation system could be uprated to improve the ACRs.'s?
I commissioned Matt Lambert of Innovated Design Solutions to review the design and develop options for improvement. His report resulted in Tom Steele asking me to develop a specification and tender package for the redesign of ward 2A ventilation system, which I did with the support of Matt Lambert.

g) In December 2015 you emailed David Wilson, Brookfield Multiplex stating that the *'pressure in the isolation rooms presenting an unacceptable risk to the vulnerable patients present within these protective environments.'*

(ii) Explain your concerns

**A** I cannot recall this specific issue without access to the reference e-mail? As there were so many issues like this.

(iii) Detail the issues

**A** The issue was that unexpectedly the ventilation AHU's for several of ward 2A PPVL rooms shutdown, these could not be restarted via the BMS system nor manually at the AHU's.

(iv) Potential patient impact

**A** Potential risk of infection for the patients occupying the affected rooms, as the rooms no longer had Positive pressure control from the lobby to the corridor nor positive air cascade flow from the lobby through the patient room with the zero air changes in the patient bedroom.

(v) what was done to resolve matters and your involvement.

**A** As this occurred out of hours, I raised an emergency callout to Schneider via our service support contract (as Multiplex were unable to help at this time). The service engineer worked on the system over night but could not identify or resolve the cause of the problem, but he did manage to adjust the controls to allow for the ventilation plant to be reinstated manually. This brought the room back to normal operating conditions for pressure control and air changes. These rooms remained on manual setting with regular monitoring of the conditions by Estates staff for at least 8 -10 weeks. When ultimately the affected controller was replaced. I don't recall ever receiving a definitive cause for this controller failure.

h) In February 2016 you prepared a report regarding the action plan for proposed increase of extract in the ensuite rooms in the Schiehallion ward refer to Estates Team Bundle, document 93:

(i) Explain your concerns?

**A** My concern and that of Dr Christine Peters (ICD) was that the design of the PPVL did not follow the design principles of SHPN 04 Supplement 1. despite the disclaimer in SHPN 04 Supplement 1 Para 1.10: “This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed. Guidance for these facilities will follow in a further Supplement to SHPN 04.” The project designers proceeded to use the principles of this guidance in the absence of more specific Guidance and without recourse to SHTM 03-01 air flow cascade principles (clean to dirty). The PPVL facilities provided do not follow the design intent to ensure the principle of air movement clean to dirty. This paper was escalated to David Loudon, to Alisdair Fernie (Multiplex) to the designers. Who advised they believe their design is compliant, with no evidence or justification. A further point to note which was not included in my paper is detailed under SHPN 04 Supplement 1, Para 4.12 Extract ventilation: An extract terminal should be fitted at high level in the en-suite room. An additional terminal may be fitted in certain circumstances at low level adjacent to the bedhead in the bedroom. The clinical requirement for this should be verified and such requirements would probably relate to highly infectious patients.

(ii) Detail the issues?

**A** The PPVL facilities provided do not follow the design intent to ensure the principle of air movement clean to dirty. Where 71.5% of the required extract is drawn from the Isolation room and 28.5% from the En-suite. Empirical data collected on site by ICD\Estates indicates that when the En-suite door is left open to the isolation room the extract in the isolation room becomes negative compared to the en-suite, increasing the risk of contamination from the En-suite.

(iii) Potential patient impact?

**A** Potential for the patient not to be fully protected from the environment particularly relating to the en-suite, where the WC plume could contaminate the environment.

(iv) What was done to resolve matters and the extent of your involvement?.

**A** This paper was escalated to David Loudon, who wrote to Alisdair Fernie (Multiplex) from there to the designers to the address our concerns raised. However the designer's response was a simple we believe the design is compliant, with no evidence or justification.

(v) Issues in respect of the safety of the PPVL rooms and adequacy for isolating infectious or immunosuppressed patients?:

**A** SHPN 04 supplement Para 1.10 states: "This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed. Guidance for these facilities will follow in a further Supplement to SHPN 04." As well as advising under table 1 Isolation suite parameters that : "Where immuno-compromised patients are to be accommodated, such as in transplant units or specialist cancer units, there could be a need for positive pressure isolation rooms." Most ICD's and clinicians I have dealt with in the past would prefer a positive pressure Isolation facility for this patient group.

9i) Why would most ICD's and clinicians prefer a positive pressure isolation facility?

**A** Positive pressure control direct into the patient's room ensures that any potential breaches of the room envelope would have to exceed the pressure of the positive pressure (+10pa) within the room for there to be any risk to the patient. As opposed to the PPVL room, where the positive pressure control is between the protective lobby to the corridor (nominal +10pa), with a nominal pressure differential between the patient room and the corridor of 0pa.

(ii) Is it right to presume that the isolation facilities were not positive pressure? If so, how did this come about? Who would have been responsible for ensuring that there was positive pressure?

**A** Yes, the isolation rooms themselves were nominal 0pa differential pressure to the corridor and therefore all area's surrounding the patient room envelope.

SHTM 03-01, Pt A, Appendix 1, Table 1, states: that the requirements for a ward accommodating Neutropenic patients are:

- Supply air to the room at 10 ACH.
- Room differential pressure at +10pa
- Filtered type: H12 (HEPA)

However, the contract design was based upon SHPN 04 Supplement 1, which is for acute general ward isolation requirements. I do not know why SHPN 04 supplement 1 was used for this design as para 1:10 of SHPN 04 Supplement 1 states:

"This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed. Guidance for these facilities will follow in a further Supplement to SHPN 04."

To my knowledge the further supplement to SHPN 04 in this regard was not published.

The designer would be responsible for the design; however, I am not aware of how this was addressed under the contract Review of Design Data (RDD) process and who was party to signing off on this.

(vi) Issues detailed in **Estates Team Bundle documents 94, 95 and 96.**

**A** This is the first time I have seen the response from Alisdair Fernie 3\3\2015 to the PPVL concerns raised in my report and David Loudon's letter dated 1\3\2015. The impact for the Hospital& patient groups were concerns by clinicians (Dr Brenda Gibson & her Team), \ICD's (Dr John Hood\Dr Teresa Inkster & her Team) and clinical management (Dr Alan Mathers, Clinical Director & Jamie Redfern, General Manager), over the suitability of PPVL isolation rooms for Immuno-compromised Transplant patients. Alistair Fernie's stated position was that 1). SHPN 04 supplement 1 does not exclude the use of extract vents in both rooms. SHPN excludes special facilities such as

infectious disease units or severely Immuno-compromised patients, Para 1:10 “Which now appears to be the criteria that isolation rooms particularly Schiehallion wards are being scrutinised” he also highlights the original proposal was to Design the PPVL as per the SHPN model (extract in en-suite only), however this was changed to the current model as part of the RDD (Review of Design Data) process and signed off by the Board and their advisors (capita). I believe that the technical advisors were Curry & Brown (David Hall) not Capita. Finally he suggests that at no point during construction, commissioning\witnessing process was it highlighted that the signed off solution was not what was required. I was not part of the RDD or sign off process however this would suggest to me that the appropriate clinical and ICD representation were not party to this process? Following on from the ongoing communications with Multiplex over this matter. I attended meetings with the Jamie Redfern, Dr Alan Mathers, Dr Brenda Gibson, Dr Teresa Inkster, ICN’s Ward Managers etc to review on-going concerns and assess options with the preferred option being to convert 4 PPVL isolation rooms to Positive pressure isolation rooms for the most vulnerable transplant patients. These proposals were reported back to David Loudon and I was authorised to have designs prepared and signed off by all parties before putting a specification out to Tender.

i) Issues detailed in **Estates Team Bundle, document 104?.**

**A** The issue relates to the design of general ward single rooms with 3 ACH as opposed to 6 ACH required under SHTM 03-01. This is the first time I have seen this correspondence and was not involved in the review or the sign off process. Alan Seabourne states that Annette Rankin was responsible for ensuring the liaison and communication with Infection control department and Microbiology was carried out effectively and that they were party to the sign off of all design matters impacting the patient including environment. I was not aware of the detail or methodology of this process nor did I see any sign off detail. Alan also advises that Facilities were also involved in these processes and signed off on these matters, I don’t believe that this included any member of the operational Estates team?

(i) Does the term Facilities relate to your earlier distinguishing of operational estates and facilities?

**A** Yes, the Facilities department encompasses Soft Facilities Management (FM) and Hard FM (Operational Estates), operational Estates are managed under the Facilities management structure and reference that Facilities were involved in sign of would suggest operational Estates involvement. However, I am not aware of any Operational Estates involvement in this process, as all the senior Facilities managers were from soft FM backgrounds.

j) Fungal growths in a number of rooms in ward 2A?.

**A** I have already covered the issues surrounding fungal spores in multiple rooms within 2A Isolation rooms and the resolution by installing sealed light fittings. However There was another incident if I recall correctly for PPVL room 19, where I was advised by Dr Inkster that routine monitoring had shown fungal counts in this room. The room was made available for investigation and it was found that there was a tear in the flexible duct connection to the HEPA filter housing, this caused the ceiling void above the isolation room to pressurise at about 10pa and the lobby pressure to drop, resulting in air from the ceiling void entering the isolation room The flexible duct was replaced and on closer inspection it looked like the duct material had a score along its length which split due the force of the air pressure applied to it over time. The flexible duct was replaced the room reseals, deep cleaned and returned to ICT for further monitoring before being placed back into service.

k) Any other issues/ incidents not mentioned above.
In providing your answer please tell us:

a) What was the issue?

b) The impact on the hospital (include wards/areas) and its patients (if applicable)

c) Who was involved?

d) What was the escalation process?

e) Were any external organisations approached to support and advise?

f) What was the advice?

g) Was there opposing advice and by whom?

h) What remedial action was decided on and who made the decision?

i) Was the issue resolved – consider any ongoing aftercare/support/monitoring?

j) Any ongoing concerns witness had herself or others advised her of?

k) Was there any documentation referenced during or created after the event. For example, an incident report?

l) Did anyone sign off to say the work had been completed and issue resolved/area safe?

Write your answers in the relevant answer boxes above.

**A** I cannot recall any other isolation room issues.

**Isolation Rooms**

214. In the Stage 3 Sectional Completion Certificate **Estates Team Bundle, document 3** on 29th January 2015, HEPA filters in isolation rooms were listed as incomplete **Estates Team Bundle, document 3, page 25:**

a) What was missing?

**A** Isolation rooms intended to house Immuno-compromised patients had not been fitted with the required HEPA filters at the PPVL lobby terminal filter boxes.

b) Why was the completion certificate signed when there were incomplete works to the isolation rooms?

**A** I don't know the answer to this question.

c) Was this discussed with other members of staff? If so, who?

**A** I don't know the answer to this question.

d) Was this issue escalated to Board level? If so, to whom and who escalated matters?

**A** I escalated this to the project Director, David Loudon. I don't know if it was escalated to Board level.

e) Explain what works were carried out to resolve this matter, your involvement and when matters were resolved?

**A** Multiplex sourced HEPA filter from one of their projects in Ireland and shipped them to site, the filters installed by Mercury Engineering and Dispersed Oil Particulate (DoP) (please define) challenge tests carried out on their behalf by H&V commissioning. From Memory this was carried out Circa June 2015.

215. What was the issued referred to in the email at **Estates Team Bundle, document 34?** How did this happen?

**A** From Memory, Professor Craig Williams had asked for the commissioning records for ward 4B BMT ward to assess the status of the HEPA filters and room differential pressures to the corridor, as this ward was supposedly upgraded to isolation room standard to accommodate BMT patients. I advised Professor Williams that Multiplex had not carried out HEPA filters DoP challenge tests nor single rooms differential pressure tests to the corridor. “as these rooms were not defined as isolation rooms” I am not sure where I got this quotation from but suspect it would have been from David Wilson (Multiplex Commissioning Manager). This means that the rooms had not been effectively commissioned for their intended purpose. I do not know how this happened as I was not involved in the change of specification for the change of use of ward 4b from a general ward to a BMT isolation ward. However it soon became clear that the ward was not generally fit for purpose however the rooms in general did not meet the requirements for the BMT patient group with the finish and engineering arrangements at hand over.

216. Discuss the air permeability testing carried out in respect of the isolation rooms **Estates Team Bundle, documents 37 & 41:**

a) Why was this work carried out?

**A** Air Permeability (Air tightness) tests of PPVL designed rooms are required to be undertaken as part of validation requirements set out in SHPN 04 supplement 1 for the Isolation suite. To ensure effective isolation, it is important that air leakage to or from adjacent areas is kept to a minimum. Construction gaps should be minimised and service penetrations sealed

before the suite is tested. These validation tests were not carried out by Multiplex as part of the commissioning and Validation process prior to hand over and therefore all PPVL isolations suites across the QEUH & RHC required Air Permeability validation.

b) What was the result of this work?

**A** I cannot speak to each test from memory, but in general the tests were carried out and were required additional minor re-sealing works were carried out. All rooms passed the Air Permiability Validation test by the end of this programme.

c) What was your involvement in the work?

**A** I supported the development of the programme working with David Wilsom, arranging access and issuing communications with the affected wards and consulting with ICD's. I also witness some of the tests carried out in wards 2A & 4B.

d) What if any issues arose?

**A** I had concerns over the requirement in SHPN 04 supplement to "Turn off the suite supply and extract ventilation systems and those serving adjoining spaces. (Rationale: All adjoining spaces need to be at atmospheric pressure in order to establish the true leakage rate.)" however David Wilson saw this as less of an issue and wanted to proceed to work with the systems as they were (occupied).

e) Refer to **Estates Team Bundle, document 47 Capita NEC3 Supervisor's Report (No 53) - dated September 2015. Estates Team Bundle, documents 51 & 55.1.** to assist with your answer.

**A** The patients were not in isolation rooms being tested, in line with the requirement to switch off ventilation in adjacent rooms, Professor Craig Williams also advised patients in adjacent rooms be relocated. Type your answer here

i) Were patients in these isolation rooms at this time?

**A** The patients were not in isolation rooms being tested, in line with the requirement to switch off ventilation in adjacent rooms, Professor Craig Williams also advised patients in adjacent rooms be relocated during the tests.

ii) Potential impact on patients?

**A** Ventilation pressure control is lost in the affected rooms during these tests therefore patients need to be relocated. Risk of exposure to contaminants in adjacent spaces if the test fails air tightness limits. It should be noted these tests should have been completed before handover where there would be no potential for patient impact.

iii) Are you aware why these tests were not completed before handover?

**A** No, I am not aware of the reason these tests were not completed before handover.

iv) Your involvement with the HAI Scribe

**A** I arranged the meeting, but I can't remember if it was David Brattey (senior Estates Manager) or myself who met with the ICN to complete the HAI Scribe.

v) Do you recall the outcome of the HAI Scribe?

**A** I don't recall the outcome of the HAI Scribe, but it would have put in place control measures to protect the patient from the activity being assessed.

217. Refer to **Estates Team Bundle, document 26** Christine Peters states that you were dealing with sealing light fittings:

a) What was the issue?

**A** I don't see any reference to my dealing with sealing of light fittings in document 26? However I believe this question refers to the fungal counts measure in one of the PPVL isolation rooms ward 2A, sometime after the air permeability test (not sure of timeline), where I identified the possibility that the light fittings had not been sealed prior to the Air Permeability test. I looked into this and arranged for multiplex to change the light fittings to a sealed unit to address the issue in the affected room, which was then rolled out to all isolation rooms. The affected room in ward 2A was deep cleaned and handed

back to ICD for further microbiological testing before being returned to service on receipt of clear results.

b) What was the potential impact on patients?

**A** Potential exposure environmental organisms.

c) What did you do to resolve this matter?

**A** I looked into this and arranged for multiplex to change the light fittings to a sealed unit to address the issue in the affected room, which was then rolled out to all isolation rooms. The affected room in ward 2A was deep cleaned and handed back to ICD for further microbiological testing before being returned to service on receipt of clear results.

218. There were issues in August 2015 with isolation rooms refer to **Estates Team Bundle, documents 44 & 45:**

a) Detail your understanding of the issues?

**A** I believe that these issues are related to the initial inspections of the ward 2A PPVL isolation rooms carried out by Dr John Hood, Professor Craig Williams and myself to assess the suitability of these rooms for patient migration, where John & I carried out smoke tests around all room IPS panels, trunking, ceilings etc to determine direction of air flow, results showed air flow in from the IPS\ceiling and wall breaches. In addition we carried out pressure differential tests between each space and the ceiling void\IPS panels to find that the ceiling was at a positive pressure relative to the en-suite. The worst rooms were rooms 18 & 19.

b) Were the affected wards/ areas complaint with the relevant guidance at the time

**A** No the PPVL isolation suites in all areas were not compliant with the guidance that they had been designed against SHPN 04-01.

c) Your understanding of whether the affected areas/ wards had been built to contractual specification at the time

**A** My opinion is that they were not as these PPVL suites were not designed with the correct Clean to dirty air flow pattern recommended with SHPN 04 supplement 1, with the main extract in the patient room rather than the en-suite, where Para 4.12 states “An extract terminal should be fitted at high level in the en-suite room. An additional terminal may be fitted in certain circumstances at low level adjacent to the bedhead in the bedroom. The clinical requirement for this should be verified and such requirements would probably relate to highly infectious patients.” In addition, these PPVL suites had not been properly commissioned and validated, lack of designer commissioning pack, equipment commissioning certificates and no overall system validation report. From the information provided in the supporting bundles to this questionnaire I cannot attest to the rooms meeting the final RRD agreed design.

(i) Was this your opinion at the time, or since being asked to consider by the Inquiry?

**A** This was my opinion at the time, and I advised the project team David Loudon\Peter Moir of this as well as (David Wilson) Multiplex.

d) Your involvement in carrying out/ instructing work to remedy any issues?

**A** Having identified an issue, I would consult with Multiplex (David Wilson) for background details, carry out an investigation\assessment and ether raise a defect via Capita or provide David Loudon with the details and options to resolve for him to address with Multiplex.

e) Whether there were patients in the affected wards/ areas at the time?

**A** With respect to this work I don’t recall patients in the ward at this time, I can’t remember the patient migration date for ward 2A, but I believe it was one of the later migrations.

f) Your understanding of the potential impact on patients?

**A** Potential patient exposure to environmental organisms as the rooms did not meet the Air Permeability (air tightness) test criteria.

219. There remained issues regarding testing in September 2015 refer to **Estates Team Bundle, document 61:**

a) Explain the issues?

**A** This was the on-going requirement to validate all PPVL rooms with respect professionally sealing of the PPVL suites to support Air Permiability (Air Tightness) tests and belated validation. Due to room occupancy\access issues this process was taking longer than expected. The issue regarding adjustment to the extract volumes relates to a trial the ICD's professor Criag Williams which to test, based on information from Leeds children's Hospital.

b) Your involvement?

**A** My involvement was to liaise with the ward staff, ICD and multiplex to manage the logistic and verify the results with Professor Williams as well as ensuring the suites were deep cleaned and handed back to ICT for microbiological sampling, before being returned to service.

c) Work carried out to resolve any issues?

**A** The works involved Pro-seal professional sealant company, sealing off all envelop penetrations gaps and potential breaches to the suite. Followed by independent Commissioning Engineers carrying out the air permeability test protocol to validate the suite air tightness against the set criteria laid down in SHPN 04 Supplement 1.

d) Potential patient impact?

**A** Patients placed in the affected PPVL suites before the sealing works and Air Permeability tests were carried out could potentially be exposed to environmental micro-organisms. However I believe this was tightly monitored and managed by ICT.

220. Refer to **Estates Team Bundle, document 70**, David Loudon stated that the Board would not be taking handover until they were confident that the rooms were fully compliant:

a) At the time how were the room not fully compliant?

**A** My interpretation of David's e-mail is related to the 2nd stage upgrade works for ward 4B BMT, as this ward had been taken back by Multiplex for further development and therefor had yet to be handed over under this stage 2 amendment to contract. The other issue referred to in the mail chain relate to works in occupied wards where hand over had already been accepted.

b) Explain your involvement?

**A** I was involved with the ICT\ICD review of the concerns for the ward's suitability for housing BMT patients. I was involved in a few progress meetings with Peter Moir, David Wilson (Multiplex), Prof Craig Williams (ICD) as well as the final site visit and review of commissioning documents with Teresa Inkster.

c) What work was carried out and how was this recorded?

**A** The following works were delivered under the stage 2nd stage contract for ward 4b:

1. Isolation room suspended ceiling replace with solid ceilings, complete with sealed access hatches for maintenance.
2. New sealed light fittings were installed.
3. Supply and extract AHU fans, motors and inverters were replaced to increase capacity.
4. Ventilation system rebalance to deliver 6 ACH at a differential pressure of 5-10 pa.
5. Supply ductwork cleaned and microbiological testing carried out.
6. Differential pressure room display, and central alarm installed and commissioned.
7. AHU filters replaced.
8. New HEPA filters fitted to all isolation rooms.
9. Room Air Permeability tests complete.
10. HEPA Filter DoP Challenge tests complete.

d) When did the rooms become fully compliant?

**A** I am not sure that these rooms could be classed as fully compliant, as they did not have ventilated lobbies and the did not achieve 10ACH or 10 pa differential pressure to the corridor, the ward was also reliant on a single supply AHU which was a single point of failure risk. But the works represented betterment to a level that I understand was acceptable to the clinical team & ICT.

e) When did the Board accept handover of the rooms?

**A** End Oct 2015.

f) Who advised the Board to accept handover of the rooms?

**A** I believe that David Loudon would have advised the Board with the support of ICT.

g) What document did you see to confirm that the rooms were fully complaint?

**A** 1. H&V commissioning reports: a. AHU Supply and Extract AHU commissioning volumes. b. AHU filter integrity test c. Ventilation Commissioning. d. HEPA Filter challenge test report. e. Room – corridor differential pressure.

2. Ventilation Duct Work cleaning report

3. Room Pressure Monitoring System Commissioning Report

4. RSK room air Permeability report

221. Discuss the issue with the manual controller in isolation rooms in ward 2A

**Estates Team Bundle, document 83:**

a) Your understanding and involvement?

**A** The issue related to a loss of ventilation plant involving 5 PPVL rooms in ward 2A RHC, Initially 2 units tripped supplying rooms 18 & 19, we managed to reset one but not the other, the units could not be switched to manual mode. I mobilised support out off hours from Multiplex (Julie Miller) and also Schneider via the Boards service support contract. During Schneiders attempts to run diagnostics on the system another 4 units tripped out (totalling 5). The Schneider engineer could not resolve the issue but managed to

restore the 5 AHU to manual mode, this restored the positive pressure to all 5 PPVL suites affected. With further support next day it was established that BMS network controller had failed, and this needed to be replaced. This was placed on order and the AHU's monitored routinely by Estates every 2 hours while on hand mode.

b) Work carried out?

**A** From memory the network controller was replaced after the software issue was identified but I cannot recall the final cause of the failure.

c) Potential patient impact?

**A** The potential impact on patients was loss of pressure control in 5 rooms over a 4-6 hour window until the units were restored in hand mode. I don't recall there being any reported adverse impact on the patient who remained in the rooms. The rooms were stable for the period they were on hand mode.

**Pentamidine Rooms**

222. Discuss Pentamidine Rooms:

a) What are Pentamidine Rooms?

**A** As I understand it a Pentamidine room is a dedicated room for the safe administration of the drug Pentamidine.

b) Your understanding of the purpose of these rooms?

**A** The provide a safe environment to protect staff from exposure to the toxic drug pentamidine.

c) The guidance applicable to these rooms for water and ventilation?

**A** I am not aware of the applicable guidance for this facility, this would appear to be clinically driven, H&S\COSHH driven requirement to protect the operator, with negative pressure HEPA filtered isolator complete with pressure differential monitor\alarm.

d) Discuss any issues with the specification of these rooms during 2015 **Estates Teams Bundle, document 38.**

In particular consider any issues with:-

a) The air change rates

b) Air pressure Estates team Bundle, document 78.

c) Compliance with guidance

d) Any issue(s) arising from the testing

**A** I was not directly involved in addressing this issue, other than the info in the above documents (which is less than clear) I don't have answers to these questions.

**Ward 4B**

223. What was the intended purpose of Ward 4B?

**A** The original intended purpose of ward 4B was as a general ward with the same ventilation specification as all other wards.

224. Did this change prior to January 2015? If so, what changes were made?

**A** Yes, the board requested proposals from Multiplex to convert this ward to accommodate BMT patients from GGH under it modified clinical strategy.

225. What, if any, changes were required to the ventilation system? Why were they made?

**A** In principle, the ventilation should have been designed as a minimum full PPVL standard, preferably positive pressure isolation suite. However I believe that the proposals were limited to what could be delivered by the plant and ward environment already constructed. The main change made was to ramp up the existing ventilation plant to maximise are volumes delivered, with a view to creating an improved ACR and differential pressure, removal of the chilled beam technology and addition of terminal HEPA filters in each of the 24 rooms.

226. How involved were you with the changes?

**A** I was not involved in any changes to design prior to hand over (Jan 2015).

227. There were issues with Ward 4B though almost straight away with an SBAR being prepared on around 7th June 2015:

a) Discuss the concerns about Ward 4B. Refer Estate Team Bundle, document 30 - What was the purpose of the SBAR?

**A** The SBAR was intended to highlight the shortcomings of the new BMT ward 4B to the senior management team and propose remedial action to address the safety concerns for the affected patient group.

b) How long after migration to ward 4B were patients decanted back to the Beatson?

**A** Approximately 6 – 8 weeks

c) To what extent were issues raised in the SBAR from June 2015 present at the point of NHS GGC taking occupation in January 2015, and when Ward 4B was handed over to NHSGCC?

**A** I would consider that the issues raised existed at the point of handover Jan 2015.

228. How could these issues arise immediately between handover and patient migration when the Ward was signed off and handover accepted?

**A** My interpretation would be the ward was not fit for purpose at point of hand over, I was not party to the design specification or the sign off arrangements for this ward or premigration confirmation of the wards suitability.

229. Refer to **Estates Team Bundle, document 36:**

a) What were the early testing being carried out?

**A** I was not involved in these works, but I believe this was an attempt to provide a sealed ceiling using the existing suspended ceiling grid with tiles fitted with rubber edge seals.

b) Why were tests being carried out?

**A** In an attempt to raise the room pressure with the existing ventilation arrangements.

c) Explain your involvement?.

**A** I was not involved in this work nor the communication loop.

d) To what extent, did the test result provide assurance regarding Ward 4B's suitability for the intended patient cohort? If so, how?

**A** I don't think this attempt was successful, I believe that ICT insisted on full solid ceiling.

230. Refer to **Estates Team Bundle document 23:**

a) Was there issue(s) with the particle counts?

**A** Yes, the particle counts were high for all rooms.

b) If so, when was the issue(s) identified?

**A** If I recall correctly I reviewed the area with Christine or Teresa (I can quite remember who) and looked at the potential source of contamination, doors not closed to the rooms, ingress are from the stair well at the rear of the ward. We agreed to put in some control\housekeeping measure as well as carrying out a further deep clean.

c) What was your role?

**A** Supporting ICD, co-ordinating response for cleaning.

d) What action was taken and by whom?

**A** I briefed Facilities as to the need for further cleaning and more routine cleaning to the ward and then advised when we were ready for resampling.

e) Did the action taken resolve the issue(s)?

**A** I think so at that stage.

231. Refer to **Estates Team Bundle document 39:**

a) What were the issue(s) with the pressure gauges?

**A** Ward 4b BMT, did not have pressure gauges fitted therefore there was no monitoring of the room status or alert if the door to the room was left open resulting in the loss of positive pressure control

b) When was the issue(s) identified?

**A** I believe this was part of the issues identified for action following the decision to relocation ward 4B patient back to the Beatson (GGH).

c) What was your role?

**A** I was not directly involved in these works until close to hand over when Peter wanted support for sign off.

d) What action was taken and by who?

**A** Peter Moir managed the upgrade specification and project as Contract manager, still seen as a contract issue at that time. Multiplex carried out the works.

e) Did the action taken resolve the issue(s)?

**A** Not entirely, there were still teething problems with poor micro-biological results, I worked with Dr Teresa Inkster to review why 3 or 4 rooms at the top RHS of the ward were returning poor results. I traced the issued down to an unfiltered air supply in the medical supplies store at the back of the ward, the door for this room was left open and the air pathway was from this room down the corridor to the affected rooms was clear. The room was sealed to verify this theory. Once confirmed a new filter housing and HEPA filter were ordered and installed in this room. Control measures remained in place with the ward staff until the works were completed. In addition I was asked By Dr Teresa Inkster if we could improve on the isolation room differential pressure, as a trial David Brattey and I source and installed an adjustable door draft excluder and fitted this to an empty room and by adjusting the undercut gap on the door via this device we were able to increase the pressure by

approximately 2 pa. This was approved by Dr Inkster and this non-intrusive solution and was applied to all rooms.

f) Why was the issue(s) not identified sooner than July 2015?

**A** I can't answer that, as I was not involved before handover, or in the ward assessment after handover.

232. Refer to **Estates Team Bundle document 40:**

Provide information on the upgrade works referred to, what the works were, why they were required, when the matter was identified and by who, what was your involvement. Were matters escalated, if so, by who and who was the situation escalated to?

**A** The upgraded supply and extract AHU fans\drive motors and invertors was required to increase the system capacity to overcome the high resistance presented by 24 HEPA filter units and to increase the ACR and pressure cascade in each of the isolation rooms to something close to acceptable by the ICD\Clinical team as the SHPN requirement for 10 ACH at 10 Pa was not achievable with the existing AHU's installed capacity. The target for this upgrade was 6 ACH at 5 – 10pa, per room. This was identified as part of the upgrade review following the return of BMT to the Beatson. I was only involved if Peter Moir need my input, I was not involved in the scoping meetings with the clinical oncology team. nor the project management. I supported Dr Inkster on any technical questions she had throughout this process. I don't believe there was a need for escalation at this stage, this was looking for reassurances regarding the capacity of the upgraded AHU to meet SHPN requirements to provide full design air flow and pressure at the HEPA filter end of life.

233. Refer to **Estates Team Bundle document 62:**

a) What is this document?

**A** This is the ventilation commissioning and validation report for the overall system.

b) Have you seen it before? If so, when?

**A** Yes, I was provided with a copy of this along with the other handover documents at the site completion meeting on or around 28/10/15.

c) What was the purpose of carrying out a ventilation report in October 2015?

**A** This was to verify the Re-Commissioning and Validation of the ventilation system upgrade following the decant of ward 4b patients July 2015.

d) Did any issues arise from this report?

**A** Not that I can recall at the time.

e) How involved were you?

**A** I was not involved with the scoping meeting with the oncology clinical team, I was only involved as and when Peter Moir needed my input toward the handover and received copied of the completion documentation.

f) What matters, if any, did you escalate arising from this report? If so, to whom and why?

**A** I don't recall escalating anything at the time.

g) If yes to (f) what action was taken?

**A** N\A

234. Refer to **Estates Team Bundle document 66:**

a) Discuss the issues referred to in this email chain.

**A** Peter Moir was seeking advice on any other commissioning data I might expect to see over and above what he already had.

b) What was your involvement?

**A** I was not involved in the commissioning process.

c) What works were required?

**A** 1. Isolation room suspended ceiling replace with solid ceilings, complete with sealed access hatches for maintenance.

2. New sealed light fittings were installed.

3. Supply and extract AHU fans, motors and inverters were replaced to increase capacity.

4. Ventilation system rebalance to deliver 6 ACH at a differential pressure of 5-10 pa.

5. Supply ductwork cleaned and microbiological testing carried out.

6. Differential pressure room display, and central alarm installed and commissioned.

7. AHU filters replaced.

8. New HEPA filters fitted to all isolation rooms.

9. Room Air Permeability tests complete.

10. HEPA Filter DoP Challenge tests complete.

d) Why were works required?

**A** To address to concerns raised by the BMT clinical team in their SBAR and those of the ICD.

e) Were all necessary works carried out?

**A** I understand that the works carried out addressed the stated aims of the clinical oncology team, however I was not party to this process.

235. Refer to **Estates Team Bundle document 69:**

a) What is his document?

**A** This is the Air permeability test certificate for the single isolation rooms within ward 4B BMT dated 27\10\15.

b) Have you seen it before?

**A** Yes.

c) How did this document inform your decisions and actions taken?

**A** This was part of the validation process for the upgrade of ward 4B, it confirms that all 24 rooms have been tested and passed the Air Permiability requirements of SHPN 04 supplement, no action required as this was a successful validation.

236. Refer to **Estates Team Bundle document 71:**

In this email Peter Moir states that Ward 4B was ready for handover:

a) How confident were you that the ward was ready for handover?

**A** As I understood it, I was confident that the commissioning and validation data meet the requirements of the clinical\ICD teams on the bases that this was not a fully compliant installation and could not be with the restrictions of the ward layout and plant available.

b) To what extent did the ward meet the relevant SHFN and SHTM 03-01guidelines for the intended patient cohort?

**A** It does not meet the requirements of SHPN 04 supplement 1 guidance, I was led to believe that the proposed upgrade works were agreed with the clinical oncology team to meet their requirements within the limitations of the existing build.

c) What reservations, if any, did you have at that time?

**A** The main concern I had was that the supply AHU was a single point of failure which could result in the loss of positive pressure control to all 24 rooms simultaneously. In addition I was concerned as to how annual maintenance and verification of the ventilation system could be delivered without impacting on the patient protective environment.

d) If so, when did you escalate these concerns and to whom? If not, why not?

**A** I raised concerns over this with David Loudon but can’t recall the timeline for this, David appointed Steve Russel from the capital planning team to assess if a standby plant could be installed to mitigate this issue. He concluded that this

was not possible with the plant room space restrictions (I believe Steve produced a paper for this).

e) Was any further work carried out to Ward 4B at this time?

**A** Not that I am aware of. Note that question 190 below has no space to respond therefore this is the response Q190: The issues detailed in the NEC3 supervisors report did not prevent handover of ward 4b on 29\10\2015.

237. Refer to **Estates Team Bundle document 73** detail the remaining defects at this stage, did this prevent handover of Ward 4B?

**A** The issues detailed in the NEC3 supervisors report did not prevent handover of ward 4b on 29\10\2015.

238. Refer to **Estates Team Bundle documents 77 & 77.1:**

a) Discuss this email?

**A** Document 77 refers to requests for ward 4b, BMT data from HPS in order to offer ICT support regarding requirements to ensure ward 4b & 2b are suitable to house BMT\oncology patients.

b) Explain your involvement?

**A** Other thanks being copied into the mail chain by Dr Inkster for information I was not involved in this process, this was being addressed by the Capital project team David\Loudon\Peter Moir.

c) Explain any assurances given?

**A** I am unaware of any assurances that were given from this email exchange.

239. In her statement Dr Teresa Inkster tells us that at a meeting on 7th December 2015 in respect of the proposed patient move back to Ward 4B that *'Ian Powrie highlighted that it was still unclear what specifications the original design team worked to.'*

To what extent is this statement accurate? What concerns did you have at the time regarding Ward 4B? What concerns did you have at the time about the ward specification? If so, explain what your concerns were and why? Had any of your concerns been resolved by December 2015?

**A** This was and is an accurate statement, I have not seen the original design spec and still don't know what the brief was, Zutec does not contain design brief data and ACONEX the contract management portal and the contract monitoring protocols are equally difficult to interrogate. I was unclear what the original specification\intent was as the ward that was delivered made no sense to me. I did not see the ward specification, my concerns were that other than there being no chilled beams in the rooms (HEPA filtered air supply) the ward looked like a standard ward with standard air volumes 3ACH and no pressure control regime, nowhere near SHPN 04 compliance. I cannot comment on the specification as I have not seen it. As of Dec 2015 these concerns had been improved with increased ACH (6ACH) at 5-10pa (average 7pa), HEPA filtered supply, pressure indication and central alarm system but still not SHPN 04 compliant. I believe this was betterment within the limitations of the ward layout and plant /ductwork configuration.

240. Refer to **Estates Team Bundle, document 87** – Why was NSS involved in the issues? Actions taken in response, your involvement.

**A** I don't know why NSS (HFS) were involved, I was not party to these communications or involved with HFS regarding ward 4B.

241. Refer to **Estates Team Bundle, documents 88 and 89**

a) Describe the situation?

**A** It would appear that Peter has been asked (possibly by HFS), about ancillary rooms within the ward were the supply vents are not fitted with HEPA filter terminals.

b) Any action taken?

**A** I am not aware that Peter took any action regarding this suggestion.

c) Your involvement?

**A** I was not involved at this stage and was not party to these discussions and was unaware that this issue had been identified. I was involved at a later stage with Dr Terresa Inkster, when microbiological counts increased in a block of rooms at the rear of the ward, this is incident is detailed in my response to Question 184e above.

d) Any concerns and whether matters were escalated and if so to who?.

**A** I am unable to comment as I was unaware of this?

242. Refer to **Estates Team Bundle, document 101**

a) Describe the situation

**A** I was unaware of this feasibility request, looks like David Loudon is seeking to introduce a pressure control regime to the corridor of ward 4b, (possibly to protect against unfiltered air supplies in ancillary rooms?

b) Any action taken?

**A** I am not aware that this was progressed.

c) Your involvement?

**A** I was not involved or aware of this proposal.

243. In respect of Ward 4B describe the works carried out, why, your involvement and when. Use the below to assist and detail issues you were aware of in respect of Ward 4B, your involvement and any remedial works – works done and why?.

Refer to the following when answering:

**Estates Team Bundle, document 71**

**Estates Team Bundle, document 72**

**Estates Team Bundle, document 97**

**Estates Team Bundle, document 115** - why was there 'pre-start' meeting – what was the issue with this?

**A** From the documents below, Document 71: This is an update from Peter Moir on the completion of stage 2 work handed over 29/10/2015.
Document 72: is the hand over bundle provided by multiplex including Commissioning and Validation of the ventilation alterations to ward 4B. these works were intended to address the concerns raised by the clinical oncology team\ICT regarding the original ward design and occupation.
Document 97 seems to relate to confusion from Multiplex as to what is being requested (specification) by the Board for stage 3 upgrade work 2 ward 4B. and Document 115 seems to be Communications from Dr Christine Peters Consultant Microbiologist and Dr Jennifer Armstrong Medical director over concerns over design parameters, management issues and infection control maters regarding the safety of patients, followed by confirmation from Billy Huntter (Facilities General Manager) that the HAI SCRIBE had been signed off. Unfortunately, I cannot answer the points raised in this question, as I was not involved in the planning or implementation or delivery of this stage 3 upgrade of ward 4B. In January 2017 I was redeployed to the depute General Manager Estates role based in the corporate offices (CMB).

244. Involvement and knowledge to HAISCRIBE – what was this and what was the issue?– refer to **Estates Team Bundle, documents 117 and 118.**

**A** I was not involved and have no knowledge of the preparation for this HAI SCRIBE document.

245. Ward 4B:

a) When were Ward 4B patients decanted from Ward 4B back to the Beatson

b) Why did this happen?

c) When patients initially transferred from the Beatson to Ward 4B was the specification of Ward 4B the same spec as the Beatson?

d) If not, then why were patients transferred from the Beatson initially if the specification?

e) Explain to the best of your understand what works were carried out to Ward 4B during this time, stating why, whether this was an issue when the ward

initially started taking patients, who signed off on the works, how did it become known that the works were required.

**A** Responses provided in earlier questions.

**Decision to Close Wards 2A/B and Move to 6A and 4B**

246. Discuss the issues surrounding and leading up to the decant of patients from Ward 2A in 2018.

a) What was the lead up and background to this refer to **Estates Team Bundle, document 133?.**

**A** I was on Annual leave 12\9\2018 – 1\10\2018 and therefore was not involved in the discussions\meetings held regarding the decant, however I understand that the ongoing concerns regarding the risks from water and drainage combined with the level of disruptive works associated with these issues affecting patients and staff as well as the historic concerns over ward 2A Haemato-oncology\TCT units not being in an effectively contained environment with non-compliant ventilation for the patient group was the catalyst for the decant.

b) What was your involvement?

**A** The Decant was complete by the time I returned from A\L, I was not involved. my involvement was to lead on the management and roll out of the water treatment installation and continuous delivery, modifications to the wards plumbing to accommodate:

a). New contour 21 clinical wash hand basins (CWHb) complete with new smooth drain outlet connection complete with a smooth transition silicone boot drain connection to minimise biofilm growth opportunities.

b). Replacement IPS panels to accommodate the CWHb and new the Markwik 21 TMT.

c). Installation of new Markwik 21 TMT's complete with Bio-guard copper lined outlets.

d). Removal of WC cisterns (due to possibility of contaminated water storage within them) and replace with direct flush valves. Refit modifications to bathroom conversion to treatment room, modify existing treatment room to

isolate whb from prep area and install additional storage. Lead on the ventilation review for ward 2A Haemato-oncology\TCT units supported by Innovated design solutions.

c) What risk assessment and additional measures were put in place to ensure patient safety?

**A** I was not involved in the patient decant and therefore not full conversant with the Risk Assessment\additional measure employed.

d) What concerns, if any, did you have about where the patient cohort was being moved to?, If so, why did you have these concerns? IMT Bundle, document 39 you flagged concerns, were these ever followed up? Did you escalate these concerns? With the benefit of hindsight, what steps could have been taken to progress this matter further?

**A** The **IMT bundle, document 39, dated 17\9\2018,** I was on A\L and did not attend this meeting, therefore I could not have flagged any concerns as suggested above. Mary Anne Kane , emphasised “that the facilities that children would be moved to on the adult QEUH site were no better from a ventilation perspective” following discussion the IMT still recommended decant as there are ongoing issues that need addressed that cannot be addressed while the ward is occupied.

e) Discuss and detail the works done to Ward 2A/B what was required to be done and why, what has been done and when the work was completed. Please include details of your involvement. Reference IMT Bundle to assist.

**A** My involvement in ward 2A\B was to lead on the management, procurement and roll out of the water treatment installation and introduction of continuous chlorine dioxide treatment as a standalone installation for ward 2A\B, Required to bring the water system within this ward back to accepted quality, went live Nov 2018, to allow ward to be reoccupied Jan 2019. This was an interim measure until the full site wide treatment strategy could be implemented and proven across the site while providing a stable water system to ward 2A\B. I also managed the procurement and implementation of works within wards 2A\B, all of which I submitted option papers to the WTG, for

discussion and approval in order to improve the environmental conditions for this patient group. These works included following elements:

a). New contour 21 clinical wash hand basins (CWHb) with newly designed smooth drain outlet connection complete with a smooth transition silicone boot drain connection to minimise biofilm growth opportunities.

b). Replacement IPS panel template to accommodate the CWHB and new the Markwik 21 TMT profiles.

c). Installation of new Markwik 21 TMT's complete with Bio-guard copper lined outlets, in order to meet SHTM 04-01 and HPS Pseudomonas guidance by removal of flow straighteners.

d). Removal of WC cisterns, due to possibility of contaminated water storage within them and the risk from the resulting flush plume and replace with direct flush valves.

e) Remove Argo bath and convert bathroom to a treatment room, removed internal flexible pipe risk and creates new treatment space. Review ward 2A Haemato-oncology\TCT and ward 2b ventilation system design to establish if the system can be amended to improve room ACR, supported by Innovated design solutions. All of these elements were completed and ready for hand over with clear water test results by the target date Dec 2018. However the ventilation reports indicated that although the ventilation could be amended it was not suitable for this patient group. Further works were carried out to develop a new ventilation strategy for these areas.

f) Any other relevant information, for example mould behind the IPS panels in Ward 2A.

**A** There may have been slight mould issues behand IPS panels, this would usually be the result of a small unidentified water leak (remember IPS panels were sealed) however I do not recall there being any substantial mould issues. There were on going technical\logistical challenges in completing these works by the Dec 2018 deadline scale, but I do not recall any other relevant details.

247. Discuss the issues surrounding the ward 2A patients when in occupation of ward 6A. In particular, views you may have in respect of:

a) Chilled beams

b) Gram Negative Bacteraemia

c) Water filters

d) Ventilation, including HEPA filters

e) issues/ testing/ escalation/ response/ IMTs/SBARs impact on patients

f) Patient communication

g) Internal escalation - HAIIT scoring

h) External escalation

**A** From Memory I was not involved in the operational management issues at this time with respect ward 6A, these would have been the remit of Andy Wilson (Sector Estates Manager Supported by Darryl Conner (Senior Estates Manager).

**Reports Prepared by Innovated Design Solutions October 2018**

248. Refer to **Bundle 6 – Miscellaneous Documents – Documents 33 and 34.** These documents are feasibility studies regarding increasing ventilation air change rates within Wards 2A and 2B by Innovated Design Solutions.

a) Who commissioned these reports?

**A** I commissioned these reports.

b) What was the background to these reports being commissioned?

**A** As part of ward 2A\B decant and status review, Tom Steele asked me to ascertain if the ACR in patient rooms could be increase utilising the existing ventilation system, I advised that it was my opinion that it was not but would need a ventilation design review to confirm this, Tom Authorised me to proceed with obtaining these reports.

c) Why were these reports commissioned? What issues prompted the instruction of these reports?

**A** To establish if the existing systems could be uprated to provided improved ACR (6 ACH).

d) What concerns, if any, did you have regarding the ventilation system in Ward 2A?

**A** My concerns were relating to the placement of Haemato-oncology\TCT patients into an environment that was clearly not designed to meet their needs for a protective environment.

e) When did these concerns arise? Was anyone else in estates concerned? Why?

**A** These concerns arose early in June 2015 after handover of the RHC, with regards to the works Dr John Hood & Professor Willams and I were carrying out in ward 2A BMT. Although Haemato-oncology\TCT do not need full Isolation facilities protection, their environment should still be controlled with positive pressure ward access air locks and suitable ventilation within their ward itself, this was clearly not the case for ward 2a with concerns later raised by Dr Brenda Gibson.

f) What was the impact on patients?

**A** Potential exposure to environmental organisms via the ward air supply, which was not HEPA filtered.

g) What concerns were raised with anyone?

**A** Yes I raised this with the project team and was advised that the ward was designed to meet the requirements asked for by the Yorkhill Haemato-Oncology team, although I can’t remember who advised me of this.

h) What concerns, if any, did you have regarding the ventilation system in Ward 2B?

**A** To a lesser extent as the patients using 2b were outpatient who were already coping with the general environment and therefore less dependent on a protective environment.

i) When did these concerns arise? Was anyone else in estates concerned? Why?

**A** These concerns were voiced by clinical staff\ICT team soon after migration, I don't recall anyone else from the estates\Project team indicating such concerns.

j) What was the impact on patients?

**A** As far as I was aware there were no adverse impacts to patients in ward 2B regarding ventilation.

k) What concerns were raised with anyone?

**A** No

l) What happened in response to these reports? For example, the SBAR you prepared?.

**A** I was authorised by Tom Steele (DoF) to commission Innovated Design Solutions to prepare a scoping document for procurement of a suitably experience design consultant to design, specify & tender a package of works for the installation and commissioning & Validation of a compliant ventilation system for these wards, with the support of Matthew Lambert of Innovated Design solutions as technical advisor.

m) What matters were escalated arising from these reports? If so, to whom, and if not, why not?

**A** These reports were escalated to the Tom Steele (DoF) highlighting the risks with the current design not being compliant with SHTM 03-01 (part A) for this patient group.

n) What works, if any, were carried out in response to any findings in these reports?

**A** I retired on 2\7\2019, the ventilation works package for ward 2A\B was passed on the Boards Capital project team to take forward, I don't know the outcome of these works after that date.

**<u>Cryptococcus</u>**

249. Refer to the **Cryptococcus Bundle and SBAR bundle to assist.**
Recall your understanding of the Cryptococcus infections in 2018:

a) What is Cryptococcus?

**A** Cryptococcus is a fungal infection caused by inhalation of Cryptococcus spores generally found in soil & pigeon droppings.

b) Had you seen/ heard of Cryptococcus in a healthcare setting prior to QEUH.

**A** I was aware that there was an infection risk from pigeon droppings or build-up of pigeon dropping (Guano).

c) What were the issues with Cryptococcus at QEUH? When did you first become aware of these issues? What happened in response to these issues? Who, if anyone, did you report these issues to?

**A** I was not involved in the operational management of the QEUH at the time the issue arose, Darryl Conner (Senior Estates Manager) had been tasked by Colin Purdon investigate pigeon ingress to plant room in support of the ICT.

d) Describe your visit to the plant rooms with Dr Christine Peters and Darryl Conner, when did you go, why did you go at that time, what did you see? Did cleaning take place before the visit – if so why – what was evidence prior to the cleaning?

**A** I visited the plant room with Dr Christine Peters and Darryl Conner at Christine's request to see the extent of the pigeon ingress and guano debris, However I was only shown a few locations where droppings were on the floor and under an AHU, this was not substantial. I believe that there were area's at high level with more substantial Guano evident on top of ducting etc but this was not accessible at the time. I cannot recall the date of this visit but it was before the IMT meetings commenced. The area was not cleaned before the visit.

e) Do you recall photos – what did they show?

**A** I was not shown any photographs of the findings.

f) Dr Christine Peters tells us that there was water cascading down the walls and that you said that this was 'not uncommon' – tell us what this means and what the consequences were? Why was water cascading down the walls?

**A** I don’t recall seeing water cascading down the walls, this would not be common on the inside of the plant room.

g) Discuss your involvement at the Cryptococcus Sub-Group Meetings - actions taken, internal escalation: HPS involvement.

**A** My involvement was in a supportive role, Teresa Inkster asked me to support John Hood carry out his investigation from a technical perspective, in addition at the IMT I had highlighted my theory that the Helipad was a focal point for pigeons roosting (regardless of the effort made to displace them), therefore a buildup of guano  is usually present, could the down draft from an emergency helicopter case dispersal in to the air intakes of the ventilation systems? I was requested to seek an expert investigation of this option.

h) What, if any, external reporting occurred?

**A** I appointed Quesada Solutions Ltd (recommended by Glasgow Caledonian University) to carry out a computational fluid dynamics simulation of the external air flow around the QEUH under various condition and the potential impact on the ventilations system.

i) PAGs/ IMTs/ AICC and BICC involvement.

**A** From Memory I was a only a member of the IMT.

j) What steps were taken in response/ precautions put in place?

**A** I was not involved in the response \precaution works, I was only involved in supporting the investigation.

k) Did you read John Hood’s report?

**A** I retired on 2\7\2019 before John Hood’s report was concluded, so I have not read John’s report.

l) When did you read John Hood’s report?

**A** N\A

m) What observations, if any, did you make after reading John Hood's report? What actions were taken following the John Hood report?

**A** N\A

n) What else could have been done? How could matters have been handled differently? What concerns, if any, did you have about how matters were dealt with?

**A** I was not involved in the response\actions taken so cannot address this question.

**Staffing and Working Environment**

250. What were the staffing levels like in estates at the point of handover? Where did the staff come from – were they mainly transferred from old site?

**A** At the point of hand over I had 5 duty managers assigned to QEUH for the operational commissioning programme prior to migration, as well as site familiarisation and attending the multiplex training programme sessions. These 5 Duty managers had been recruited to these posts from applicants from demitting sites (mainly supervisory staff).

251. Concerns if any about staffing following handover – to what extent did the staffing levels manage the workload? Refer to **Bundle 8, document 40.**

**A** Staffing level was inadequate for size and complexity of the campus, when I raised this concern, I was advised that the CEO\SMT expected that Multiplex would be providing maintenance during warranty period (this was not the case) and that the maintenance requirements would be less for a new build in comparison with the demitting hospital stock. I advised that this was not the case and indeed the new hospitals were highly serviced complex buildings requiring a higher level of maintenance and support. This did not make any difference to the Boards position regarding the Estates Budget and therefore staffing levels. The estates management team all provided day to day support and management of the items identified in the workload schedule contained in the above document as delegated. However, this combined with the volume and duration of defect issues meant that the team were constantly firefighting

with little time (if any) to focus on routine maintenance and PPM. I believe that Andy Wilson (Sector Estates Manager) carried out his own staffing review and came to a similar conclusion that he required circa 108 WTE staff in order to provide effective estates services for the campus.

252. Was appropriate training in place for new and existing staff on using new systems and working within the QEUH? How did you ensure that new and current staff were appropriately trained? Refer to **Estates Team Bundle, document 5** - what was this and what was the training like? How did this assist you and staff with working at QEUH – was it equipment focus, asset focused please describe.

**A** There were no existing staff for the QEUH, this was treated as a new independent campus where all staff were new transferring from demitting sites. Multiplex provided a schedule of training as per contract requirements post hand over, this covered a) Site Familiarisation. b) Manufacturers Training on specialist plant\systems. c) Systems familiarisation training (i.e. building services configuration, locations, key components etc). I had limited control over the delivery of training via the post-handover training programme, during this period the intended staff for the QEUH were still employed at their demitting sites, I communicated with my counterpart Sector estates managers regarding their release for training however due to the intensity and duration of the programme very few members of Estates staff could be released for this training programme, therefore it was run on a training the trainer basis. I attempted to schedule training following migration via multiplex and the project team however there was little flexibility in this. I also sought support via the Facilities senior management (GM's) to assist in release of staff for training but they were of the same opinion that the demitting sites staff were required to support on-going operational support. Document 5 referenced above is A record of attendees for the for the "Detailed Training" package delivered on the 3rd February 2015 by Mercury on behalf of Multiplex for the Chilled water system. As well as the training agenda. Although this is recorded as a "Detailed Training" it was a high level system over view and familiarisation, as well as manufacturer induction on the operation and control of the chiller plant (again high level). It was helpful in understanding the

scope, scale and lay out of the system however the plant operation and fault diagnosis side of the training was limited in its benefit.

253. Who was responsible for providing staffing? Who was responsible for ensuring staffing was maintained at sufficient levels?

**A** Under the Maintenance strategy report I prepared for David Loudon I identified the need for circa 108 WTE staff to support the whole campus Including the retained estate. However due to the Maintenance budget being limited to the QEUH outline business plan, less than approximately 50% of the identified requirement. I had to rework the maintenance strategy to what was called the affordability model, with a subsequent reduction on staff to about 68 WTE. It was my responsibility to maintain staffing to this level. However this was wholly inadequate. Estates Staffing levels were protected from the Boards Cash Releasing Efficiency Scheme (CRES) for the first year but in the 2016/17 financial year Estates had to contribute to CRES by releasing vacant posts, I cannot recall the figures for this CRES contribution.

254. What concerns did you have regarding staffing levels?

The operational Estates staffing levels were totally inadequate for a campus of this size, The staff levels we had barely covered the volume of defect\fault reporting across the site, it was therefore a struggle for the Estates management team to meet the planned maintenance requirements.

255. What was the working environment like when QEUH opened – work life balance/ workplace culture? What issues, if any, did you have? If so, what concerns did you raise? Who did you raise these concerns with?

**A** The working environment was high pressure constant issues requiring support and management of the critical situations arising on a daily basis, both myself and my team were being pulled in all directions to keep services going. Work\life balance was practically non-existent, I myself works 12-14hrs days 7 days a week during operational commissioning and migration, the duty managers were working 10 hour days. After migration I was still working 10 – 12 hour days but managed to drop off the weekends, David Brattey was also putting in 10 hour days after migration, with the support of the rotary shift duty

managers. I was concerned that due to the level contractual defects, system failings like the PTS\AGV, Energy centre problems, PSSR\PED failures and PPC permit management, integration of retained estate HV electrical network with the energy centre, and preparing contract proposals for the adoption of the T&L centre\office block for the provision of facilities services against external service bids, etc, that I was unable to perform the duties of Sector Estates Manager to oversee, manage and ensure that all management processes and procedures were implemented and monitored, I raised these concerns several times (informally) with my line Manager Billy Hunter (Facilities General Manager), his response was let's get the site settled down then we can get thing back to normal and take control.

256. Who was on site to manage and assist with carrying out works relating to equipment? How did this assist your workload in estates? To what extent, if any, was there a reliance on commercial third parties such as Multiplex when it came to staffing levels?

**A** The estates management team covering the new Adult and RHC hospital, consisted of David Brattey (Senior Estates Manager responsible for these buildings), William Madden (Estates Manager, reporting to David Brattey) Plus off planning supervisor (Mark McKaig) & 5 Rotary shift duty managers providing 24\7 emergency cover and maintenance support (1 per shift), this was supported by 16 off day shift Maintenance technicians and 8 off Maintenance assistants as well as 20 rotary shift technicians providing 24/7 emergency cover and maintenance support (4 per shift), In parallel to this there is an estates team responsible for looking after the retained Estates 1 off Senior Estates manager, 2 off Estates manager, 2 off Planning supervisors, supported by 20 day shift technicians and 5 Maintenance assistants, staff from the retained estates team can also be drafted in to support works in the A&C buildings as required. There is a copy of the organogram representing this structure in the maintenance strategy document. As part of the Estates Maintenance Strategy paper, I had developed a matrix of service support contract requirements for 3rd party specialist, most on a Support service contract complete with emergency call out response. In addition due to the size and scale of some of the services

and the complexity the following contracts included a normal working hours on site presence: Schneider Controls (BMS) – 1-2 WTE's, Swisslog AGV total support 1 WTE & PTS service + 2nd line emergency response. – 2 WTE. Scotsheild Fire Alarm – 1 WTE + emergency response. These support service and emergency response contracts absorbed half the estates maintenance budget. Multiplex only offered support to address system issues that were deemed to be contract defects, the Estates team had to provide 1st line response to check all issues to establish if they were defects or not, Multiplex would generally reject issues that they did not consider as defects.

257. Generally – discuss the workplace environment and culture – What concerns, if any, did you have?

**A** The work place culture at this time was tense, the operational Estates and facilities team worked well together to address the issues as they arose however these were overwhelming at all levels. The relationships between Estates and Facilities and the project team were less supportive, with the project team aim to bring the contract over the wire at all costs, seemingly siding with the contractor over concerns raised by Estates\Facilities and ICT. Multiplex response to most questions over contract was the Board agreed to this and it was difficult to question or challenge design decisions.

258. Describe the handover process – did it run smoothly or not? What concerns, if any, did you have in the run up to handover? What matters did you feel went to plan and what, if any, matters, had not gone to plan?

**A** The hand over did not run smoothly from my point of view, the site handover was accepted on Monday 26th January 2016, from memory Multiplex gave their staff a week of to recognise the effort in getting to handover, the following Monday 200+ Multiplex contractors arrived on site to continue fitting out in the RHC and various other works listed in the NEC 3 defects schedule, this level of activity was maintained at a steady level for the best part of the Operational Commissioning of the site up until Migration. During this time of the 5 Duty Estates managers I had available to me 2 of them were tied up dealing with the review of Risk Assessments and Method Statements (RAMS) from Multiplex and its contractors as well as managing the contractor access

control arrangements. There were also ongoing system failures to be dealt with and responded to, such as the repeated failure of push fit connections on the LTHW fitting for above ceiling heater batteries, causing wide spread water damage across the site, these push fit units could not cope with the system pressure and Multiplex had to arrange for the replacement of all off these connections with mechanical connections (1000's of connectors across all areas of the site. On the run up to hand over my focus was on the operational commissioning, I was under the impression that the building was ready and that there were only a few outstanding snags but nothing of consequence. The operational commissioning programme went well and was completed on time for migration, the migration plan was well executed, obviously a lot of logistical and inter agency planning had gone into this.

259. GGC took handover from Multiplex earlier than initially contracted for – what did you think about this? Why did it happen? What was the rationale for the early handover?

**A** I thought that instead of early hand over the time could have been used to complete the contract works rather than accept Practical Completion and handover of an incomplete contract the time could have. My understanding of why this happen was that it was the Boards intention to start the Operational commissioning works early in order to meet the target migration plan dates. The rationale being that failure to meet these dates would have a knock-on effect in the logistic for migration that had already developed. However my understanding is 3rd hand remove from these decisions.

260. Were the concerns raised by infection control colleagues regarding the general build of QEUH/RHC taken seriously? What action did you take in response to these concerns, not already mentioned in your answers? Refer to Estates Team bundle document 100 and 116 in considering your answer.

**A** I believe that the decisions\actions arising from this meeting were under the purview of the senior management team, with appropriate action being directed from the SMT, as evidenced in the e-mail between David Loudon and David Wilson in Document 100 above, I was not party to these decisions or

instructions at this time. My role at the above meeting was to provide technical support to David Loudon where required.

261. On 4th October 2017 you attended a meeting in respect of the SBAR prepared by Dr Peters:

a) Discuss what the nature of this meeting was?

**A** This meeting was convened by Dr Jennifer Armstrong (Medical Director) to address infection control concerns raised in correspondence from both Dr Penelope Redding (Consultant Microbiologist) and Dr Christine Peters (Consultant Microbiologist), and the subsequent SBAR prepared to inform this meeting.

b) What concerns were raised at this meeting and by whom?

**A** Concerns were raised about:

a) Patient placement - source Isolation (Mers\MDRTB) and Protective Isolation (PICU HEPA filter requirement), raised by Dr Redding.

b) Single room accommodation, 3 ACH not meeting guidance requirements & chilled beam dust entrainment raised by Dr Redding.

c) Cleaning: No cleaning agent used on ward floors and Dishwasher cleaning responsibility, Raised by Dr Redding.

d) Water quality & testing, Cleaning and maintenance policy not reported, delay in response to [redacted] request for Serratia sampling, Raised by Dr Peters

e) Plumbing within the INS building Blocked drains\sewage leaks into theatre, raised by Dr Redding.

f) Decontamination provision for Respiratory clinics, identified as inadequate, Raised by Dr Peters.

g) Infection Control Team Structure, roles within ICT are unclear. Raised by Dr Redding.

c) Describe your understanding of the issues raised by Dr Peters and colleagues in respect of estates? For example, the lack of cleaning and maintenance policy in respect of thermal taps/ production of the water testing result.

**A** The issue regarding the TMT cleaning and maintenance policy reporting, until now the expectation that the cleaning and maintenance policy should be notified had not been brought to my attention by ICT. This should have been available to ICT on request from the Water Written Scheme via the Authorised Person (water), In addition the TMT sensitisation works shop and thermal sanitisation system were still being installed and not yet operational. With regards to water sampling this had never been a problem before, Estates always respond quickly to a request from ICD for water samples, as I indicated at the meeting [redacted] request could have been a communication issue relating to changes in personnel in both departments. With regards to the water testing quality in ward 4b, it was my understanding that ward 4b had been downgraded and being used as a winter pressure ward at this time, therefore no need for routine water sampling.

d) Why were the issues raised by Dr Peters not addressed at the time?

**A** I believe that I sought confirmation of the status of the thermal sanitisation workshop and test rigs with Paul McAlister (Senior Estates Manager) who picked this task up from David Bratty (on his retirement), this was required in order to initiate a thermal sanitisation service exchange model detailed in the pseudomonas risk assessment that was produced by Sandra McNamee (Associate Nurse Director), John Green (Facilities H&S Advisor) and I following the decision by David Loudon not to replace the Horne TMT's as recommended in the HPS Pseudomonas SBAR. At the time it seemed that we were restricted to this method of thermal sanitisation protocol as the TMT's could not be safely thermally sanitised on the systems and local chemical sanitisation local was impractical and contrary to manufacturers advice.

e) What was your understanding of the action plan made following this meeting?

**A** I cannot recall a full action plan being issued, however from that actions listed on the minute I was required to provide documentation supporting the works carried on PPVL room.

f) What work and action was taken by you in response to the action plan? When was this work carried out?

**A** I provided the PPVL room data, and I escalated the water sampling requests to the Sector Estates Manager.

g) Was this communicated to clinical colleagues?

**A** I believe I issued this to the ICD.

h) Do you feel that these concerns raised by infection control colleagues were taken seriously?

**A** In hindsight I do not think that there was a collaborative approach to addressing these concerns.

262. Is there anything further that you want to add that you feel could be of assistance to the Inquiry?

**A** I can't think of anything else that has not already been covered in this questionnaire at this time.

**Declaration**

263. 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.

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

**Appendix A**

A43955371 – Bundle 8 – Supplementary Documents

A48185184 – Bundle 6 - Miscellaneous Documents

A48184865 – Bundle 9 - QEUH Cryptococcus Sub-Group Minutes

A48184800 – Bundle 4 – NHS Greater Glasgow and Clyde – SBAR

A48184790 – Bundle 1 – Incident Management Team Meeting Minutes

A47944648 – Bundle 12 – Estates Communications

A32993814 – Email C&B to K Connolly – Ward Ventilation