

BAM Building Ltd

New Children's Hospital –
Main Contract Phase A



Submission 001 Rev 03

Construction Management Plan – **PHASE A**

Live Working Document Amended As Works Progress



BAM Building Ltd

July 2017

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Appendix H – Traffic Management Plans *(included)*

Appendix I – Central Access Road Layout *(included)*

Appendix J – Phase A 8 Month Programme *(included)*

Appendix K – Surveying & Movement Monitoring Plan *(included)*

1.0 EXECUTIVE SUMMARY

BAM Building Limited have been appointed Main Contractor for the construction of the National Paediatric Hospital Project at St James's Hospital Campus, Dublin 8.

BAM have prepared this Construction Management Plan (CMP) and the construction methodologies set out within to demonstrate how works on the Hospital Campus and surrounding environment will be delivered for the Main Contract Phase A in a logical, sensible and safe sequence with the incorporation of specific measures to mitigate the potential impact(s) on people, property and the environment.

Chief among the challenges of the project is the introduction of construction activities, significant in scale and volume, on the operational adult acute hospital campus, adjoining sensitive Residential Properties, Luas Redline Tramline, Linear Park, South Circular Road and other public roads and areas.

A construction project of this scale, while planned to be as least disruptive as possible, can introduce a degree of concern and inconvenience for impacted surrounding/adjoining residents members of the public that use St. James's Hospital and hospital staff. BAM is committed to the success of the project and will establish the communications and resident/public engagement processes that will assist in bringing the main contract to fruition successfully in a harmonious manner. Stakeholder involvement from an early stage with a priority given to addressing issues raised will be an abiding principle throughout the course of this project. BAM are committed to limiting the effect of interruption caused by the works relating to traffic access/egress coupled with control measures to mitigate against and reduce levels of dust, noise and vibration.

This document sets out the strategies and control measures BAM commit to implement to service the works with respect to personnel, materials, accommodation and welfare facilities, removal of waste, movement of materials and personnel, security considerations and programme & logistics challenges for the scheme, whilst being mindful of the operational constraints within and around the site environs.

2.0 INTRODUCTION

The proposed National Paediatric Hospital development at St. James's Hospital Campus consists of 3 main buildings, namely:

- A 473 bed new children's hospital;
- A Children's Research and Innovation Centre;
- A 53 Bed Family Accommodation Unit.

2.1 PROJECT SETTING

Location - The project is to be located within the existing St. James's Hospital campus site boundaries;

Adjoining Owners – The site is in a busy city centre location and contains a number of adjoining residential and sensitive properties. The proximity of adjacent property owners presents a physical constraint which will require careful attention and management by BAM at all times;

Site Specific Constraints – The existing site has specific constraints relating to traffic management, existing services, ground conditions, construction methods to be used, materials, etc. Two key services constraints specifically highlighted are the location of the existing Drimnagh Sewer and the existing utility services tunnel;

St. James Hospital – The existing St James's Hospital will remain "live" and fully operational during the construction period. Maintaining safe pedestrian, vehicular and blue-light access to the campus is an absolute priority.

The total site area on the St. James Hospital campus is 19.48 hectares, of which an area of 4.85 hectares is proposed for the siting of the NCH.

2.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The overall scope of the proposed development on the St James's campus comprises:

- The demolition of all buildings on the site of the new children's hospital and the proposed Children's Research and Innovation Centre (CRIC);
- A new children's hospital building;
- A two-storey underground car park and shared facilities management hub below the new children's Hospital;
- A Children's Research and Innovation Centre at James's Street;
- A 53 no. bed Family Accommodation Unit (FAU) at the entrance to the new children's hospital;
- Public realm improvements to the existing St James's campus spine road, the linear park at the Rialto Luas station and the public steps between Mount Brown and Cameron Square;
- Improvements to the road junction at the existing campus entrance on James's Street and a new campus entrance piazza from Brookfield Road / South Circular Road;
- A new energy centre for the new children's hospital and a new shared flue stack for the campus;
- A range of infrastructure works, including the diversion of the existing Drimnagh Sewer and revised boundary treatments.

2.3 NEW CHILDREN'S HOSPITAL AT ST. JAMES'S HOSPITAL

The new children's hospital will be a world-class facility providing secondary paediatric services for the greater Dublin area and specialist services for the country as a whole. It will be an academic health sciences hospital that values world-class research, education and innovation, which in turn will drive excellence in clinical care.

The hospital will:

- Provide 380 in-patient beds including 60 critical care beds, all in single en-suite rooms;
- Provide 93 day care beds, 18 theatres, including three hybrid theatres to facilitate access to imaging during surgery;
- Provide outpatient consulting examination rooms ;
- Provide an Emergency Department and urgent care facilities;
- Make safe existing services/utilities and demolition of existing St. James's Hospital buildings/facilities;
- Provide significant utilities and services diversions including Drimnagh Sewer & Services tunnel;
- Provide 1000 car parking spaces;
- Provide an Energy Centre within the basement.

The proposed development consists of a 7 storey structure over 2/3 below ground levels within a gross internal floor area of 118,113m² with an additional 32,000m² provided for underground parking, bringing the total floor area of the building to 150,113m². The building is primarily organised vertically in four clear zones.

1. Facilities management spaces and horizontal distribution together with plant rooms and two levels of car parking (Levels B1 & B2);
2. Outpatients and Diagnostic and Treatment areas (4 floors-Levels LG, 00, L01 & L02);
3. Interstitial floor, accommodating plant rooms and administration/non-clinical spaces (Level L03);
4. Wards (3 floors-Levels L04, L05 & L06.)

2.4 NCH CONTRACT PHASING

2.4.1 Enabling Works Contract

BAM Civil Limited are already on site having commenced works on the Enabling Works Contract in July 2016. The Enabling Works Contract comprises of all works to clear the site, including service diversions and demolition of buildings, with works due to be completed in August 2017.

The BAM Enabling Works team will work in harmony with BAM colleagues joining the New Children's Hospital project, providing for the assignment of the Enabling Works to the Main Contract. This arrangement provides for a seamless transfer of existing Client and stakeholder team relationships at a critical point in this project phase.

2.4.2 Main Contract

The Main Contract is subdivided into Phases A and B

2.4.2.1 Phase A

This CMP covers the works to be constructed under Phase A of the Main Contract, with works to include piling, excavation, diversion of services and commencement of construction of the structure up to lower ground floor level.

Phase A has an anticipated start date of July 3rd 2017, and will continue for 15 months.

The Pre Phase B Construction Engagement Process will run concurrently with the first 9 months of Phase A to establish the Adjusted Contract Sum and a Guaranteed Maximum Price for the Project.

The extent of Phase A works for the first 8 months is set out in the Phase A Programme attached in Appendix J.

2.4.2.2 Phase B

Phase B works will include all other works required to complete a fully commissioned children's hospital.

Total duration of Phase A & Phase B is 50 months.

3.0 CONSTRUCTION MANAGEMENT

3.1 INTRODUCTION

The following sections set out and describe BAM's sequencing of the project together with discussion on site management issues and logistics requirements.

3.2 SEQUENCING OF PROJECT

The NCH Main Contract will be carried out sequentially in line with the overall programme, with Start and Completion dates in accordance with Clause G of the Schedule Part 1 of the Conditions of Contract and the Schedule to the Conditions of Contract. The programme will be updated on a monthly basis for inclusion within the monthly Progress Report.

The Integrated Programme provides the following deliverables:

1. Master and Milestone Programme (Level 1)
2. Summary Level (Level 2)
3. Detailed Project Programme (Level 3)
4. Critical Path(s) Filter Layout
5. Manpower Plan (programme needs to be man-hour loaded to achieve this)
6. Bulk Quantity S-Curves (for the physical progress measure)

BAM will develop a Level 3 Construction Programme as well as a Mobilisation Plan, a first 120 Day Schedule which is the Contractor's Work Plan for the first 120 days of the project. It will cover all aspects of the project including off site, on site, town-planning, detailed engineering and design, procurement, submittals, staffing plans, resource plans, equipment plans etc.

The Programme will be included as part of the Project Execution Plan which will be developed in September 2017.

The construction programme for the Phase A Early Works project is set out in Appendix J which covers construction activities for the first 8 months of the Main Contract works.

3.3 SITE MANAGEMENT

BAM are responsible for overall site management for the duration of the proposed works. Anticipated numbers of construction personnel on site for the Main Contract Phase A will remain below 150 until early 2018, at which time the workforce is expected to start to grow significantly. At peak in 2019, there will be between 1,000 and 1,200 construction personnel on site. With this in mind, BAM have prepared a mobility management plan and arranged compound accommodation and facilities to cater for these peak numbers.

CONSTRUCTION TEAM PHASE A:

Contract Director – Denis McCarthy

Contracts Managers – Darren Devane / Aidan O'Connell

Commercial Manager – Pat Murphy

Project Manager – Jim Dillon

Site Agents – Shane Gray / Philip Doherty

Site Foreman – Pat Fennelly

Quantity Surveyor – Keith Davey / Brendan Phelan

Section Engineer – Cathal Sweeney / Ross Burns / Barry O’Gara

Construction Manager – TBC

M&E Manager – David Barron

EDMS Manager – Michael Murphy

Safety Health & Environmental Advisor – Heidi Murphy / Yvonne Brophy

MEP Coordinator – William Connolly

Programme Manager – Bryan Bellew / Paul O’Connor / Barry Kiely

Communications Liaison Coordinator – Garry Keegan

Temporary Works Coordinator – Jim Dillon

Mobility Manager – Yvonne Brophy

Specialist Subcontractors – the specialist subcontractors shall include but may not be limited to the following:

Activity	Name
Noise & Vibration Monitoring Consultant	Sandy Brown
Airborne dust monitoring	Environmental Efficiency
Asbestos Removal	Grove Environmental Limited
Archaeology	ASCU Limited
Condition Surveys	ABL Surveyors
Structural Monitoring of buildings	Murphy Surveys
Demolition	Hegarty Demolition Limited
Traffic Management	Total Highway Maintenance Limited
Utility Diversions	BAM Civil Limited
Mechanical Diversions	Jones Engineering (appointed subcontractors)
Electrical Diversions	Mercury Engineering (appointed subcontractors)
Hoarding	Clifton Scannell Emerson
Temporary Works	Byrne Looby / Clifton Scannell Emerson
Piling	TBA
Materials Testing	BHP Limited
Domestic Waste Removal	AES
Bulk Excavation	McGuire Haulage
Dewatering	TBA
Classifying excavated material	TBA

The exact scope of the work of each of the above will be developed in detail within a specific Method Statement, which will include resources, programme, materials, plant/equipment, environmental management and safety criteria.

3.3.1 Health & Safety

BAM have a proven track of delivering projects in the Healthcare Sector with professionalism and to the highest of safety standards. We not only consider the safety of those working on our site, but the safety of all individuals that are, or could potentially be, effected by the works involved in the completion of the NCH. BAM along with the NPHDB are committed to supporting safe and healthy working conditions, equipment and systems of work for delivering the NPH project without risk. BAM have a primary responsibility to all people within the campus and all work will be planned in advance working in co-operation with the NPHDB. It is an important project goal that everyone on the associated sites goes home safely every day.

As the site is located on one of the busiest hospital campus in Dublin, the safe and uninterrupted work flow will not be compromised by construction works and BAM will have a Live dedicated access road throughout the project and will be adhering to the "Safeway, it's the only way" and "Contractor Safety Code" manuals .

Its basis is founded on communication and ensuring that all personnel know what to do, and not being afraid to stop, think and ask for help or direction.

BAM will also respect the Dublin 8 and SJH communities by giving consideration to works impact, prioritising courtesy, minimising the impact of deliveries and protecting and enhancing their environment.

To achieve such a culture and overcome the various challenges on the project, a number of key enablers have been identified that provide focus for all involved in the NPH project. These are referred to as to as "Five Safety Enablers":

1. **LEADERSHIP** – Visible and Proactive;
2. **EXPECTATION** – Setting the Standard;
3. **KNOWLEDGE** – Educate and Train;
4. **COMMUNICATION** – Consistent Message of 'Care and Concern'; and
5. **INCENTIVE** – Acknowledge and Reward.

The "Five Safety Enablers" are incorporated into BAM's Beyond Zero Programme and the Project Safety Management system (PSMS) enhancing NPHDB Health, Safety and Wellbeing vision. "Best person for the job", "Top Down" and "Win-Win" approaches will also be demonstrated and reinforced at every level of management through to the workforce so that there is no doubt about the behaviour that is expected on the project. Each member of the BAM site management team has a role to play in the PSMS and everyone is given the information, instruction and training in their role – e.g. Temporary works coordinator, Lifting Operations Co-ordination, Sub-contractor owners etc. Before commencing on the NCH all operatives will have completed the BAM Online induction. This ensures that all persons have received a consistent message of the Safety requirement. The site specific induction will also be an introduction to the BAM Management team and will highlight the specific hazards and rules. This induction is currently being held in the BAM Site Office on Monday, Wednesdays and Fridays @ 8am but will be reviewed as the project progresses.

Project Safety Goals & Objectives

The following safety goals & objectives apply to the NPH project, these are:

- ❖ Supporting the NPHDB to secure their Health, Safety and Wellbeing Vision;

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- ❖ Securing and maintaining a safe and healthy workplace for all;
 - ❖ Securing everyone's safety and health by attaining to the highest level of health and safety performance, care of public safety, management of risks, positive embedded attitudes etc.;
 - ❖ Aspergillus Control measures in place at all times.
 - ❖ Operate a good neighbour programme: Respecting the Dublin 8 and SJH communities by giving consideration to works impact, prioritising courtesy, minimising the impact of deliveries
 - ❖ Protecting and enhancing the environment – Zero Environmental Incidents
 - ❖ Injury free workplace.
 - ❖ Promote a positive safety culture and encourage all operatives to attend Beyond Zero either before or within 2 months of completing their Site specific induction.
 - ❖ Close out any issues raised by site operatives in a swift manner.
 - ❖ Good communication between site operatives and BAM Management at all times.
 - ❖ Elimination of Construction Dust.
 - ❖ Working Safety at Heights - 100% Fall Protection at all times.
 - ❖ Protection of the public
 - ❖ Hospital protocol procedures to be adhered too.

3.3.1.1 Management to Lead

All Director, Contracts Managers, Site safety Managers, Project Managers, Site Managers, General Foremen and all Site Management are to give the lead in all matters of Safety and Health and to stimulate a positive attitude on the part of all employees by stressing the need for care and safety. Management support for the Company Health and Safety Policy and subsidiary policies will be clearly demonstrable and visible to employees.

Everybody including workers and site supervisors are influenced more by what we do than what we say or write down. Senior management must lead by example at all times.

3.3.1.2 Management Participation

The Contracts Director Denis McCarthy who has responsibility for Safety, Health and Environmental issues, supports the Company Safety Health and Welfare Policy by a communication to all of employees at least quarterly. Denis will complete high visibility Safety, Health and Welfare tours every 6 months. This Safety, Health and Welfare Tour is a planned formal walk through the site, to visibly demonstrate support of the SMS. Senior Site Management (CM) will make a high visibility Safety, Health and Welfare tour on their sites every three months during which they see most of their employees and generally promote Safety & Health on site. A checklist derived from the site SH Plan and recent relevant incidents within the Company are used on this tour which is fully recorded. Managers from all levels participate in special Safety, Health and Welfare activities as the opportunity or need arises.

Site Management will encourage and involve employee participation in Safety, Health and Welfare matters e.g.

- Safe Work Plans.
- Involve some key experienced personnel and or Safety Representative in formulating safe solutions to special risk situations or recurring unsafe incidents.
- Involve some key experienced personnel (e.g. crane driver, section foreman) in accident /incident investigations and ask them to help for proposals to prevent recurrence.

- Get the Safety Representatives to accompany:- – A General Foreman in an audit/ inspection of a site

3.3.1.3 Lead by Example

Correct on the Spot

It is the duty of the Director, Contracts Manager, EHS, and the General Foreman to see that their respective staff members correct unsafe situations practices and behaviour on the spot. Where members of site staff correct matters on the spot they are to be supported by their superiors and other members of staff.

Enforcement, Commendation and Discipline

Commendation is known to work better than discipline and is to be practiced at every available opportunity. All Company Management and Supervisors are to be involved. Enforcement of the safety rules on the site is essential. Discipline is to be used where persons persistently breach the safety rules. Where an employee's conduct, relating to safety or affecting other personnel's safety at work warrants disciplinary action, the following disciplinary procedure will apply, (except in cases of gross misconduct attracting summary dismissal).

Safety Disciplinary Report Card, First Offence: Verbal Warning/Yellow Card:

Initially the employee will be given a Verbal Warning (Yellow Card) by their supervisor. This should be recorded in the Safety Disciplinary Report Card Book as a First Offence / Verbal Yellow Card.

Safety Disciplinary Report Card, Second Offence: Written Warning (2nd Yellow Card)

In the event of a further breach the employee will be given a written warning. This should be recorded in the Safety Disciplinary Report Card Book as a Second Offence Written (Yellow Card), a copy of which must be sent to the Trade Union Representative as appropriate.

Safety Disciplinary Report Card, Third Offence: Suspension or Removal from site (Red card)

In the event of yet a further breach the employee will be given a Red Card, spelling out the consequences – including suspension or dismissal.

3.3.1.4 Safety and Health Plan

The NCH Safety and Health Plan will be the main tool for managing Safety and Health during the construction phase on site. It describes how Safety and Health will managed on the site and defines WHO and WHAT, WHEN and WHERE.

The Safety and Health Plan is a Live Document that has been populated from information contained within the preliminary Safety and Health plan and includes the following:

- Emergency Numbers
- NCH Project Site Organisation Team & Matrix of Duties
- NCH Project safety Policy & Objectives
- Overview of the NCH Project

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- Main NCH hazards and risks including Sub-Contractors associated with the work on the site:
 1. Particular Risks (as per Schedule 1 of 2013 Regulations)
 2. Generic Risks
 3. Job Specific Risk Assessments
 4. Occupation Health Hazards
 5. Contractors All Risk (CAR) Hazards
 - Preventive measures to control those risks.
 - How they are to be managed and communicated.
 - How implementation is to be checked.
 - How contractors are coordinated.
 - How information and facilities are to be shared between contractors.
 - Site Safety Rules, Site Restrictions and Work Permits.
 - PPE Requirements for the site.
 - Emergency and evacuation plans including emergency drills.
 - Accident Reporting
 - Notifications to the HSA Authority: AF1 & AF2 Forms
 - Meeting Schedule i.e. Monthly PSDP/PSCS Co-Ordination Meeting / Joint Safety Committee (JSC) Meeting.
 - Traffic Management Plan
 - Scaffolding Plan
 - Lift Plan
 - Letters of Appointed Persons
 - A copy of the Preliminary H&S Plan
 - A Copy of the Environmental, Health & Safety Pre-Start meeting
 - Sub-Contractor Safety File Checklist.

NB: The above lists are no-exhaustive and will be extended as the works progress. All amendments will be recorded in the Safety & Health Plan which will be updated accordingly through the course of the works as per legislative requirements.

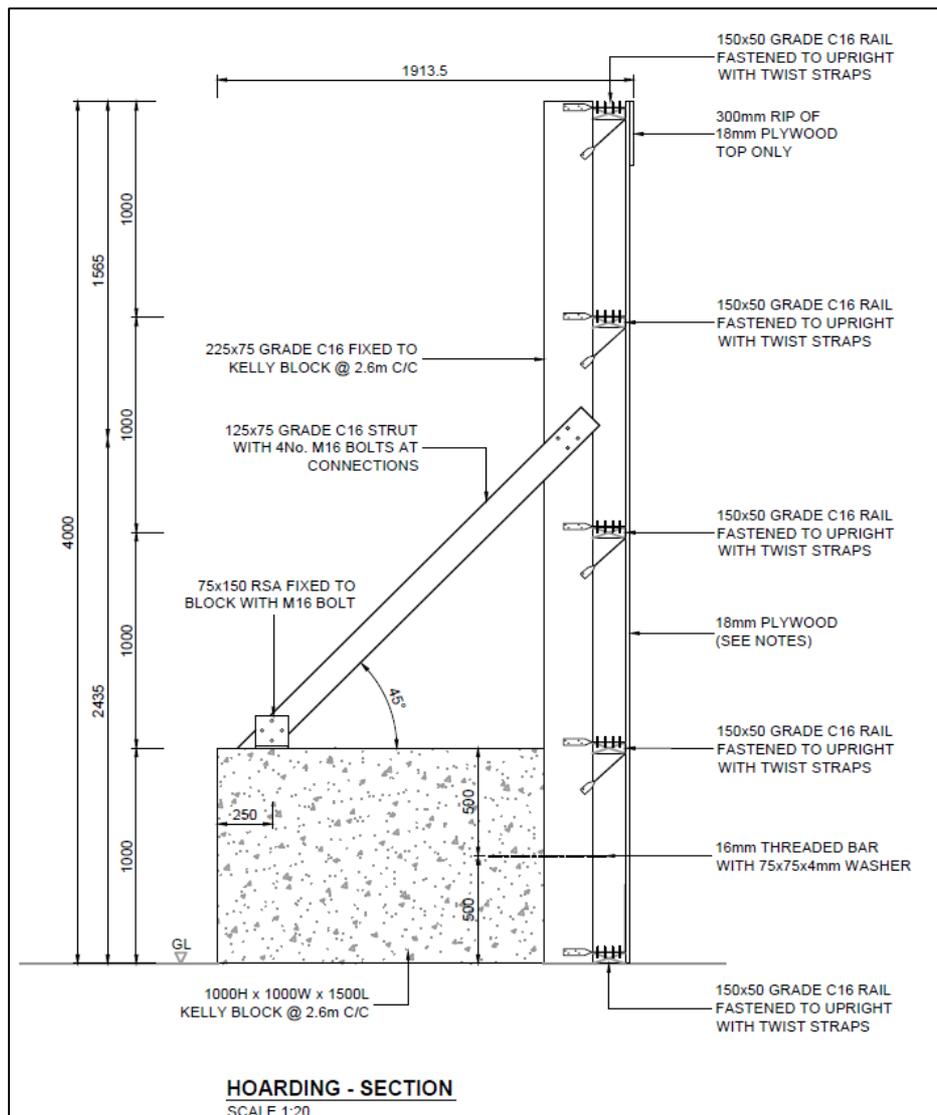
The 'Safety and Health Plan' includes means of communicating SHW needs with:

- The Client.
- P.S.D.P., P.S.C.S. (if relevant).
- Sub-contractors.
- Others affected by the works (other contractors, adjacent properties etc.).
- Stakeholders.

3.3.2 Hoarding & Site Security

As the location of the site adjoins residential properties and is within the confines of a live and operational hospital campus, the overarching consideration in all elements of the site set-up will be to ensure the works can be undertaken in a safe manner for the hospital, adjoining properties, members of the public and the Main Contractor and his staff. All hoarding will be erected and maintained, as necessary, by BAM while works are being undertaken.

The 3.0m & 4.0m high boundary hoarding currently in place for the Enabling Works Contract will remain in place for the Main Contract Phase A also. The temporary works design for the boundary hoarding structural supports has already gone through the Employer's Representative approval process.



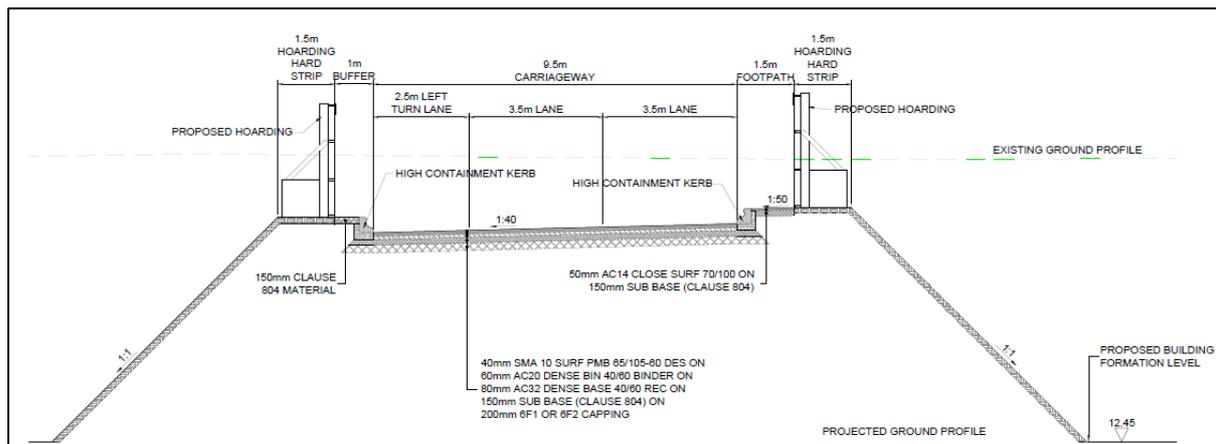
Extract from drawing no. 16_132_00_2408 - C02, "4.0m Hoarding Details"

The hoarding shall be erected in accordance with the hoarding layout drawing provided and shall be subject to the public relations and marketing requirements set out in the Works Requirements. The National Paediatric Hospital Development Board envisage engagement with Local Community

groups, schools and the children's forum group to embellish the hoarding with artwork or graphics which would be appropriate for the area, BAM will facilitate installation of such artwork or graphics.

Additional 2.4m high hoarding will be erected along the realigned Central Access Road (once constructed), with works for same to be carried out as follows:

- i. A detailed works activities method statement (including temporary works design of structural supports) will be submitted to the Employer's Representative for approval;
- ii. Permanent hoarding 2.4m high hoarding will be erected as shown on drawing "Access Road Cross Section" (drg. no. 16_132_00_2901-CM00 – see extract below);
- iii. Only competent and experienced personnel will be permitted to erect any element of the hoarding and all works will comply with the required Health, Safety and Environmental standards;
- iv. Photographic reprographics material in panel sizes of 2.4m X 1.2m, will be securely fixed to full external surface of the solid wooden hoarding;
- v. Regular inspections and maintenance will be carried out on all elements of the hoarding to ensure that all are in a safe and suitable condition;
- vi. Hoarding to afford tree protection as required in specific areas.
- vii. The hoarding line will be set out by the BAM Engineer and the ER will be invited to inspect this to ensure the alignment does not clash with the secant pile wall or any live services. Any alteration to the hoarding line shall be directed by the ER.



Extract from drawing "Access Road Cross Section" (drg. no. 16_132_00_2901-CM00) showing the new 4m high hoarding to be erected along the Central Access Road.

BAM's site offices of accommodation and welfare facilities are currently located in the old Private Clinic. This is an interim measure in advance of relocating same adjacent to Linear Park where there will be sufficient space to accommodate facilities to cater for the planned 1,000 – 1,200 construction workers the project will require at its peak in 2019.

BAM recognise that the installation of the hoarding along the Central Access Road as well as the amendments to the hoarding at linear park involve working in public areas on footpaths at tie-in locations. As a result, BAM will develop detailed traffic & pedestrian management plans that will be issued to the ER, Dublin City Council, SJH Management, RPA (Luas), Dublin Bus and all affected stakeholders for comment prior to any hoarding works commencing. All traffic and pedestrian

management plans that are implemented will be designed so that the public (including internal staff/traffic movements within the SJH campus area) are fully protected during the hoarding installation process. At all times access for blue light vehicles (emergency) will be prioritised. In addition, the relevant section of Dublin City Council will be consulted and any necessary licences obtained prior to hoarding being installed along public (DCC controlled) paths or roads. Where deemed necessary, temporary lighting will be installed if new hoarding alignments result in existing lights being behind new hoarding lines. All existing lighting within the main SJH campus will be replicated in full and installed adjacent to new routes to maintain adequate lighting levels at all times.

Another integral aspect of the hoarding installation is to design a barrier system that will attain the requirements as set out in the EIS in terms of noise mitigation. The perimeter hoarding will be constructed of suitable material density (generally 18mm thick plywood) to ensure that noise levels are maintained within the prescribed thresholds/allowable limits. Hoarding may be further supplemented using acoustic quilts in sensitive areas during certain construction activities to mitigate against noise impacts.

BAM will continue their inspection regime implemented for the Enabling Works Contract for the Main Contract Phase A also. This involves inspecting the entire hoarding system on a weekly basis for any defect, damage or environmental related failures i.e. wind damage, freeze/thaw action. Remedial works will be carried out promptly on any defective sections of hoarding that are found to have developed.

At designated sections along the hoarding line, access gates will be installed in order to allow safe access/egress to and from the works areas. These gates will be positioned at locations that afford the maximum visible sight lines to ensure that both the works and public are protected.

BAM have 24 hour security in place and are linked to SJH CCTV monitoring.

BAM will be responsible for the security of the site for the duration of the works.

BAM will:

- Install and maintain adequate site hoarding to the site boundary with adequate controlled access and
- egress points;
- Maintain site security staff at all times;
- Install access security in the form of turn-styles and gates for staff;
- Ensure restricted access is maintained to the works;
- Operate a Site Induction Process for all site staff;
- Ensure all staff have current 'Safe Pass' & Construction Skills Cards;
- Monitor and record all deliveries to site and all materials/waste taken off site for disposal to appropriate licensed facility.

The hoarding line is likely to be adjusted significantly at 2no. stages in the project:

1. Following completion of the temporary Central Access Road – Month 9;
2. Following completion of the permanent Northern Access Road – Month 18.

A fire watch system regime has been implemented and appointed fire watch supervisors inspect the site at the end of each shift. At site inductions, all staff and operatives will be fully inducted into the

security, health and safety and logistic requirements on site, and will be made fully aware of their individual responsibilities with regard to security and will undertake their work in line with guidelines.

3.3.3 Site Compound

BAM's accommodation and welfare facilities make use of the existing buildings on site and are currently located in the old Private Clinic as an interim measure. The Site Compound will be established to the South of the proposed building adjacent to Linear Park by Month 4 where there will be sufficient space to accommodate facilities to cater for the planned 1,000 – 1,200 construction workers the project will require at its peak from 2019. Expansion of the Site Compound will be carried out on a phased basis, with each layout requiring minimal adjustment as additional facilities are added.

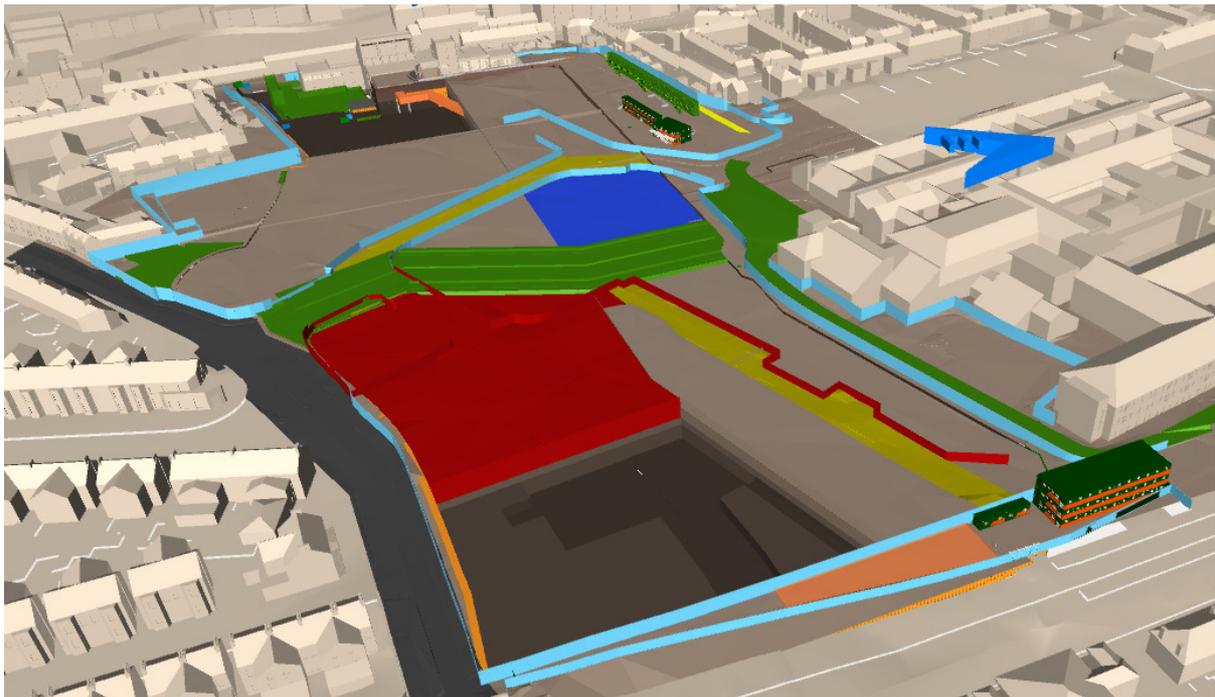
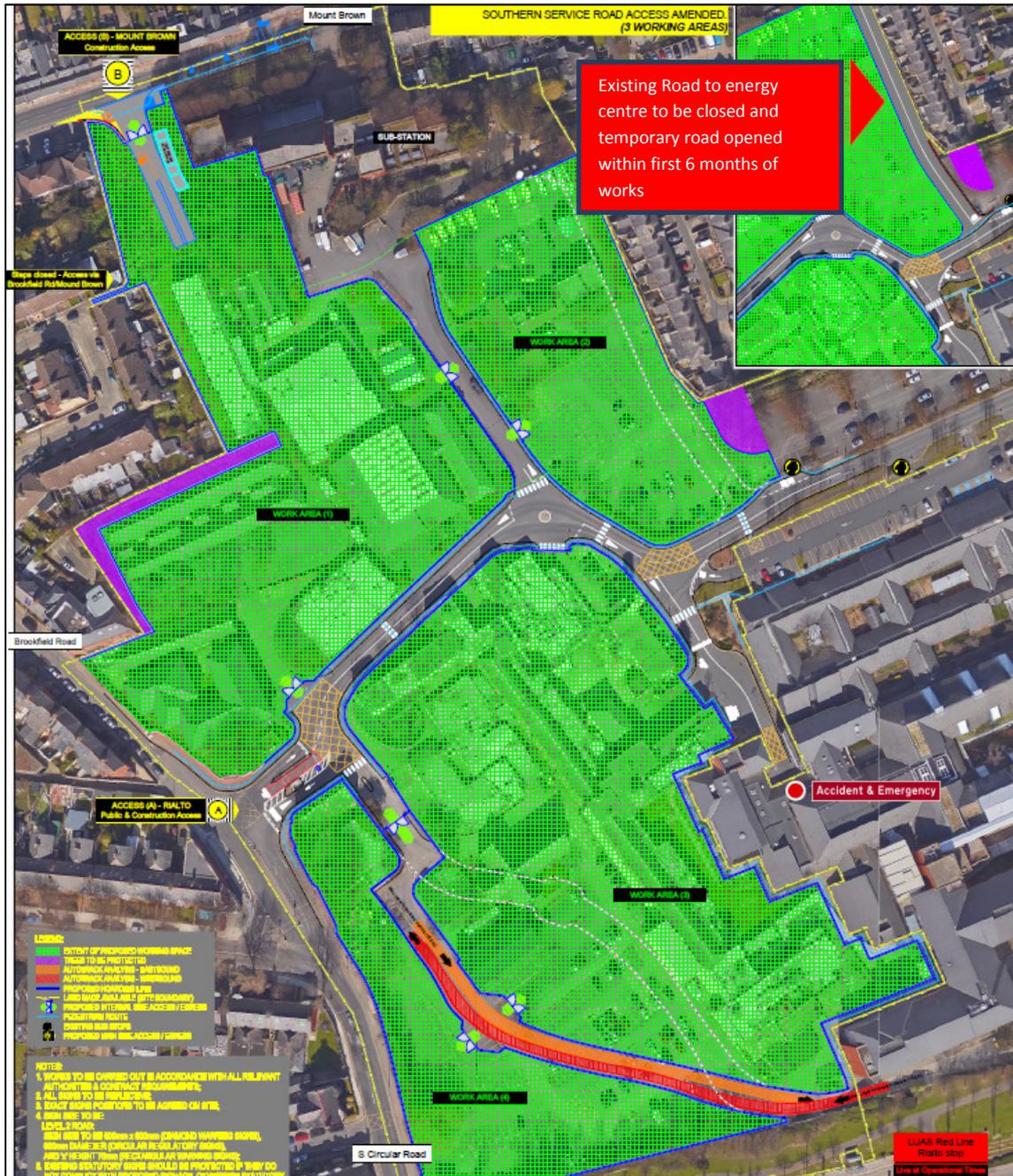


Figure above looking Northwards shows the proposed site compound adjacent to Linear Park

The Site Compound is to remain near Linear Park for the duration of the Main Contract works. Towards the end of Phase B, BAM will make use of the future development platform at the north end of the building and will establish a second compound at this location to facilitate travel distance of workers to the building.

3.3.4 Site Access & Egress

As the construction site is located on the campus of a live hospital, access to the existing campus must carefully and safely managed during the works. BAM will maintain protected vehicle and pedestrian/staff access routes as well as blue light and service vehicle access into and through the campus from the Rialto Gate, as well as to the Emergency Department, Energy Centre, Delivery Hub, south perimeter road. Use will be made of 2 main construction site access and egress points for the duration of the works, namely in the area of the existing Rialto Gate off the South Circular Road (Access A) and at Mount Brown (Access B) which will be constructed and operational from Month 4.



Extract from drawing 16 EM00X "Temporary Traffic Management Layout for Internal Site Traffic & Pedestrian Management to Facilitate Construction Works: Phase 1a & 1b".

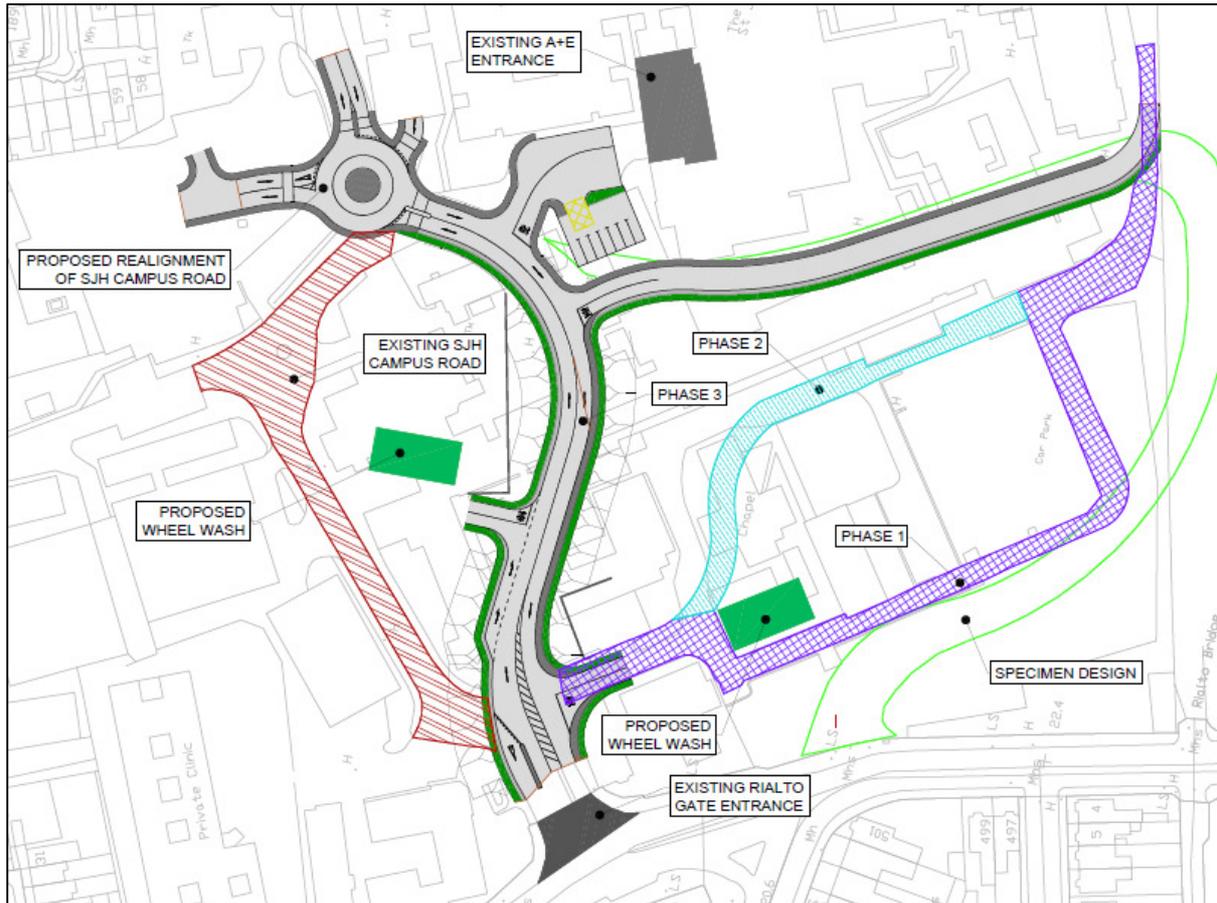
During the initial phase of works, access for emergency vehicles and any appropriate through traffic will be maintained by means of the existing road through the hospital campus. This will naturally split the site into 2 separate areas which will typically be served by the Rialto Gate Access A until Mount Brown Access B is operational (Month 4). At this point the northern portion of the site will be serviced largely by the new construction access point at Mount Brown. The Rialto Gate Access A will serve both portions of the site depending on the construction activity on-going. A Flag Man located at each access point onto the hospital/public road network will manage and marshal truck movements and Public/Hospital Users in a safe and controlled manner. The temporary Central Access Road will be operational from Months 9 to 18, at which time the permanent Northern Access Road will be operational. Refer to Section 3.5 Construction Traffic Management for further details.

3.3.5 Central Access Road Realignment

In order to maintain a road link between the Rialto Entrance & St James Hospital during construction of the Main Contract Phase A, the main road through the campus must be realigned. BAM have proposed a Central Access Road, utilising the existing Rialto entrance off Brookfield Road. This Central Access Road will be in place for a duration of 9 months until such time as the permanent northern access road is constructed, and will cross the works, emerging just north of the A&E access and south of the existing roundabout.

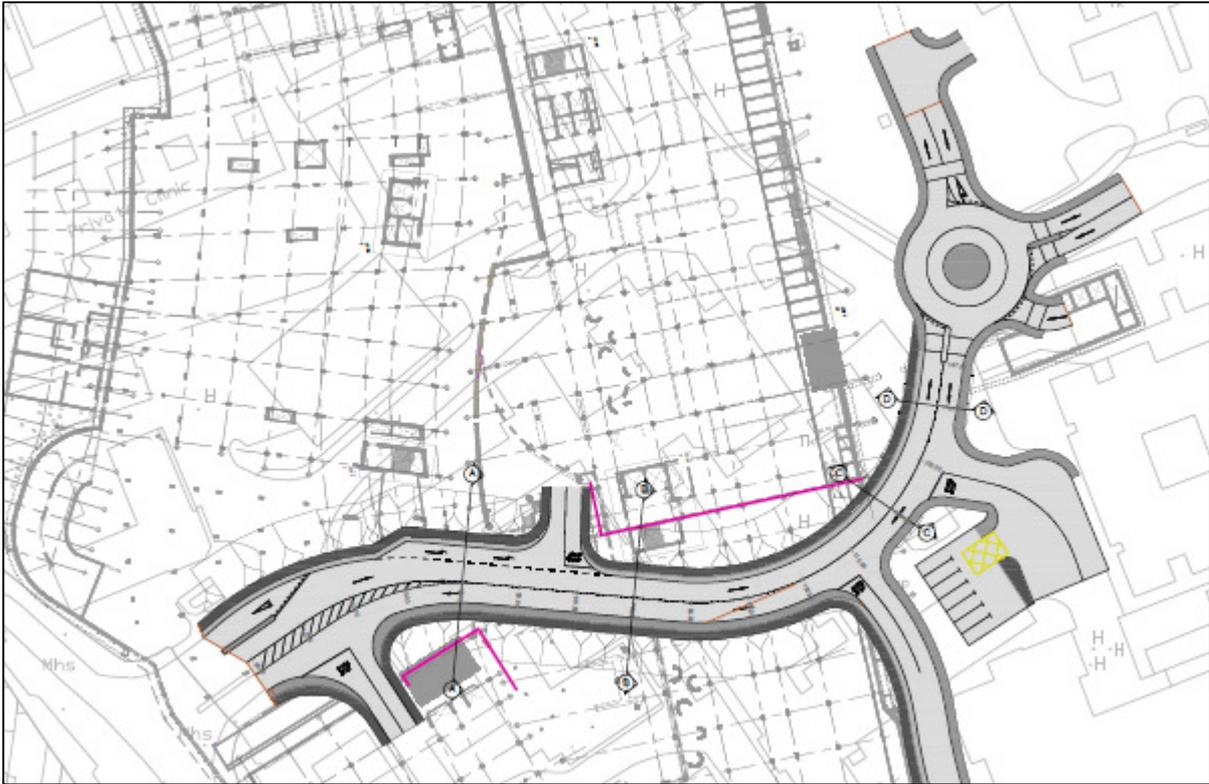
Design of the Central Access Road falls under Temporary Works, with a detailed design including alignment, slope retention (sheet piling will be required at 2 locations), drainage, hoarding, safety barrier, lighting, etc. to be submitted to the Client for approval in advance of commencing these works. A detailed method statement will also be submitted for approval.

Refer to Appendix I for proposed layout of the Central Road Access.



*Extract from drawing "Proposed Access Road Phasing Arrangement", drg. ref. 16_132_00_2001-C01.
Refer to Appendix I for full set of temporary works design drawings.*

The alignment of the Central Access Road is such that it runs parallel to a structural expansion joint (in the new building) providing an efficient and natural break point. It also avoids the new building's lift and stairwell shafts, allowing the structure to be constructed independently to each side, with infill works on the footprint of the access road to be undertaken immediately upon making live the permanent northern access road.



*Extract from drawing "Access Road Layout", drg. ref. 16_132_00_2200-C01.
Refer to Appendix I for full set of temporary works design drawings.*

The alignment is also optimised to ensure safe blue light / emergency vehicle access and egress to and from the A&E department, and to maintain the services access to SJH.

3.3.6 Deliveries to Site

Construction deliveries to site will make use of both the Rialto Gate and Mount Brown access points. BAM will adopt the "just in time" approach for the delivery of particular materials such as concrete formwork and reinforcement due to the minimal nature of space for storage of material on site. Deliveries of materials will be planned and programmed outside of the hours of 07:00 and 09:00 where possible, and only as they are required on site. These deliveries will be called in from the storage area at Davitt Road.

Works requiring multiple vehicle deliveries to site, such as large concrete pours, will be planned well in advance. Concrete pours of up to 2,000m³ are expected on site, with planning of these pours to include the subcontractors' commitment to ensure that trucks don't queue on the public roadways around the site. BAM will enforce the measure of all concrete trucks arriving to the first stage holding area at Davitt Road before proceeding towards the construction site at St James's Hospital campus when requested to do so by a traffic controller located at the works.

3.3.7 Storage of Materials on Site (Including Harmful Materials)

Whenever possible materials for construction activities shall be ordered as to prevent the minimum storage time and kept in the staging area at Davitt Road before release to site in line with the “just-in-time” approach.



Map details the location of the Davitt Road Staging Area relative to Saint James's Hospital.

Materials delivered to Davitt Road will be received and controlled by BAM, with gatemen/flag men available to ensure safe access/egress of all vehicles. Materials will be stored as per their respective material data sheets to minimise the potential of damage or wastage. Measures will include off-ground storage e.g. on pallets, remaining in original packaging, protection from rain damage or collision by plant or vehicles.

The staging area at Davitt Road will be secured and subject to 24 hour security supervision to prevent unauthorised access.

BAM will establish a designated fuelling point within each area of works to the north and south of the campus access road with all plant to be brought to these 2 points for filling. All fuels and chemicals stored will be clearly labelled.

Where mobile fuel bowsers are used the following measures will be taken:

- Designation of bunded refuelling areas on the site;
- Provision of spill kit facilities across the site;
- Any flexible tap, valve or pipe will be fitted with a lock and will be secured when not in use;
- The pump or valve will be fitted with a lock and will be secured when not in use;
- All bowsers to carry a spill kit and operatives must have spill response training;
- Portable generators or similar fuel containing equipment will be placed on suitable drip trays.
- Fire prevention measures in the form of extinguishers will be located adjacent to fuelling areas.
- As a BAM policy fire extinguishers are also located in each excavating machine.

In the case of drummed fuel or other potentially polluting substances which may be used during construction the following measures will be adopted:

Secure storage of all containers that contain potential polluting substances in a dedicated internally banded chemical storage cabinet unit or inside a concrete banded areas;

- Clear labelling of containers so that appropriate remedial measures can be taken in the event of a spillage;
- All drums to be quality approved and manufactured to a recognised standard;
- If drums are to be moved around the site they should be done so secured and on spill pallets;
- Drums to be loaded and unloaded by competent and trained personnel using appropriate equipment.

3.3.8 Removal of Materials from Site

The most intensive period of material removal from site will take place during the bulk excavation of the basement works. Excavations will be required throughout the site to facilitate the formation to basement levels, ramp access, construction of the utility tunnel, modifications to existing services including the Drimnagh Sewer and to facilitate construction of new services.

In total, an estimated 413,000m³ of made ground and clay material will be required to be excavated and removed off site. All excavated material will be disposed of in an approved manner using a licenced haulier to an approved licenced location. Copies of all collection, delivery and acceptance at approved licence location documentation will be kept on site.

BAM will make use of the Davitt Road staging area for empty trucks to wait before being called on to site, a measure which will prevent queuing of trucks on the public roadways to the site.

All trucks will have a built on tarpaulin that will cover the excavated material as it is being hauled off site and wheel wash facilities will be provided at all site egress points (refer to drawings provided in Appendix I showing wheel wash locations).

As previously stated, all vehicles will leave the site via Rialto Access A or Mount Brown Access B, with flag men posted to direct construction vehicles entering/exiting the site and manage public/construction vehicle movements.

OCSC document "*Soil Classification, Site Investigation & Groundwater Monitoring Report*" (doc. ref. no. NPH-C-OCSC-9010-0001) details areas on the site where hazardous material has been identified, and further areas which have been identified as "potentially contaminated areas". A specialist contractor will be brought in to classify the material in this area prior to excavation by:

- (a) reviewing testing to date, and
- (b) carrying out further testing using an accredited laboratory.

In addition to this, WAC testing will be carried out on an ongoing basis throughout the bulk dig works to ensure excavated material being removed from site is sent to an appropriate location based on its composition.

Water (grey water) will be recycled from the attenuation tanks for use during construction, toilets, and washing.

3.3.11 Groundwater Control

Groundwater will be directed in a controlled manner away from the cut faces, discharged under license to the storm sewer network (i.e. the River Camac), and continually monitored to ensure consistent quality.

Any discharge to storm sewer will be regulated under a Discharge Licence obtained from the Regulator (Dublin City Council) issued under the Water Pollution Act (Section 4 Licence).

Attenuation, pre-treatment and monitoring of discharge water will likely be required under any Discharge Licence (Section 16 Licence). Pre-treatment and silt reduction measures on site will include a combination of silt fencing, settlement measures (silt traps, silt sacks and settlement tanks) and hydrocarbon interceptors. Active treatment systems such as Siltbusters or similar may be required depending on turbidity levels and discharge limits. Qualitative and quantitative monitoring will be implemented.

BAM will keep the works free of water by:

- lowering and maintaining the water level (dewatering);
- preventing water from entering the earthworks;
- arranging for rapid removal of rainwater etc. by channelling it towards the dewatering sumps;
- silt traps, hydrocarbon interceptors etc. to be used where required.

Groundwater levels vary across site. BAM are currently engaging with a specialist sub-contractor to establish the extent and duration of dewatering required. Once complete, BAM will issue for approval to the Employer's Representative a detailed dewatering method statement. BAM shall implement a monitoring programme as required under any Discharge License and to assess impacts of dewatering on the local groundwater regime and all monitoring results shall be submitted to the ER/Engineer on at least a weekly basis during excavation and basement construction and monthly (or other agreed interval) until project completion.

3.3.12 Hours of Work

Schedule of working hours (refer to contract):

Monday-Friday	-	0700-1900 hrs
Saturday	-	0800-1400 hrs

If BAM need to carry out specific works outside these times then prior approval will be sought in advance from the Employers Representative and the relevant Planning Authority.

Adequate notice will be provided in advance of the proposed commencement of the works to be carried out outside of the scheduled working hours to ensure all parties have sufficient time to review BAM's proposal.

BAM note that condition No.9 of the granted planning permission notes that HGV movements to site between 0700-0900 hours should be minimized. In this regard, deliveries to site will be staggered where required to prevent an influx of HGV to the site during these hours.

3.3.13 Public Relations/Community Liaison

BAM will develop and implement a project Communications and Engagement Programme, which will protect the reputation of the Employer, its Client and the Children's Hospital Group. This team will be led by the Community Liaison Officer, Garry Keegan, and will include BAM personnel from the BAM Enabling Works team to ensure consistent communication channels are maintained with the various project stakeholders. Garry has extensive experience of infrastructure development matters such as construction methodology, community liaison, property and third party stakeholder engagement. He has worked in the capacity of Communications Liaison Officer on the design, planning, construction and operational phases of many projects for the last twenty years.

Garry's role will include:

- Participation and distribution of a local newsletter;
- Briefing with neighbours on progress and issues;
- Liaison with Dublin City Council and emergency services as appropriate;
- Liaison with An Garda Siochana, particularly in relation to traffic movements and permits;
- Preparation of reports for the site meetings on neighbourhood issues.

There will be National Children's Hospital "Drop-in" Evenings held at intervals to update the local community on the project's progress, the next such evening to be held is on Thursday June 29th from 4pm – 8pm. Garry Keegan will introduce himself and provide residents with numbers for the Resident's Helpline as well as his own mobile number should they need to contact him.

BAM will also be organising another "Meet the Buyer" event where local businesses can meet with BAM to discuss potential supply chain opportunities.

BAM will also operate a "Good Neighbour Policy". Due to the nature of construction works it is essential to implement this wherever possible.

The key aspects of the Project Team's good neighbour policy include: -

- Early implementation;
- Quick response to issues arising
- Good client, Staff and Neighbourhood liaison;
- Reduction of nuisance factors;
- Clear access for neighbouring premises;
- Clear and concise information;
- Designated liaison officer.

3.3.14 Environmental Management

The site of the proposed Children's Hospital is adjacent to the 'live' section of St. James's Hospital and residential property owners of O'Reilly Avenue, Cameron Square, Brookfield Road, Mount Brown and South Circular Road. It also includes the Davitt Road Compound. The properties and hospital are highly sensitive to the potential impact of the Works, particularly airborne noise, vibration and dust and associated traffic movements related to the execution of the works.

A detailed Environmental Management Plan (EMP) including mitigation measures has been compiled for the works to demonstrate how any impacts of the works on the surrounding environment are going to be monitored and protection measures put in place to avoid exceeding the specified tolerance levels. This EMP has been prepared in accordance with the BAM Environmental Management System (EMS), and forms part of the PEP coordinated deliverables. The EMP for the

Main Contract Phase A is included in Appendix B.

To promote Environmental awareness and sensitivity of the site and surround, all personnel at induction stage will be made aware as a minimum of the following Environmental requirements which need to be considered:

- Airborne Noise
- Dust (including the role of dust in the spread of aspergillus)
- Vibration ground-borne
- Air Quality
- Ground water
- Water Quality
- Removal of construction related materials off site.

This will be continually communicated to the relevant sub-contractors and personnel who will be working on the site for the construction period. Throughout the construction period the Environmental impacts in the form of monitoring and adjustment of mitigation measures (as necessary) will be carried out to ensure compliance with the Works Requirements.

During the course of the works particular attention will be given to the following elements which have been deemed under the EIS as being of particular relevance:

- Dust – created during the course of building demolition or excavation/diversion of services.
- Noise – created during the course of the various elements of the works.
- Vibration – ground borne and created, principally, during building demolition.
- Waste Management – to ensure proper and correct disposal of construction related waste.
- Vermin control

3.3.15 DUST CONTROL & MONITORING

BAM have developed a dust minimisation plan for the Main Contract Phase A which will be implemented continuously through the course of the works. As prescribed in the contract, the method for measuring any dust particles generated will be by the Bergerhoff Method (jar collection) with an allowable limit of 350mg/m²/day as a 30-day average (as specified by the Environmental Protection Agency (EPA) for licensed facilities in Ireland) being the established criteria. The proposed 11 locations for the dust jars for the Main Contract Phase A are indicated on a layout plan contained within Appendix D (included with this CMP). Each dust jar will be collected on a monthly basis for dust analysis testing and a report issued. Working methodology and mitigation measures will be constantly reviewed and enhanced if and is required based on the results of this ongoing monitoring process.

BAM believe that the key principle in any minimisation plan is to limit the amount of dust created at source i.e. at bulk excavation, piling and concrete construction phase and associated service diversion works which involve trenches being opened by cutting either bituminous or concrete surfaces. BAM are aware that the construction works have the potential to affect the hospital and

that the hospital service in general could be at an increased risk of developing invasive fungal infections, primarily through aspergillus related syndromes, with dust that is generated from the building work being one of the main promoters of this problem. Stockpiling of excavated material on site will be kept to a minimum. BAM note that Aspergillus prevention and infection control for hospital environments will be adhered to during the works. SJH infection control section will be kept up to date on all works through co-ordination á meetings which will be held on a weekly basis.

There are a number of dust suppression techniques which will be employed by BAM during the works:

- i. **Archaeology:** All excavations arising from the archaeological slit trenching works on site will be managed in a manner which prevents dust. All stockpiles of material from the excavation will be covered or dampened down by watering.
- ii. **General Demolition:** In demolishing any specific building the overriding principle will be, in as far as is practicable, to prevent the stockpiling/accumulation of demolished material on site. It is intended that material will be segregated in a timely fashion and removed off site at the earliest opportunity. Stockpiles of demolition waste act as dust collection points and in dry and windy weather this can lead to spread/blowing of dust. During the actual demolition process there will be two defined methods of watering the works area:
 - a) By installing a lance/hose on the jib of the machine that is demolishing and which will direct water to the precise location of demolition.
 - b) By physically spraying the works area using a hoist where an operative is in the basket of the hoist and sprays water onto the demolition location.
 - c) A sprinkler system will be installed on the hording at various locations to direct water into the general site areas.
- iii. **Climatic Conditions:** The prevailing weather conditions i.e. dryness, rainfall prediction, wind speeds and direction, will be monitored continuously through the works to aid assessment on site before any particular section of demolition commences. Assessment of future weather patterns will enable BAM to allow for the most appropriate type of dust suppression method. For example, if a period of sustained dry weather is expected then road sweepers can be booked in advance.
- iv. **Material Removal:** Materials that is being removed off site will be loaded into HGV and transported off site. The bodies of all trucks will be tightly covered with a tarpaulin to prevent dust from blowing off this material during transport. Vehicle wheel washes located at site egress points, road sweeping and generally housekeeping will ensure that the surrounding environment is free of nuisance dust and dirt. A speed limit of 15km/hr will be enforced for all site traffic within the SJH campus. Signage will be installed to this effect and this information will be issued to all employees/personnel at site induction stage and enforced through a combination of monitoring by the site foreman and corrective action / disciplinary measures where necessary.
- v. **Access Roads:** Roads throughout the SJH campus which form the main access/egress from any specific works area i.e. to Rialto Gate and Mount Brown accesses, will be kept free of extraneous material that are created as a result of the works. Of equal importance are the public roads Brookfield Road, South Circular Road and Mount Brown. In addition to this

measure, road sweepers will be deployed on the access roads and adjacent public road network to keep lanes and road drains clear. As part of the works, BAM will aim to maintain as much of the existing hard surfacing as possible within any works area. Hard surfaces are readily swept of dirt if required. As part of the BAM safety management system roads will be inspected for dirt and general degradation (among other items) on a daily basis. Condition of the roads (internal and external) will be noted and any remedial actions required will be taken immediately.

- vi. **Rock Breaking:** It is anticipated that a very small volume of rock excavation will be required in the southern portion of the site. Such excavations will be through the upper weathered layers of the rock and as such has been technically evaluated as being suitable for “hard ripping” by a 32 tonne excavator or equivalent and should not require the use of hydraulic breaking. To counteract the spread/blowing of any dust during ripping, there will be two defined methods of watering the works area:
- a. By installing a lance/hose on the jib of the machine that is demolishing and which will direct water to the precise location of demolition.
 - b. By physically spraying the works area using a hoist where an operative is in the basket of the hoist and sprays water onto the demolition location.

In either of the above mitigation measures, BAM will ensure that the measure taken is adequate to suppress the dust created. The excavated rock will be kept segregated from other materials and removed off site at the earliest opportunity.

Preventative measures identified above will be included in the BAM Site Safety Induction that all personnel must attend before being allowed onto site. In addition to this the document will be issued to all subcontractors as part of their contract documentation package. It will be the responsibility of all personnel to play their part in minimizing dust creation.

3.3.16 Noise & Vibration Control & Monitoring

BAM have engaged specialist subcontractor, namely, Sandy Brown Associates to prepare and develop the Noise & Vibration Monitoring Plan for the Main Contract Phase A which is included in Appendix E of this CMP - “16301-R03-B - Noise, Vibration and Movement Monitoring Management Plan”).

Sandy Brown Associates will act as Surveying, Instrumentation and Monitoring Specialist (SIMS) for the Main Contract Phase A and will attend site as required. Murphy Surveys will continue to carry out all noise and vibration monitoring of the Main Contract Phase A following their involvement in the Enabling Works Contract. All monitoring equipment and associated specifications will be reviewed and approved by the SIMS.

The proposed locations of the noise and vibration monitors are indicated on a layout plan contained within Appendix E (attached). The exact locations of these monitors will be agreed with the ER before installation. To maintain the integrity of measurement and to afford general protection of these monitors throughout the course of the works, the monitors placed along the hoarding line will be fixed on concrete plinths.

In general, this type of monitor requires an 110v power supply. Due to the spatial arrangement of the monitors, being positioned along the boundary of the works and out of reach generally from

readily available power sources, it is proposed that each monitor will be self-powered by way of solar panel with back-up battery (for night time measurements). These will be monitored remotely and will further be inspected weekly by the BAM Engineer to ensure continuous monitoring.

A baseline noise and vibration survey was carried out in advance of the commencement of the Enabling Works Contract to demonstrate the existing noise and vibration environment throughout the works area and within the hospital. BAM will use this base line level for the Main Contract also as a historical basis which will be considered when reviewing the monitored data.

The N&V plan issued for the Enabling Works sets out how both noise and vibration will be measured in accordance with the contract requirements. The N&V Plan for the Main Contract Phase A will do likewise. Measurements will be taken at the frequency and parameters required. Threshold levels will be as follows:

Noise: Monday – Friday	Day :	0700-1900	70dB
	Evening :	1900-2200	60dB (only for agreed out of hours works)
Saturday	Day :	0800-1400	65dB

BAM recognise that an internal noise limit threshold of 45dB L_{Aeq} measured over a 1 hour period will apply to noise infiltration as a result of the works in all hospital and clinical buildings.

Vibration: Two categories of building are noted each with their own respective allowable limits:

1. Residential/Sensitive, (O' Reilly Avenue, Cameron Square / Haughton Institute)

<10Hz	: 3mm/s
10 – 50 Hz	: 3-8mm/s
50 – 100 Hz	: 8-10mm/s

2. Clinical (SJH):

Range (depending on acute level of room) : 0.01 m/s^2 – 0.005 m/s^2 (acceleration).

As noted, threshold levels will be set to the above parameters. A trigger point alarm system will form the basis of alerting an agreed list of users of any breach in allowable parameters. Both noise and vibration monitors will measure on a continuous basis at all times. Reporting will be in tabular format and will be issued on a weekly basis.

The monitoring of the system requirements and any corrective actions necessary will be carried out in compliance with the N&V Monitoring Plan and with *OCSC Technical Specification: Condition Surveys, Monitoring & Instrumentation*.

For the duration of significant noise generating construction works, the site perimeter boundary hoarding height will extend to 4m at key interfaces which are directly adjacent to residential and hospital buildings.

3.3.17 Vermin Control

BAM's appointed specialist pest control company Pestguard Environmental Services will develop and implement a comprehensive site wide vermin control plan for the Main Contract following on from that developed for the Enabling Works Contract. This will be included in BAM's "Vermin Control

Management Plan", to be submitted as part of the Project Execution Plan. The plan submitted for the Enabling Works will remain effective until such time as the plan for Phase A is implemented.

Pest control will be carried out by pre-baiting along the site boundary using bait boxes which will be monitored/checked on a monthly basis. Specific areas of the site will have its own problems and solutions i.e. areas around waste refuse and these will be specifically targeted in the control process. Areas of particular note will be those where there are open drains, vegetation and sub level building works. Areas previously identified by a specialist vermin control company during a site survey carried out prior to commencement of the Enabling Works Contract established the best locations for baiting points, with the servicing technician monitoring the success of the installed system to ensure best results.

For the Main Contract Phase A, the installed system will be reviewed and amended as required to ensure its effectiveness. Specific areas that will be concentrated on will be boundary protection and specific identified rodent runs or harbourage/refuge locations. The works compound will also be of a high priority, with the installed system to be reviewed as the compound relocates to Linear Park, and expands to accommodate the increasing workforce.

BAM will adopt a pest management program which involves a three pronged attack and defence against possible pest infestations:

1. Preventive Measures
2. Proactive Monitoring & Auditing
3. Reactive Treatments.

This approach will be implemented as follows:

4 Preventative Measures

A vermin control layout plan was devised with bait located at all areas identified by the initial site survey. An ongoing review of baiting locations will continue throughout the duration of the project to ensure the effectiveness of the installed system. The specialist will maintain monitoring stations strategically placed in rodent attractive areas in order to address any infestation which may find its way into the area quickly and efficiently. Housekeeping will play a key role in ensuring conditions are not conducive to harborage. Bins will be emptied frequently. Skip areas will be kept tidy, with skip sizes to be appropriate to their rate of fill and changed frequently. Surface areas with standing water will be regulated where possible.

5 Proactive Monitoring & Auditing:

Monitoring is carried out by 12 routine visits in a yearly cycle that will inspect the monitoring poison blocks that are placed in the bait points. This serves a dual purpose of both controlling the rodents by poisoning and giving tangible evidence of the locations onsite that the rodents have been present. These inspections are designed to fully assess all aspects of pest management both internally and externally under the standards of ISO: 9000:2008 and beyond the requirements set out under BRC and HACCP guidelines. These standard visits are supplemented with any additional call out that will arise from rodent sightings on site. On each visit any potential problems are identified and are logged in the Onsite Report Folder. Each inspection will provide any additional recommendations that are deemed necessary

regarding *Proofing* and *Housekeeping* audits identifying possible food sources, areas of entry and harborage/refuge which may attract infestations.

6 Reactive Treatments:

Emergency Call out Service: If required, emergency call out inspections will be carried out by the specialist as a matter of priority with the aim of eradicating any potential pest problems in the quickest possible time.

The following preventative measures will be implemented:

- **First Line of Defence:** The specialist will maintain external monitoring stations acting as a first line of defence, eradicating rodent migration prior to entering the premises of any area within the works.
- **Client Recommendations:** Each inspection will provide any additional recommendations that are deemed necessary regarding *Proofing* and *Housekeeping* audits identifying possible food sources, areas of entry and harborage/refuge which may attract infestations.
- **Strategic Baiting:** The specialist will maintain internal and external monitoring stations strategically placed in rodent attractive areas in order to address any infestation which may find its way into the area quickly and efficiently
- **Routine Site Inspections:** The specialist will provide routine service inspections against rats and mice.

On Site Report Folder

The specialist will provide a reporting System which is custom designed to meet specific audit of the works. This folder will be maintained on site and will be available for inspection.

Information that will be contained in this folder will include:

- Quality, Health & Safety Statement
- Service Specification Information
- Bait Point Maps
- Detailed Inspection Reports

The *Vermin Control Layout Plan* for the Enabling Works Contract is still in place and is attached in Appendix F of this document.

3.3.18 Condition Surveys

A specialist surveying/monitoring company will carry out all surveying and movement monitoring on behalf of BAM.

The monitoring and surveying of buildings will be in accordance with the specification. The residential properties which abut/adjoin the works area and are considered as being sensitive receptors are included in the contract drawings. Included within the scope of the surveys will be a section of the existing St. James's Hospital and the utility tunnel. The following surveys are required:

- (i) Initial pre-condition surveys of all residential properties, services utility tunnel and St. James's Hospital;
- (ii) Post condition surveys of the above on completion of the Main Contract;
- (iii) Structural monitoring of the buildings throughout the course of the Main Contract. Electrolevels and tiltmeters will be installed as appropriate on building and boundary walls at agreed locations adjacent to the works.

3.3.18.1 Pre/Post Condition Surveys

Initial pre condition surveys as per (i) above were carried out in advance of the commencement of the Enabling Works Contract by ABL Surveyors on behalf of BAM.

Upon completion of the Main Contract, BAM will arrange for ABL Surveyors to return and carry out post condition surveys as per (ii) above.

The post condition surveys will involve each property being re-surveyed by a Chartered Building surveyor as per the contract requirements. An existing record of all cracks, blemishes and defects based on a visual inspection will be made. No opening up works or sampling of materials will be undertaken with a photographic record being taken of defects and blemishes to each property, all of which will be included in each report. Boundaries, hard standing areas and outbuildings will be included as required. The report will also include a section comparing the pre and post condition findings. Reports for each property will be issued to the client.

BAM will ensure the surveys are carried out so as to limit the disruption to all occupiers and not to affect their normal day business/work.

Full agreement will be gained from SJH in order to gain access to the hospital for carrying out the condition survey.

3.3.18.2 Structural Monitoring

BAM will monitor all buildings for level and movement (in x,y,z planes) as set out in the contract requirements. On installation of the various targets, level studs, etc. monitoring will occur on a weekly basis for the duration of the Main Contract and Monitoring Reports will be issued in compliance with Works Requirements Document "*Structural Specification: Condition Surveys, Monitoring & Instrumentation*" – NPH-C-OCSC-TD-SP-2028-007. If required, more intensive monitoring will be undertaken i.e. methods of continuous monitoring will be employed to buildings.

3.3.19 Quality Control

BAM's accredited Quality Management System (QMS) in accordance with ISO 9001 will be developed and implemented for the Main Contract Phase A. BAM shall ensure that all sub-contractors, suppliers and specialists work to a clear and definite project specific Quality Management System (QMS) in accordance with BS EN ISO 9001:2008.

3.3.20 Document Control

The Employer has established 4-Projects (4-P) as the Electronic Document Management System (EDMS) to be used on the project through all stages including construction and handover. All contractual correspondence between the Contractor and the ER shall be through 4-Projects. This includes all letters, relevant emails, instructions, closing out RFI's, issue of drawings, commissioning documents etc.

BAM's EDMS Manager (Document Control Manager) will be responsible for the system and its operation for the duration of the contract.

While Works are being executed BAM must keep on the EDMS:

- A full up-to-date set of the Contract documents, the Works Requirements, directions, Change Orders, and Contractor's data
- A log of directions, Change Orders, and Contractor's data, showing dates of issue and of revisions
- All publications mentioned in the Works Requirements and the Contractor's data
- Wage records, including time sheets and copies of all pay slips, applicable to all Contractor's Personnel.

BAM will give the Employer's Representative, and any person authorised by the Employer's Representative, access to the above at all reasonable times.

The entire Health and Safety File, along with all the associated information shall be stored by the Contractor and supply chain on 4-Projects. The Format shall be agreed with the PSDP as set out in the Preliminary Health and Safety Plan.

3.3.21 TECHNICAL SUBMITTALS

3.3.21.1 Method statements

BAM will prepare detailed method statements covering key elements of the works to be carried out for the Main Contract Phase A. Method statements to be submitted for the Main Contract Phase A will cover the following works (including all temporary works) with further method statements to be developed and submitted as required:

- Noise and Vibration Monitoring
- Airborne Dust Monitoring
- Archaeology
- Condition Surveys
- Structural Monitoring of Buildings
- Hoarding
- Mount Brown Access
- Main Excavation Works including the Removal of Material off site
- Materials Testing
- Dewatering
- Construction of the Central Access Road
- Sheet piling
- Traffic Management for Central Access Road tie-ins
- Traffic Management for Other Works
- Establishment of site compound at Linear Park
- Open cut Drimnagh Sewer installation
- Micro tunnelling - Drimnagh Sewer
- Connections to existing Drimnagh Sewer
- Construction of shafts for Drimnagh Sewer
- Permanent Diversion of the Drimnagh Sewer
- Secant Piling
- Contiguous Piling – Temporary Works for Utility Tunnel
- Temporary Propping of Piles
- Auger Piling under Flue Stack

- Utility Tunnel Excavation
- Utility Tunnel Construction
- Waterproofing & Backfilling to Utility Tunnel
- M&E Fit Out to Utility Tunnel
- Utility Tunnel Tie-in – incl. M&E works
- General Concreting Works
- Tower crane installation
- Frame Erection

BAM will submit Method Statements for all works to the Employer's Representative for approval in advance to the commencement of any related works. The Method Statement will contain, but is not limited to the following:

- a. Method of Construction
- b. Sequencing
- c. Inspection and Test Plan (ITP)
- d. Timing and duration

3.3.21.2 Material Approval Requests (MARs)

BAM will submit Material Approval Requests (MARs) for all materials intended to be used in the permanent works. The proposed materials should comply with all requirements within the Specification and any other relevant drawing / specification supplied for the works. Each MAR must be reviewed and approved by the Employer's Representative prior to the commencement of any related works.

Where materials and products are subject to CE marking, MAR submissions will include the associated documentation and Declaration of Performance Certificates.

3.3.21.3 Contractor Submittals

Where required, BAM shall submit calculations, drawings and specifications as requested by the Employer's Representative, for example:

- Temporary Works design & calculations associated with all structural elements, demolitions, excavations, piling etc.;
- Temporary de-watering system for site;
- Concrete mix design;
- Structural steel connection design and anchor design;
- Structural steel design for façade support;
- M & E co-ordinated works drawings;

Shop and specialist drawings, calculations to support details and components chosen and any other relevant information shall be submitted in advance before manufacture begins.

BAM shall check that all shop and installation drawings are complete and co-ordinated and shall confirm in writing to the ER/Engineer that he has done so, prior to submission.

Details of temporary works including method statements shall be submitted to the Employers Representative for review a minimum of 20 working days prior to commencement of work.

The Specialist Piling Sub-Contractor is to submit two hard copies of all calculations, drawings, specifications, product data sheets etc. as a full submission. This submission shall be submitted in sufficient time in advance of the works to allow 20 working days for response from the Design Team.

3.3.22 Notice of Inspections – INF & BC(A)R

An Inspection Notification Framework (INF) shall be developed with the Assigned Certifier and design team based on the Preliminary Inspection Plan (PIP) and accompanying documents and certificates schedule.

BAM shall comply with the “Code of Practice for Inspection and Certifying Buildings and Works” (as published by the Minister with reference to Article 20G of the Building Control Regulations).

BAM will submit Inspection Requests to the Engineer for all works related to the Inspection and Test Plan (ITP) contained within the relevant Method Statement. The Inspection Request will note the date, time, location and works to be inspected, and should be submitted to the Engineer a minimum of 48 hours prior to the required inspection. BAM will complete pre-pour inspection sheets before placement of any concrete and prior to Design Team inspections of same, with post pour inspection sheets also being completed.

3.3.23 Design Requirements (Temporary)

For any temporary works, a full design and check (external) where applicable shall be carried out by a competent Chartered Engineer to current Eurocodes and the associated Irish National Annexes. It is envisaged that any temporary design works will be completed as required during the course of the works and shall include the following (non-exhaustive list):

1. Hoarding;
2. Demolition;
3. Construction/alterations to Energy Centre – Falsework/Scaffolding;
4. Traffic Management;
5. Shuttering system for the construction of the utility tunnel;
6. Temporary piles to facilitate construction of the utility tunnel;
7. Support to temporary piles to facilitate excavation works;
8. Shuttering system for construction of the utility tunnel shafts;
9. Fixings for surface mounting the temporary diverted watermain.

Temporary works will be developed as the works progress and any further requirements will be regularly assessed. Where temporary works are identified, BAM's Temporary Work Co-ordinator Jim Dillon will liaise with a Designer to establish the design requirements. Upon completion of a temporary works design, installation of that particular element will be carried out. The installation will be inspected post completion by the Designer and a certificate issued.

The PSDP will be advised of all temporary works requirements and will coordinate between designers. A register of temporary works will be established and updated as necessary. Design risk

assessments and temporary works certificates will be forwarded to the PSDP for countersignature prior to the works being installed on site.

All Temporary Works Design and coordination will be carried out in accordance with BAM's Temporary Works Procedure, part of the Safety & Health Plan.

3.3.24 ARCHAEOLOGY

3.3.24.1 Archaeological Requirements

BAM will carry out the works as outlined within the works requirements and any relevant method statements. All site investigations and excavations will be monitored by an Archaeologist in accordance with Planning Condition No.15 of the granted permission. Should any unforeseen event occur such as the discovery of uncharted underground services, BAM will submit a proposal to the Employers representative in advance of commencing associated slit trench or general bulk excavation works. Any such proposal will ensure that all archaeological mitigation requirements are met.

The Archaeological Consultant represented by an Archaeologist used during the Enabling Works Contract will be retained by BAM for the Main Contract and will implement the Archaeological Strategy detailed above and/or any deviation from the works requirements for the proposed works. The Archaeologist will be highly experienced within his/her field, licensed and suitably qualified for the position. The initial site strip will be undertaken under the supervision of BAM's archaeologist, who will monitor both site clearance and excavation works. The presence of BAM's Archaeologist on site will ensure Archaeological findings discovered on site are identified and protected as appropriate, and any applicable testing is carried out.

3.3.24.2 Archaeological Findings

Should any finding of Archaeological importance be found, BAM will follow protocol as outlined below:

- i. Fence off the area to protect the findings from disturbance.
- ii. All mechanical excavations will cease in the area immediately and the excavator will move to a different location.
- iii. Clearance or machine works in the affected area shall stop immediately.
- iv. BAM will inform the Employer's Project Archaeologist who will liaise with the ER.
- v. BAM's Archaeologist will revise the relevant Method Statement, submit to the ER and Employers Project Archaeologist, incorporate relevant comments and submit final Method Statement to the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Additionally a copy of the approved Method Statement will be submitted to the Archaeology Office of Dublin City Council (DCC) for comment prior to submission to the National Monuments Service and National Museum of Ireland. The Method statement will have considered all requirements as set out in the works requirements and with the Department of Arts, Heritage, Gaeltacht and the Islands Policy and Guidelines on Archaeological Excavation.
- vi. Findings will be clearly and individually labeled, contained in bags, location identified etc.... as set out in the NMI Advice Notes.
- vii. In the event any human remains are discovered BAM's Archaeologist will inform the client and a specialist oesteo-archaeologist will be summoned to site. As a minimum An Garda Síochána, National Museum of Ireland and the County Coroner for Dublin will be contacted. Other specialists such as conservator and palaeoenvironmental consultants will also be notified.
- viii. BAM's Archaeologist will confirm when all Archaeological excavations have been complete to the Employer's Project Archaeologist and ER.

3.3.24.3 Reports

BAM's Archaeologist will submit Archaeological progress reports as set out in the works requirements which will detail, plant details, personnel/staff and details of works under taken. The Archaeologist will attend and submit reports for fortnightly meetings.

Draft, preliminary and final reports will be submitted to the Project Archaeologist for review. The final reports, which will incorporate comments, will be submitted to the National Monuments Section of the Department of the Environment, Heritage and Local Government, to the National Museum of Ireland and the Archaeology Office of DCC.

3.3.24.4 Archiving

BAM's Archaeologist will ensure, subject to approval from the client, that site archive material from archaeological investigations is archived in accordance with the Dublin City Archaeological Archive Guidelines and the relevant method statements which includes but is not limited to the following:

- i. Description/details of findings
- ii. Digital and hard copies will be provided
- iii. Photographs
- iv. Labeled in accordance with the requirement of DCLA
- v. Maps, plans, drawings etc.
- vi. Placed in appropriate filing boxes.

3.4 WASTE MANAGEMENT

3.4.1 Introduction

As part of the Project Execution Plan (PEP), BAM are also developing a site specific Waste Management Plan which will be adopted for the duration of the works (included in Appendix C of this CMP). BAM will dispose of all materials generated in accordance with all current waste disposal legislation and guidelines. Any contaminated material identified on the site will be tested and disposed of to an appropriately licenced facility, in line with the procedures outlined in the Waste Management Plan.

All waste generated on site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed contain-all disposal facilities. Haulage permits will be made available to the client as proof of compliance and these will be issued to DCC Environmental Department if requested. BAM make particular reference to the disposal of asbestos in this contract. Full documentation will be made available for the transportation and appropriate disposal of this hazardous material.

Any contaminated material identified on the site will be tested and disposed of to an appropriately licenced facility, in line with the procedures outlined in the Waste Management Plan. Areas of the site identified through the initial site investigation/soil classification reports as being noted as potentially containing non-inert/contaminated material will be pre-tested prior to works i.e. bulk cut occurring in any specific area. Specific locations where underground fuel tanks exist will also be targeted on this process.

Disposal/haulage dockets will be kept on site as a record of waste leaving site and segregation of waste into skips will form a key part of the overall strategy of the BAM waste management plan.

The following legislation is to be adhered to in all works:

1. Waste Management Act 1996 (S.I. No. 10 of 1996) as amended by the Waste Management (Amendment) Act 2001. Sub-ordinate legislation includes:
 - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended 2011 (S.I. No. 323 of 2011);
 - Waste Management (Collection Permit) Regulations S.I No. 820 of 2007 as amended 2008 (S.I. No 87 of 2008);
 - Waste Management (Facility Permit and Registration) Regulations, S.I No. 821 of 2007 as amended 2008 (S.I No. 86 of 2008);
 - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004), 2010 and (S.I. No. 350 of 2010);
 - Waste Management (Packaging) Regulations 2003 (S.I. No. 61 of 2003) as amended 2004 (S.I. No. 871 of 2004), 2006 (S.I. No. 308 of 2006) and 2007 (S.I. No. 798 of 2007);
 - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997);
 - Waste Management (Landfill Levy) Regulations 2011 (S.I. No. 434 of 2011) as amended 2015 (S.I. No. 189 of 2015);
 - European Communities (Waste Electrical and Electronic Equipment) Regulations 2011 (S.I. No. 355 of 2011);

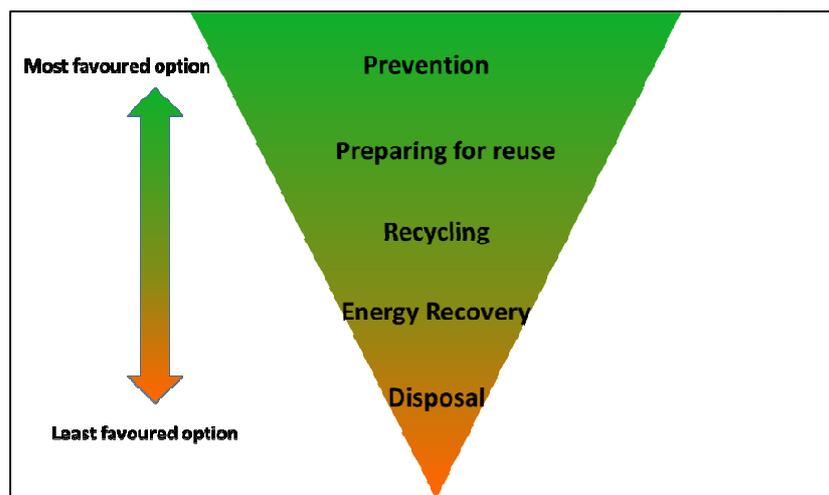
- Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009), as amended 2015 (S.I. 190 of 2015) and European Union (Household Food Waste and Bio-waste) Regulation 2015 (S.I. No. 191 of 2015).
2. Litter Pollution Act 1997 (S.I. No. 12 of 1997);
 3. Protection of the Environment Act 2003 (S.I. No. 413 of 2003).

3.4.2 Waste Management of Demolitions

All waste materials arising from the demolitions at St. James Hospital for the Enabling Works Contract and Main Contract Phase A are managed and disposed of in accordance with the:

- Provisions of the Waste Management Acts 1996 – 2013 and associated regulations;
- Project Specific Construction Requirements (Contract Documents);
- The Company Environmental Management System;
- Best Practice Guidelines on the preparation of waste management plans for construction and demolition waste projects.

As stated in BAM's Waste Management Plan for the Main Contract Phase A, BAM's Recycling/Waste Management Goal is to manage all waste in accordance with the relevant statutory provisions and the waste hierarchy:



BAM's Waste Management Hierarchy

BAM's approach to waste arising from demolition works is to:

- Maximise the reuse of soils and rock on site during the construction of the project;
- Segregate construction and demolition wastes into reusable, recyclable and non-recyclable materials;
- Reuse and recycle materials on site during construction where practicable;
- Recycle other recyclable materials through appropriately permitted / licensed contractors and facilities; and
- Dispose of non-recyclable wastes to licensed landfills.

BAM will provide a dedicated fenced off waste handling and segregation area (i.e. a waste compound) on the site. Construction and demolition waste of the non-bulk type will be brought to

the waste compound for sorting and segregation into designated skips for off-site recycling or disposal. Skips/bins shall be distributed around the site for the collection of rubbish and non-bulk type waste, for transfer to the waste compound.

The waste compound and other waste areas will be large enough to ensure safe delivery and collection of skips and waste containers. Each waste skip and bin will be clearly labelled as to the type of waste contained.

3.4.3 Waste Management of Excavations

OCSC document "*Soil Classification, Site Investigation & Groundwater Monitoring Report*" (doc. ref. no. NPH-C-OCSC-9010-0001) details areas on the site where hazardous material has been identified, and further areas which have been identified as "potentially contaminated areas". A specialist contractor will be brought in to classify the material in this area by:

- (a) reviewing testing to date, and
- (b) carrying out further testing using an accredited laboratory.

As stated previously, WAC testing will be carried out on an ongoing basis throughout the bulk dig works to ensure excavated material being removed from site is sent to an appropriate location based on its composition.

All excavated material will be disposed of in an approved manner and to an approved licenced location. Records of the source of each load leaving site will be kept for traceability purposes. Copies of all collection, delivery and acceptance at approved licence location documentation will be kept on site.

3.4.4 Main Construction Works

During the construction phase, waste will be produced from surplus materials such as broken concrete blocks or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. However, BAM will be required to ensure that oversupply of materials is kept to a minimum. In a similar fashion to the demolition phase, waste materials will be segregated at source and placed in dedicated skips such as general waste, wood, mixed ferrous and concrete rubble on site to maximise the opportunity for reuse/recycling/recovery of materials.

3.5 CONSTRUCTION TRAFFIC MANAGEMENT

3.5.1 INTRODUCTION

The location of the construction site for the NCH on a live hospital campus in a residential and densely populated area requires meticulous planning to ensure the impacts during the construction stage are minimised for both St. James's Adult Hospital and the surrounding local residential community. First and foremost, uninterrupted blue light passage for emergency vehicles must be afforded at all times. In addition, the services access to St. James's Hospital must also be maintained.

3.5.2 TRAFFIC MANAGEMENT PROPOSALS PHASE A

For each temporary traffic management proposal, BAM will liaise with their traffic management designer – Total Highway Maintenance – resulting in a carefully considered temporary traffic management design in compliance with DCC's *"Directions for the Control and Management of Roadwork's in Dublin City"* and designed in accordance with the NRA's *"Traffic Signs Manual: Chapter 8 – Temporary Traffic Measures and Signs for Roadworks"*. The TTM design and associated Temporary Works Certs is signed by Total Highway Maintenance designer and countersigned by the PSDP following successful review. The completed TTM package including certs is then issued to the Employer's Representative and DCC for approval. BAM will liaise directly with DCC's Roads and Traffic Department and Roadworks Control Unit to obtain all the necessary road opening licenses and T2 permits.

BAM shall be responsible for the design, implementation, maintenance and removal of all necessary TM to complete the construction works. All plans developed will accommodate the various stakeholders, in particular uninterrupted blue light passage for emergency vehicles directly to the Accident & Emergency Department.

In addition, various stakeholders such as SJH, Dublin Bus, DCC, and ambulance service will also be fully consulted prior to any TM plan being implemented. Access/egress for construction traffic will be from the Rialto Gate entrance initially, with an access/egress point to be located at Mount Brown also, operational from Month 4.

3.5.2.1 Construction Access to the Site

The construction access strategy to serve the construction works of the new children's hospital will be consistent with the designated HGV routes in the city centre and will form the primary access and egress routes between the construction site and the external road network.

BAM will maintain protected vehicle and pedestrian/staff access routes as well as blue light and service vehicle access into and through the campus from the Rialto Gate, as well as to the Emergency Department, Energy Centre, Delivery Hub, south perimeter road.

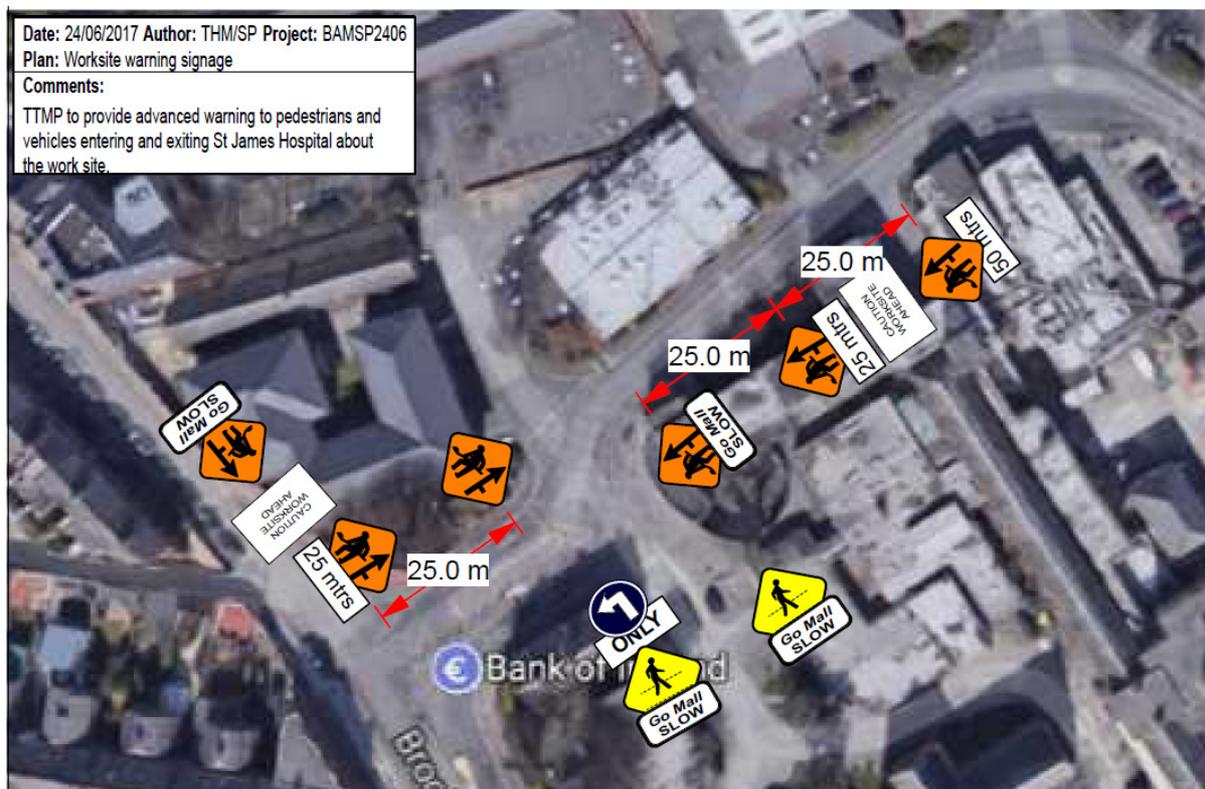
Where feasible, TM proposals will be designed to minimise the travel distances of HGVs through the campus to the works areas. BAM will minimize HGV movements insofar as is possible during the hours of 07:00 – 09:00 Monday to Friday. This minimisation of HGV's will be managed by BAM engaging with all suppliers and delivery drivers. Notifications will be issued with all enquiries to subcontractors and suppliers advising them of this restriction. This requirement will be included in the pre-start meeting with all subcontractors. BAM security personnel will monitor this on site, with any infractions of this site rule being reported to BAM management for appropriate action to be taken.

3.5.2.3 Traffic Management through the Campus

3.5.2.3.1 Current Arrangement

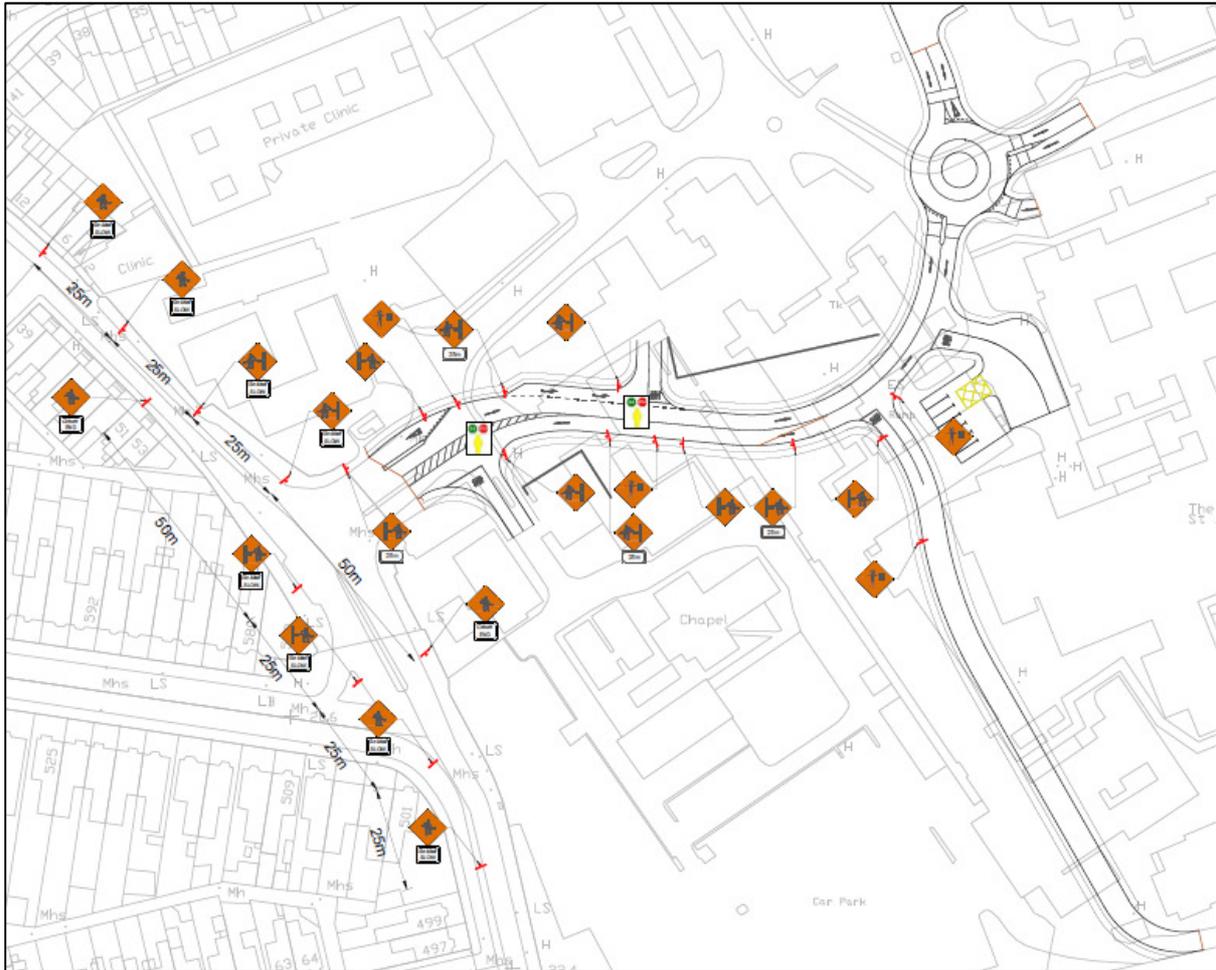


Extract from drawing "Traffic Management Plan to Enable Removal of Spoil at Ambulance Centre Car Park, St. James Hospital", included in Appendix H



Extract from drawing "Worksite Warning Signage – Rialto Gate Access A", included in Appendix H

3.5.2.3.2 From Month 9 (via Temporary Central Access Road)



Extract from drawing 16_132_00_3800 "Proposed Traffic Management Plan", included in Appendix H

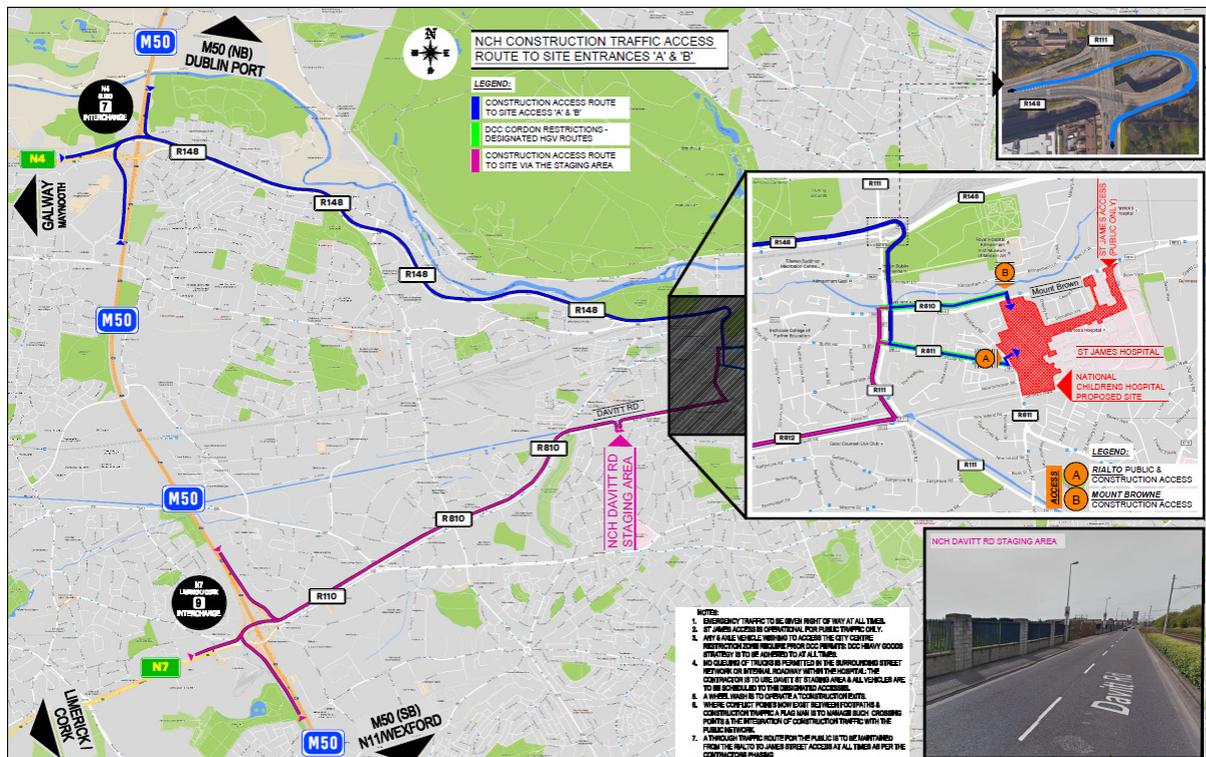
3.5.2.3.3 From Month 18 (via Permanent Northern Access Road)



Image above at Month 18 shows the live Permanent Northern Access Road (yellow) with works underway to remove the Temporary Central Access Road (red).

3.5.2.4 Construction Routes from the M50

To ensure efficient HGV movements arising from the works on the local road network, BAM have developed a temporary traffic management layout for transportation routes to the NCH Construction Accesses A & B from the M50:



Extract from drawing 16 EM001a "Temporary Traffic Management Layout for Transportation Routes to the NCH Construction Accesses A & B from the M50"

This layout ensures that HGV's heading to and from the construction site remain on main arterial routes and regional roads. The need for adherence to this traffic management plan will be set out to all subcontractors appointed by BAM, with BAM to monitor same on an ongoing basis to ensure compliance by all parties.

3.5.3 TRAFFIC MANAGEMENT PLAN

3.5.3.1 Introduction

In compliance with the requirements of the Project Execution Plan, BAM will prepare a Construction Traffic Management Plan which will be updated throughout the course of the project to capture all specific TM and pedestrian management proposals developed during the works. Each proposal will be submitted in advance of implementation for approval by the Client and DCC.

BAM's Main Contract Phase A Traffic Management Plans in accordance with the Dublin City Council document "*Directions for the Control & Management of Roadworks in Dublin City*".

Specific TM and pedestrian management plans will be developed for the following programmed works:

- i. Installation of further perimeter hoarding in public areas as required for Main Contract Works.
- ii. Provision of underground pedestrian route for construction personnel beneath the main blue light/emergency vehicle access linking the east and west sections of the construction site
- iii. Re-location of main compound to the south boundary adjacent to Linear Park for the Main Contract Phase A.
- iv. Provision of an off-line loading bay along South Circular Road between the junctions of Mount Brown and Suir Road (subject to agreement with Dublin City Council);
- v. the connection of the traffic signals controlling the existing mid-block pedestrian crossing along South Circular Road to the traffic signals at the junction of South Circular Road/ Mount Brown
- vi. Upgrade Works in Linear Park.
- vii. Works associated with service diversions (including *removal of spoil from ambulance centre car park* and *removal of spoil St James' Hospital*)
- viii. TM plan to facilitate construction of the Central Access Road, incorporating access to Hospital from Brookfield Road, blue light access to A&E, and services access.
- ix. TM plan for Central Access Road
- x. TM plan for access and egress to the Davitt Road compound.

The above is a non-exhaustive list and further plans will be developed as and when required.

Initial traffic management proposals as tabulated below have been developed and are contained within Appendix H:

Drawing No.	Drawing Title:
16 EM00x	Temporary Traffic Management Layout for Internal Site Traffic & Pedestrian Management to Facilitate Construction Works: Phase 1a & 1b
16 EM00x	Temporary Traffic Management Layout for the Temporary Mount Brown Access Arrangement to Facilitate Construction Access/Egress
16 EM001a	Temporary Traffic Management Layout for Transportation Routes to the NCH Construction Accesses A & B from the M50
-	Traffic Management Plan to Enable Removal of Spoil at Ambulance Centre Car Park, St. James Hospital
-	Worksite Warning Signage – Rialto Gate Access A
16_132_00_3800	Proposed Traffic Management Plan – Realigned Central Access Road
16_132_00_2200	Access Road Layout
16_132_00_2001-CM00	Proposed Access Road Phasing Arrangement
16_132_00_2002-CM00	Proposed Access Road Phase 1
16_132_00_2003-CM00	Proposed Access Road Phase 2
16_132_00_2004-CM00	Proposed Access Road Phase 3
16_132_00_2900-CM00	Access Road Profile
16_132_00_2901-CM00	Access Road Cross Sections

Additional traffic management plans will be developed and implemented as the works progress. These plans will take into account pedestrian and vehicular movements in and around the campus.

3.5.3.2 Contents of Traffic Management Plan

The construction TMP will include but not limited to the following headings:

1. Health & Safety
2. Temporary Signage
3. Temporary Road Markings
4. Temporary Road Closure
5. Operation of a Contra Flow
6. Temporary Traffic Signals
7. Proposed changes to Street Infrastructure to Enable Roadworks
8. Arrangements for Local Access, Pedestrian and Cyclist Routes
9. Provision for pedestrian movements including any special provision required to facilitate the mobility impaired and disabled
10. Proposed use of Barriers
11. Proposed Lighting Arrangements
12. Proposed use of Flag Men
13. Arrangements for informing affected parties

This plan will include the following measures:

- The prohibition of construction staff parking within the campus to mitigate the potential traffic impact during the construction phase of the project;
- No queuing of trucks will be permitted on either the surrounding street network or the internal roadway within the hospital campus;
- The provision of a construction compound at the former Unilever Site at Davitt Road to allow for the storage of materials. The Davitt Road construction compound will also facilitate the

staging of construction traffic and allow for their orderly arrival on site. This will ensure that construction vehicles do not need to wait on the public street network near the St James's Hospital campus to access the construction site;

- The provision of a temporary internal access road to facilitate the construction of the new children's hospital maintaining access to St James's Hospital from South Circular Road for the entire duration of the construction project;
- The management and marshalling of construction vehicles on the public road within the hospital campus by flag men;
- Inclusion of the Mobility Management Plan for BAM construction staff and co-ordination with the St James's Hospital Campus Mobility Manager during the course of the construction project.

3.5.4 CONSTRUCTION VEHICLE GENERATION

3.5.4.1 Introduction

Construction traffic will be generated for the duration of the works on site, with levels of vehicles movements varying throughout the construction period depending on the construction activities on-going. The construction vehicle generation will be from a number of sources:

- Hauling of demolition and excavated material off site;
- Concrete deliveries;
- Deliveries of reinforcement & formwork and other building materials such as drainage goods etc. to site.

The levels of construction traffic will vary during the weeks and almost on a day to day basis, with peak volumes predicted to be during combinations of the following activities:

- Demolitions;
- Excavations;
- Typical concrete pours for foundation/sub-structure and rising elements;
- Large concrete pour for basement/foundation slabs at levels B2 and B1.

BAM will enforce the no-parking policy for construction workers on or around the site. BAM's Mobility Management Plan (included in Appendix G of this document) sets out alternative measures for the safe mobilisation of the construction workforce to and from the site.

All HGV traffic entering and exiting the works site will be recorded by the site security company. Details of the date, time and type of load will be recorded and maintained in a central register on the BAM system.

3.5.4.2 Initial Phase (Months 1-6)

During the first 6 months of the Main Works Contract Phase A, works will be largely machine based with numbers of construction workers numbering approximately 60 -70.

Initially there will be two piling rigs on site, with up to 10 no. truck movements required to remove spoil from the site each day and 15 no. truck movements to deliver the concrete for the piles each day. To meet programme requirements the number of piling rigs may be increased to 3nr.

Construction vehicle generation from the Main Dig will be steady, with up to 100 truck movements required daily to meet the construction programme in removing the 413,000m³ of excavated material off site over the course of 367 week days.

3.5.4.3 Main Construction Phase (Months 7 -15)

During the Main Construction Phase, the site may have up to 4 piling rigs in operation, resulting in up to 20 no. truck movements required to remove spoil from the site and 56 no. truck movements to deliver the concrete for the piles.

Construction vehicle generation from the Main Dig will remain steady at almost 150 truck movements per day.

Contract Month	Date	Basement Exc m3	Load per month	Load per day (5 day week)	Pile Arisings m3	Load per month	Load per day (5 day week)	Total Load Muck Away / Day	Concrete to Piles m3	Load per month	Load per day (5 day week)	Concrete to Frame m3	Load per month	Load per day (5 day week)	Total Concrete Trucks / Day	Vehicle in per day
M-2	Jun-17															
M-1	Jul-17	12,969	1,081	51	484	40	2	53	484	65	3				3	57
M01	Aug-17	12,910	1,076	47	2,663	222	11	58	2,663	355	15				15	73
M02	Sep-17	18,274	1,523	73	2,651	221	11	84	2,651	353	17				17	100
M03	Oct-17	11,886	991	45	2,205	184	9	54	2,205	294	13				13	68
M04	Nov-17	19,244	1,604	73	2,601	217	11	84	2,601	347	16				16	99
M05	Dec-17	8,550	713	34	2,104	175	9	43	2,104	281	13				13	56
M06	Jan-18	22,134	1,845	80	2,636	220	11	91	2,636	351	15				15	106
M07	Feb-18	25,508	2,126	106	2,433	203	10	116	2,433	324	16				16	133
M08	Mar-18	29,523	2,460	112	1,896	158	8	120	1,896	253	11	2,294	306	14	25	145
M09	Apr-18	31,137	2,595	124	1,485	124	6	130	1,485	198	9	2,710	361	17	27	156
M10	May-18	38,362	3,197	139	1,074	90	4	143	1,074	143	6	3,455	461	20	26	170
M11	Jun-18	35,798	2,983	142	1,264	105	5	147	1,264	169	8	7,859	1,048	50	58	205
M12	Jul-18	26,282	2,190	100	474	40	2	102	474	63	3	9,437	1,258	57	60	162
M13	Aug-18	24,759	2,063	90				90				8,206	1,094	48	48	137
M14	Sep-18	23,974	1,998	100				100				11,135	1,485	74	74	174
M15	Oct-18	12,452	1,038	45				45				8,140	1,085	47	47	92

Table above shows the Projected Vehicle Generation for the Main Contract Phase A (Months 1 - 15)

3.5.5 Davitt Road Staging Area

The Davitt Road construction compound / staging area will support the storage of materials to allow for the orderly delivery of materials to the St James's Hospital campus and to stage construction vehicles before proceeding to the St James's Hospital campus. This will ensure that any goods / materials delivered to site are those for immediate incorporation into the permanent works.

The operations that will generate traffic at the Davitt Road Construction Compound primarily comprise:

- The staging of concrete trucks, before proceeding towards the St James's Hospital campus;
- Deliveries of building materials for storage before transfer to St James's Hospital campus;
- Transfer of materials to the Main Construction site.

Vehicle generation at the Davitt Road site is likely to be up to 40 movements/day during the first 8 months of the project.

3.5.6 Measures to Minimise Impact of Construction Traffic Generated by the Works

1. BAM to ensure that only the construction access routes agreed with Dublin City Council are used;
2. BAM will minimize HGV movements insofar as is possible during the hours of 07:00 – 09:00 Monday to Friday. This minimisation of HGV's will be managed by BAM engaging with all suppliers and delivery drivers. Notifications will be issued with all enquiries to subcontractors and suppliers.
3. BAM will strictly enforce the policy of no construction staff parking within the SJH Campus;
4. BAM will not allow trucks wait/ queue on the surrounding road network or on the internal roadway within the hospital campus;
5. BAM will assign flag men to manage construction vehicle access onto the public roadways, both within the campus and at both Accesses A (Rialto) and B (Mount Brown);
6. BAM have prepared a Construction Stage Mobility Management Plan for agreement as part of the Construction Management Plan – this document is included within under Appendix G;
7. BAM have appointed a Contractor Mobility Manager to liaise with the St James's Hospital campus Mobility Management team;
8. BAM will carry out regular travel surveys among construction staff, and review the results;
9. BAM will provide direct pedestrian access to the construction site from both the Rialto Luas stop and the Rialto entrance from South Circular Road (TM drawings for same currently being prepared);

10. BAM will provide on-site bicycle parking for construction staff;
11. BAM will promote the 'Cycle to Work' and the 'TaxSaver' scheme among construction workers;
12. BAM will prepare a Wayfinding Strategy to assist members of the public once they arrive on campus who may not be familiar with the revised access road arrangements;
13. Dust suppression measures (e.g. damping down during dry periods), vehicle wheel washes, road sweeping and generally housekeeping will ensure that the surrounding environment is free of nuisance dust and dirt;
14. BAM will implement a road sweeping programme, monitoring same to ensure its effectiveness.
15. BAM will prefabricate M&E elements to reduce multiple deliveries and personnel numbers on site.

3.5.7 Mobility Management Plan

To ensure the successful mobilisation of construction workers to and from the site, BAM have prepared a Mobility Management Plan (included in Appendix G of this document). BAM have also appointed Yvonne Brophy as the Mobility Manager.

The following measures are to be implemented by BAM's Mobility Manager to deliver the strategies set out within this Plan:

- Liaise directly with the Mobility Manager for the St James's Hospital campus;
- Carry out travel surveys among contractors based on site;
- Actively promote the Mobility Management Plan measures among construction staff;
- Promote direct pedestrian access to the construction site from both the Rialto Luas stop and the Rialto entrance from South Circular Road;
- Ensure secure storage facilities are provided for construction staff to store tools and other work equipment;
- Ensure ample bicycle parking is provided for construction staff;
- Ensure sufficient changing facilities are provided for construction workers within the construction site
- Promote the 'Cycle to Work' scheme among construction staff
- Promote the 'TaxSaver' tickets among construction staff

3.5.7.1 Pedestrian Access During the Works, including a Wayfinding Strategy on Campus

BAM will provide high quality and consistent way-finding signage throughout the site in accordance with the "*Exemplary Site Set-Up Manual- Safeway*" document included at the Appendices of the Prelim Health and Safety Document. BAM will include for all signage which may be required to ensure that the public, staff and visitor, and the contractors, sub-contractors and suppliers can easily navigate the site. The signage will be subject to ongoing review to be changed and adapted throughout the Project as required.

3.5.7.2 Car Park Management During the Works

It is a noted restriction in relation to parking on the site. As part of the BAM Safety Induction (which is a requirement for all personnel who work on the site) all persons being inducted are advised of the parking restriction on site and that parking in the surrounding areas is to be avoided, and advise all that the Luas and bus networks should be used where possible as a means of transport to the site. Bicycle parking is available on site and is encouraged by BAM. BAM have arranged for park and

ride facilities to be established in Saggart which will allow for personnel to park cars and use the Luas or bus routes to the site. This facility will be established during Phase A of the project.



Image above shows location of Saggart LUAS station relative to Saint James's Hospital

3.5.7.3 Registration of Contractors' Vehicles and Drivers with SJH

All contractors' vehicles accessing the site shall be registered with SJH. BAM will liaise with the ER to provide a list of current vehicle number plate registrations, drivers and company names to be provided via ER to SJH security.

4.0 ENABLING WORKS

4.1 INTRODUCTION

The construction of the National Paediatric Hospital on the St. James's Hospital site will involve a series of demolition and enabling works to be undertaken in a carefully controlled sequence to achieve a clear site for the build. The purpose of the enabling works is to:

- Secure the site and organise the presence of the Main Contractor and the protection of live campus activities;
- Maintain blue light and emergency traffic access to and from the campus;
- Provide new utility connections to facilitate the clearance of the National Paediatric Hospital site;
- Safely divert all live services away from the National Paediatric Hospital construction footprint;
- Install new services infrastructure;
- Safely prepare and demolish the existing buildings to be removed, including removal of asbestos;
- Clear the site and prepare for large scale excavation;
- Excavate where possible and prepare the site for the Main Construction works generally.

The Enabling Works Contract was awarded to BAM Civil Limited who commenced works in August 2016 and has an anticipated completion date of August 2017.

4.2 DEMOLITION

4.2.1 Building Demolition

As part of the Enabling Works Contract, demolition is being carried out to buildings as per the decanting strategy, and as outlined in drawing NPH-C-OCSC-DR-XX-00-0001.

While demolition works near completion, and due to the overlap between both Contracts, demolition of the following buildings will be undertaken following commencement of the Main Contract Phase A:

- Hepatology Building
- Private Clinic
- Medical Gas Building
- Medical Information Centre
- National Centre for hereditary coagulation

The demolition of these buildings has been covered under specific method statements submitted under the Enabling Works Contract.

All existing services currently contained within the properties will be removed and/or diverted. The services currently anticipated are Water, Electricity, Gas and Sewage and Eircom. In addition, fire alarm panels and CCTV will be of particular importance as they are, in all likelihood, linked to a main panel located in the main hospital. BAM note that building services may be linked to each other in a "daisy chain" type effect and that these services will have to be broken and reconnected in a controlled fashion prior to demolition. This will be confirmed with the relevant service provider and the hospital technical services department in advance of any demolition works. All sewer drains will be sealed at the manhole immediately outside the building line.

Asbestos

A full and detailed asbestos survey report will be developed once each building is formally handed over to BAM. These surveys will be performed by a specialist surveyor. The resulting reports will be submitted for review to the ER for each building prior to the removal of asbestos commencing.

The slates on many of the buildings are Asbestos cement and will be dealt with using the guidelines set out by the HSA publications for dealing with Hazardous substances and in line with the Safety, Health and Welfare at (Construction) Regulations 2006. Operatives, wearing harnesses fixed to a secure point via a lanyard, will gain access to the roof of the property using a boom hoist. They will strip the roof slate and remove them by hand from both properties. All elements of asbestos found through the survey will be removed by a specialist sub-contractor and disposed of to a suitable facility. On completion of the asbestos removal by the sub-contractor, the specialist consultant will re-survey the building and give sign off that the asbestos has been removed. Demolition will commence once the clearance certificate has been issued. Full transport and deposition records for the removed asbestos will be made available to the client on completion of the works.

A soft strip of the building will be carried out to remove all fixtures/fittings and M&E items. All site waste will be segregated prior to removal off site. Some large items, such as cabinets etc. may be left in place and will be segregated during the demolition stage by the demolition excavator. All sharps (if found) will be placed in sharps boxes for separate disposal.

The walls of the structure will be demolished using the selector grab to topple those inwards in a controlled manner. The first floor (where present) will be removed in a similar manner to the structure. When all structures have been demolished, the selector grab will be changed to a traditional bucket attachment and the rubble loaded into skips / tipping trailers for removal off site to a suitable facility. Dust mitigation in the form of sprinklers and dustbusters will be used during the heavy demolition works. Spoil will be removed from site as soon as possible after demolition, with a minimum of stockpiles of material left on site at any time, unless agreed otherwise with the ER.

4.2.2 Demolition – Other Works

While a large portion of the demolition and de-commissioning works form part of the Enabling Works Contract (EWC), localised areas of demolition are excluded from the EWC and shall be specifically carried out under the Main Contract. These include, but are not limited to:

- Demolition of diesel tank room in Energy Centre
- Demolition of existing retaining walls and flue stack adjacent to Energy Centre.
- Local demolition for connection of utility tunnel to Energy Centre and tie-in with existing tunnel.
- Local demolition of secant piles for utility tunnel and FM tunnel connection to the new hospital building.
- Buried tanks in Ambulance area.
- Underground weighbridge south of energy centre.

Method statements will be submitted for Client approval in advance of commencement of the above demolition works.

4.3 UTILITY DIVERSIONS

As part of the Main Contract Phase A, there is a requirement to carry out the following utility diversions:

- Temporary Watermain Diversion
- Utility Tunnel including diversion of its services
- Drimnagh Sewer

- O'Reilly Avenue connections to new foul sewer
- SJH Main drains (Storm and Foul)
- Fuel Oil diversionary works
- Medical gas alarm system
- Utility Tunnel ventilation systems

For each of the service diversions, removal, upgrading etc. BAM will carry out the following works:

- i. Liaise with and obtain consent from the relevant utility provider and SJH where appropriate.
- ii. Produce a specific Method statement for the required work, which will be submitted to the Employers Representative and the relevant utility provider for comment/approval.
- iii. A specific methodology and submission to Irish Water will be made with regard to the Drimnagh Sewer diversion for agreement prior to works commencing.
- iv. Address and incorporate comments
- v. Design, install, maintain and remove Traffic Management for each element of work (if required).
- vi. Design the service diversion in accordance with the utility provider's requirements.
- vii. Complete CCTV surveys pre/post as required (drainage)
- viii. Provide attendance to the relevant Utility provider
- ix. Compile as built information including specification sheets for the newly installed services
- x. Carry out relevant testing of installed services and commissioning
- xi. Provide all required handover documentation, including that required under BC(A)R and for all services diverted within the SJH campus that relate directly to the hospital.
- xii. Reinstate surface to original condition

Planning of Service Diversion Works

Prior to commencement on site, it is a policy of BAM to contact all relevant utility providers and to request a copy of all drawings which indicate the potential location of all services. It will be a priority to identify all major services within or in the proximity of the site and to put measures in place to ensure that these services are maintained at all times. A key component in assessing the precise location of underground live services is to undertake trial holes on any particular service to determine the exact location of same. This is carried out under the supervision of BAM by a specialised crew with archaeological monitoring as required. Once a service is located it will be surveyed to record the location prior to backfilling and marked with a coloured stake. A series of trial holes will be undertaken on a particular service in order to determine the precise route. In this way, the extent of services to be capped/truncated or diverted can be readily assessed prior to demolition works commencing.

ALL SERVICES UNCOVERED ARE TREATED AS LIVE UNTIL FINAL CONFIRMATION FROM THE CLIENT OR BY EXHAUSTING ALL AVENUES OF EXCAVATION CONFIRM OTHERWISE.

The planning and assessment of any potential diversionary work on any existing service supply forms an integral part of BAM's approach to the realization of a successful execution of the project. All relevant parties, including the specified utility provider and particularly the staff of the maintenance

section of SJH will be consulted in order to assess all implications in terms of shut downs, time constraints and suitability of time (day or night) for carrying out diversions. The basic principle that will be considered in developing any diversion strategy is to maintain continuity of service to SJH. Method Statements will be prepared for the following M&E / Utility Works:

- i. Electrical installations of small power, lighting and Cable Management Systems
- ii. Installation, testing & commissioning of Fire Alarm Systems
- iii. Installation testing and commissioning of BMS systems
- iv. Installation testing & commissioning of ICT systems
- v. Installation testing & commissioning of CCTV systems
- vi. Mechanical installation of pipework associated with Natural Gas
- vii. Mechanical installation of Medical Gas systems
- viii. Mechanical installation of domestic water systems
- ix. Mechanical installation of low temperature hot water and steam systems
- x. Strip out of mechanical systems
- xi. Strip out of Electrical ICT & Fire systems
- xii. Installation and modification of Medium Voltage system

On the basis of these consultation meetings, BAM will develop detailed methodology statements which will be based on parameters previously discussed/agreed at meetings. These method statements will be forwarded for review/comment and revised if required until all parties are satisfied the works can proceed on the basis of what is entailed in the method statement. A defined date and time for the works to commence and be completed will be agreed before works commence.

Due to the nature of this contract, BAM acknowledge that close co-operation with SJH nominated contractors will be necessary in order to allow an efficient decanting process of the existing buildings through each demolition phase. Any potential service disconnection works (externally) that are required by the SJH contractor will be undertaken in a timely manner in order to allow a particular building to be closed and prepared for demolition.

Prior to commencement of excavation/demolition works, the area to be excavated will be scanned thoroughly to identify any services, which may not have been picked up previously. A 'Permit to Dig' scheme will be operated in any areas to be excavated, whereby no excavation can take place until it has been signed off by the BAM Engineer in charge, and counter signed by the excavator driver and banksman.

4.4 UTILITY TUNNEL

These works will include:

1. The construction of a contiguous piled wall to the north of the site to facilitate the construction of the Utility Tunnel (part of temporary works). A temporary works design in accordance with Irish Eurocodes (including the Irish National Annex) has been submitted to the ER.
2. Construction of the Utility Tunnel including breakthrough works into CHP room of the SJH Energy Centre.

3. BAM carrying out necessary surveys to existing Utility Tunnel and Energy Centre as required to clarify the proposed extent and detailing of construction to final section of tunnel leading from the EC to future NCH basement B2 to take account of follow on Main Contract works.
4. In tandem with construction of the Utility Tunnel, BAM will construct the temporary works driveshaft chambers to facilitate follow on tunnelling for SJH main drains and Drimnagh Sewer installations.
5. Diversion of SJH MV from below hardstanding (between ESB Energy Centre and Utility Tunnel) to within Energy Centre to ARUP scope.
6. Temporary relocation of existing double doorset on southern façade of Energy Centre with adjacent fixed louver of same size, including relocation of all associated entry/access controls, provisions of new Fire Exit/Directional Signage etc. All to be reversed once new utility connection to the EC and associated works are completed.

Opes will be left in the roof of the utility tunnel to facilitate installation of M&E fittings as required. The redundant utility tunnel will be removed once the new Utility Tunnel is completed and all contained services within are "live". Where a void remains following the removal of the utility tunnel under building footprints and adjacent structures then this void shall be backfilled with C16/20 wet mix lean-mix concrete.

4.5 DRIMNAGH SEWER

The most significant civil service to be diverted on site is the Drimnagh Sewer. This is an existing public sewer line extending through the site of the new children's hospital and flowing in a south to north direction and alignment. The sewer comprises mainly twin (foul/combined and storm) 610mm diameter pipes, possibly understood to have been constructed c.1925 by tunnelling and enters the site at the southern boundary (adjacent to the existing St. James's Hospital Cardiac Unit) at a depth of approximately 8m below ground. At its deepest (in front of the existing St. James's Hospital Technical Services Building) the sewer is approximately 11m deep and at this point the storm line changes to a trapezoidal section and prior to connecting back into the sewer at Mount Brown changes profile to ovoid/flat semi-circular arch approximately 1m wide.

A combination of open cut and micro tunnelling techniques will be required to complete these diversion works.

A series of method statements covering all works associated with the Drimnagh Sewer will be submitted for the Client's approval in advance of the particular element of works commencing, including as a minimum the following elements:

- Open cut sewer installation
- Micro tunnelling installation
- Connections to existing Drimnagh Sewer
- Construction of shafts for Drimnagh Sewer

BAM note that there is a requirement to consult with third party bodies, namely, Irish Water and its appointed agent JB Barry & Partners and DCC and to gain agreement/approval for all related methodology and materials to be used prior to works commencing. The submissions will also include any temporary works required i.e. cofferdam/shaft construction. The following documents/information and obligations will be met by BAM:

- H&S plan.

- Any associated TM Plans – in particular the tie-in points to the existing network located on the Old Kilmainham Road.
 - Proposals for the use of construction materials such as pipe bedding/pipes/concrete/remediation products/manhole covers and iron mongery etc.
 - Advise Irish Water on any Technical, Quality, safety issues that may arise.
-
- Review all manhole designs including insitu concrete, precast concrete elements, permanent covers and internal fixtures ensuring safe access in line with industry standards and regulations.
 - Review and advise on overpumping proposals/method statements
 - Co-ordinating visits with the Site Supervisory Staff on a weekly basis, to monitor that the Works are being executed in accordance with Irish Water Agreement and Requirements and advising Irish Water on the result of site inspections. Reports to be issued no later than the following day after the site inspection to ensure any H&S issues can be escalated if required.
 - Producing weekly reports and a concluding report. If the works are stalled/stopped at any stage the weekly visit shall be postponed.
 - Review and comment on any design changes that emerge during the Contract.
 - Witness pipe testing and water testing of manholes and no flow diversion will be allowed to take place until the consultant has signed off on these tests.
 - Ensure defects are addressed before making the new pipe live.
 - Review Flow Diversion Contingency Plans and advise Irish Water if the plans are adequate for Irish Water to allow flows to be diverted.
 - On completion of the works Review comment on the defects list and make additions if necessary.
 - Review and comment on the draft Safety File to be developed by the PSDP for the project.
 - Certify in the capacity as third party checker in the form of a 'completion' document to Irish Water the satisfactory completion of the works and the satisfactory diversion of flows and handover of the Safety File in accordance with the required criteria.
 - Prepare a Project Completion Report in line with IW proforma and attend final close out meeting with Irish Water"

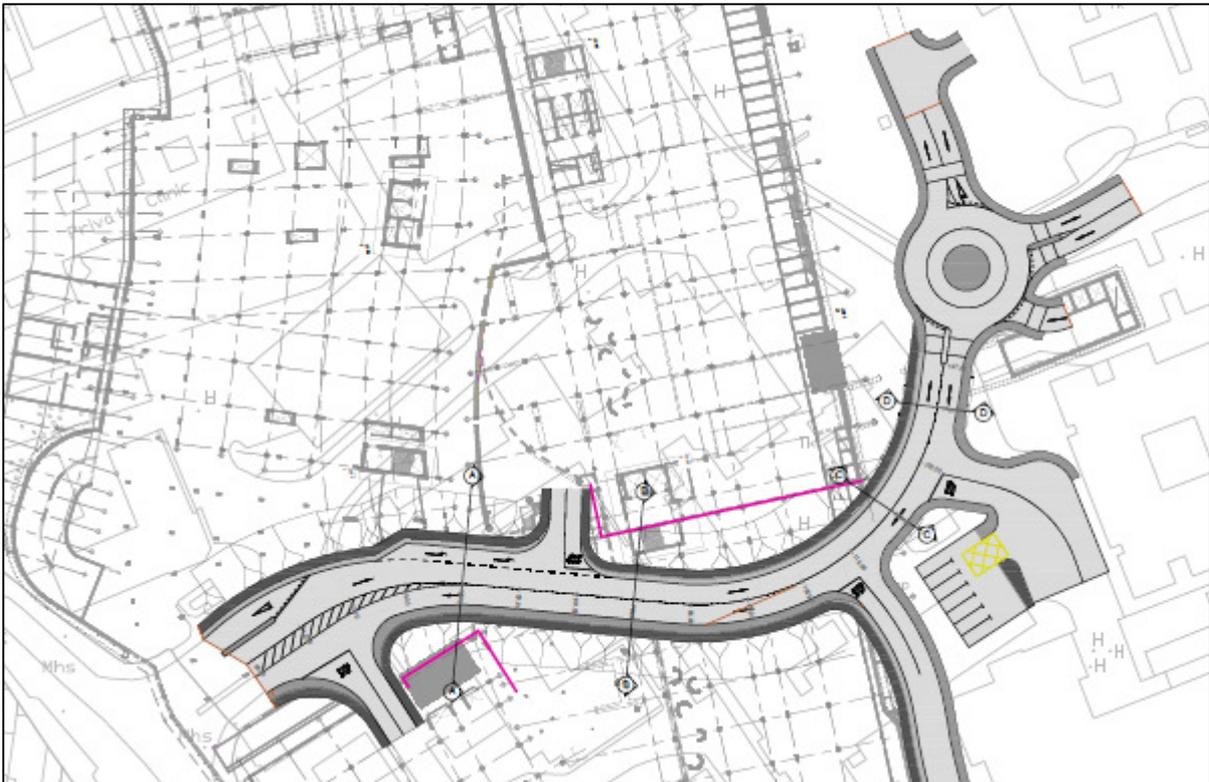
5.0 BASEMENT WORKS

5.1 INTRODUCTION

The Basement Works consist of all elements of the building structure up to and including the Level 00 slab. The basement footprint extends almost over the entire extent of the site, extending from the southern boundary accommodating Clinical/Out Patient Departments at lower ground level (single basement with car parking below at B01) to 2+ basement levels over the northern extent accommodating both car parking support services including FM Hub, Plant and Waste Marshalling Yard etc. The basement structure typically consists of a reinforced concrete cast insitu frame with concrete foundation slab, concrete walls and columns together with suspended concrete slabs at each floor level.

5.2 SITE SET-UP

The Basement construction works will be undertaken with the Central Access Road in place. As stated previously, the alignment of the Central Access Road is such that it runs parallel to a structural expansion joint providing an efficient and natural break point. It also avoids the new building's lift and stairwell shafts, allowing the structure to be constructed independently to each side, with infill works on the footprint of the access road to be undertaken immediately upon making live the permanent northern access road:



*Extract from drawing "Access Road Layout", drg. ref. 16_132_00_2200-C01.
Refer to Appendix I for full set of Central Access Road temporary works design drawings.*

5.3 SECANT PILE WALL & EXCAVATIONS

To facilitate the construction of the hospital in such a tight urban site location, the building footprint is contained within a secant piled wall. The detailed design of the secant pile wall is a Contractor Designed Element. On appointment of a specialist subcontractor and designer, the detailed design will be completed and issued to the ER for approval.

Temporary propping and/or anchoring of the piles will be required. BAM will submit to the Client and PSDP the necessary temporary works design. A method statement detailing the propping requirements will be submitted for Client review.

Up to 4 piling rigs will be mobilised to site, with piling to commence at the following locations as soon as possible:

1. Along the northern boundary of the site, including the augured pile foundations to flue stack;
2. Secant pile wall at the north western corner of the site adjacent to the Mount Brown Access heading southwards;
3. Secant pile wall at the south west corner heading both eastwards and northwards.
4. Installation of temporary contiguous piles to facilitate construction of the Utility Tunnel.

The overall plan extent of the secant pile wall is c.900 linear metres leading to a requirement for c.1000no. piles. The piles vary in length depending on their location on site and the lowest level of structure at that location, with piles typically varying from c.10m to c.20m in overall length. The quantity of piles to be bored each day will vary depending on the ground conditions. The rotary boring of piles will generate spoil which will be hauled off site and disposed of at an appropriate licence facility (refer to Section 3.3.8 for details on Removal of Material from Site). The casting of the piles will require concrete deliveries for the duration of this element of works (refer to Section 3.3.6 for Delivery of Materials to Site).

BAM note, that in some locations, piling will take place in close proximity to services in specific areas, particularly along the footpath of South Circular Road and Rialto Gate entrance. All services will be fully investigated and the alignment of same fully determined prior to piling operations commencing.

5.3.1 Secant Piling – Waterproofing Requirements

OCSC Specification for Waterproofing covers the design, detailing, supply and installation of a waterproofing system for the construction of below ground structural elements of the New Children's Hospital.

The below ground elements are to be protected to a minimum Grade 2 level in accordance with Table 2 of BS 8102:2009 with the FM Tunnel Link, and the habitable space of Lower Ground Floor, Basement B1 and B2 Levels to be protected to a Grade 3 Level (where indicated on drawings) in accordance with Table 2 of BS 8102:2009.

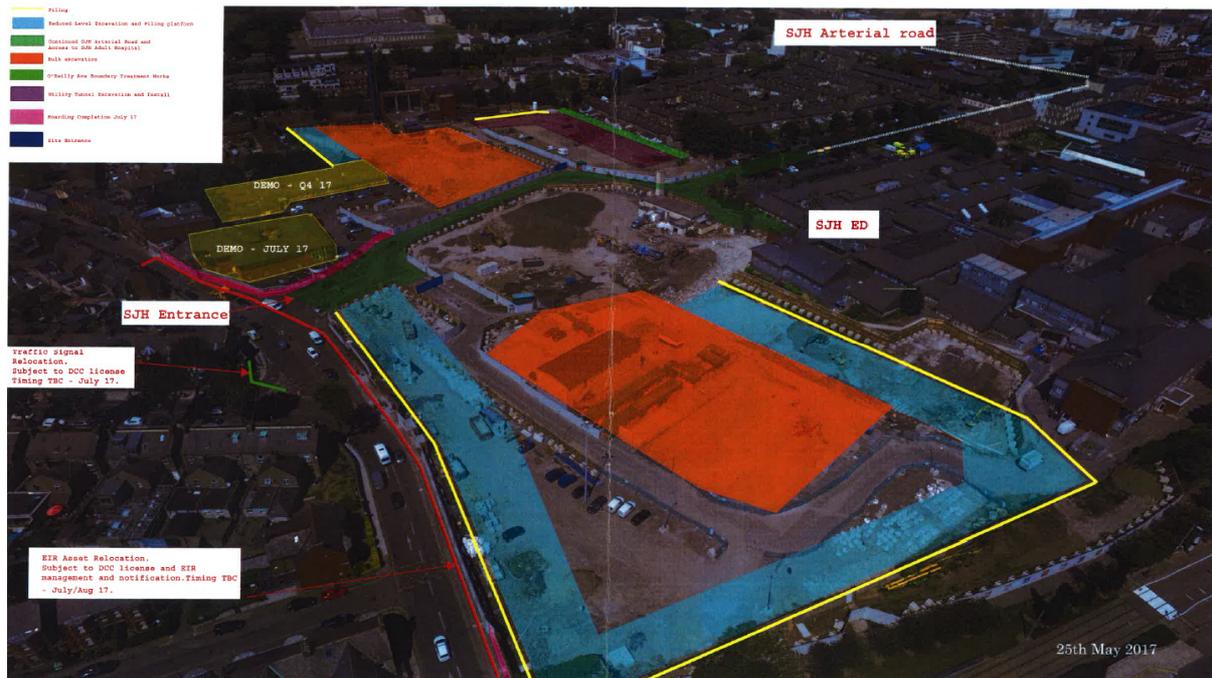
5.3.2 Testing Requirements of Piles

Load and integrity testing to be carried out on all types of permanent piles, i.e. secant, foundation and rock anchors as per requirements set out in *OCSC Piling and Embedded Retaining Wall Specification*.

Testing of rock anchors is also described on drawings NPH-C-OCSC-DR-ZZ-00-1010-0150 to 0152.

5.3.3 Excavations

Excavations will be required throughout the site to facilitate the formation to basement levels, ramp access, construction of the utility tunnel, modifications to existing services including the Drimmagh Sewer and to facilitate construction of new services.



Areas of initial bulk excavation are shown above in orange

In total, an estimated 413,000m³ of made ground and clay material will be required to be excavated and removed off site.

Any areas requiring temporary retaining works will be determined by BAM and their temporary works / geotechnical designer (Byrne Looby). Secant piles will require propping where material in front of them is to be removed. BAM together with Byrne Looby will carry out slope stability checks on cut faces anticipated during construction in advance of excavation works commencing. Any temporary works design for supporting the secant piles, or the sides of excavations with slopes steeper than 1:1, or less if poor ground conditions exist, will be submitted by BAM to the Client for approval. Excavations shall not undermine the foundations of existing buildings.

All cut faces will be subject to weekly inspections during the works or after an event which may affect stability.

BAM will backfill any excavations undertaken below building footprints and adjacent structures that are wider or deeper than required with C16/20 wet mix lean-mix concrete (u.n.o.).

For example:

- Area within the secant piled wall of the new hospital
- FM tunnel
- Substation, Service yard and VIE Compound
- Utility Tunnel

- Any adjacent ground bearing structures

For all working spaces outside the building footprints, backfill will be in accordance with the OCSC *Specification for Civils Works*, NPH-C-OCSC-TD-SP-ZZ00-102 (u.n.o.).

BAM will submit a bulk excavation method statement for Client approval. In addition to the operational sequence of work and safety measures to be adopted, this method statement will include details of access/egress points, measures to prevent stacking of trucks, wheel wash implementation, dedicated areas where tarpaulin covers will be fixed before leaving the site, details of the excavation / stockpile register to be maintained by BAM.

The method statement will also include a watching brief and discovery procedure for contaminated material, detailing how potentially contaminated material to be excavated will be segregated and stockpiled in a contained manner and characterised by a competent professional through laboratory testing.

The excavations will be undertaken in a tiered fashion to facilitate the depths required, and in a sequential manner to ensure that the access and egress routes are unimpeded with the laden trucks making use of the both the Rialto Gate and the Mount Brown routes to ship materials off site. As noted previously, trucks will have a built on tarpaulin that will cover the excavated material as it is being hauled off site and will be required to pass through the wheel wash facilities provided. As the depth of excavations increase, temporary propping/supports as per BAM / Byrne Looby's temporary works design will be provided to support the secant pile wall.

The material to be excavated is predominantly boulder clay. However, given the depth of basement and the profile of the bedrock, it is anticipated that a very small volume of rock excavation will be required in the southern portion of the site. Such excavations will be through the upper weathered layers of the rock and as such has been technically evaluated as being suitable for "hard ripping" by a 32 tonne excavator or equivalent and should not require the use of hydraulic breaking.

As material is excavated, it will be loaded directly into trucks for transport off site, with no large scale or bulk stock piling of excavated material to be carried out on site (except for material that may be potentially contaminated which will be left insitu until a plan for same is agreed).

BAM shall ensure that all waste materials associated with the project (surplus and unsuitable/contaminated soil and wastes) are appropriately classified and documented with appropriate measures to be included in BAM's Construction and Demolition Waste Management Plan to be submitted as part of the Project Execution Plan. Soil sampling shall be carried out by a competent person following a documented sampling procedure or recognised standard. Waste soils (either U1 or U2 type materials) shall be managed by BAM in accordance with all relevant waste management and environmental legislation/regulations.

OCSC document "*Soil Classification, Site Investigation & Groundwater Monitoring Report*" (doc. ref. no. NPH-C-OCSC-9010-0001) details areas on the site where hazardous material has been identified, and further areas which have been identified as "potentially contaminated areas". A specialist contractor will be brought in to classify the material in this area by:

- (c) reviewing testing to date, and
- (d) carrying out further testing using an accredited laboratory.

As stated previously, WAC testing will be carried out on an ongoing basis throughout the bulk dig works to ensure excavated material being removed from site is sent to an appropriate location based on its composition.

All excavated material will be disposed of in an approved manner and to an approved licenced location. Copies of all collection, delivery and acceptance at approved licence location documentation will be kept on site.

Where old foundations, basements, filling, tanks, service pipes, drains, etc. not shown on the drawings are encountered, BAM shall not enter and shall obtain instructions from the NPHDB / Employer's Representative before proceeding.

BAM shall inform the Employer's Representative if the ground conditions differ from those noted in the geo-technical reports, or if hard and soft spots or highly variable material or desiccated soil at formation level is encountered.

5.4 BELOW GROUND SERVICES

The project will require a wide range of new below ground services to be installed, in addition to the services diversions discussed earlier in Section 4. All of the proposed services have been designed to meet the demands of the proposed development with connection points into the local authority and utility services providers agreed and incorporated within the design proposals. BAM have included the construction sequence of these services in their Level 3 Programme, and will liaise with each of the relevant authorities as required in advance of construction and to arrange tie-ins / connections etc.

Particular reference to live services that must remain in service during the excavation works. These services will be fully exposed and marked up on site plans and will be traced and marked out on the ground prior to excavation works taking place. All excavations will be subject to a "Permit To Dig" as per BAM H&S policy. Redundant services will be treated as live until proved otherwise.

5.5 BASEMENT STRUCTURE

The Basement Structure comprises of the following discrete levels:

- Level B3
- Level B2
- Level B1
- Level LG
- Level 00

Formation levels vary across the site as shown on the tender design drawing *NPH-C-OCSC-DR-XX-00-1010-0120* (formation levels for detailed design TBC). A minimum of 300mm of material will be left in place above formation level as weather protection until such time as measures are in place to approve the formation and subsequently cover it up as per the foundation details shown on the detailed design drawings. Formation approval will be carried out in phases, with areas signed off for approval by the Employer's Representative immediately prior to covering up.

5.5.1 Level B3

The level B3 is located in the northern portion of the site. It acts as an attenuation tank for storm water drainage for the site. Its structure consists of a foundation slab bearing onto the formation stratum of Boulder Clay. The slab will be constructed as follows:

- Completion of excavations to the formation level;
- Dewatering of excavations, if required, by the Main Contractor;
- Immediate placing of a concrete blinding layer to protect the foundation formation;
- Installation and placing of waterproof membrane & drainage;
- Placing of reinforcement;
- Casting and curing of concrete.

Once the slab has cured, works will commence on the rising elements from Level B3 to Level B2. These works will comprise:

- Installation and placing of waterproof membrane;
- Placing of reinforcement for vertical columns and walls;
- Erection of formwork to columns and walls;
- Casting of vertical elements.

5.5.2 Level B2

The Level B2 consists of plant space, loading bay and storage space. The structure is a mixture of a foundation slab bearing directly onto the formation stratum together with a suspended flat slab over the Level B3 area. The foundation slab will be constructed in a similar fashion to the Level B3 slab with:

- Backfilling of excavations around the perimeter of the B3 rising walls with leanmix blinding;
- Completion of excavations to the formation level for remaining footprint;
- Dewatering of excavations, if required, by the Main Contractor;
- Immediate placing of a concrete blinding layer to protect the foundation formation;
- Installation and placing of waterproof membrane & drainage;
- Placing of reinforcement;
- Casting and curing of concrete.

The works on the rising elements from Level B2 to B1 will be undertaken in the same fashion as that for the lower level.

5.5.3 Level B1

The Level B1 consists of plant space and car parking. The structure is a mixture of a foundation slab bearing directly onto the formation stratum together with a suspended flat slab over the Level B2 area. The construction works will follow the same form as those for Level B2 for the foundation slab whilst works for the suspended slabs will involve:

- Placing of propping and laying of formwork;
- Fixing of steel reinforcing bars for concrete;
- Casting of concrete slabs;
- Striking of formwork and temporary propping once concrete has adequately cured.

The works on the rising elements from Level B2 to B1 will be undertaken in the same fashion as that for the lower levels.

5.5.4 Level LG

The Lower Ground Floor Level (Level LG) comprises a mixture of car parking areas and areas of clinical accommodation. It consists of a concrete flat slab with a slab level of 16.8m OD. Again, structural works will be undertaken in a similar fashion to the lower levels.

5.5.5 Level 00

The L00 features the main pedestrian entrances into the new children's hospital building with access points located to the north, south, east and west elevations. It comprises accommodation with a variety of uses including Emergency Department, Diagnostics & Imaging as well as Out Patients Departments. The structure consists of cast in-situ concrete flat slab construction, with the thickness of slab varying to meet the end use requirements. The slab level internally is typically at a level of 21.0m OD with the levels externally stepped to suit the adjacent areas. To area the north of the main hospital superstructure consists of a suspended slab over the basement level carpark area. The permanent access road travels to the west, north and east of this area and consists of a mixture of suspended slab and beam structures over the basement footprint together with a traditional ground bearing outside of this area. The level of the road falls from c. 21.0mOD at the junction with South Circular Road to a level of 16.6m OD at the entrance to the car park along the northern perimeter of the basement.

5.6 WATERPROOFING

The below ground elements of structure include the following non exhaustive list:

- Basement B3 Level incorporating Attenuation Tank
- Basement B2 Level incorporating Facilities Management & Plant, Corridor, Link Tunnels
- Basement B1 Level incorporating car-parking
- Lower Ground Floor incorporating car parking & outpatients department
- Lower Ground Floor of Ronald McDonald House
- Utility Tunnel
- Facilities Management (FM) Tunnel Link to St. James' Hospital
- Suspended campus ring road (part of Landscape Architects spec.)
- Below ground vertical elements up to and including 300mm from Ground/DPC level or other similar horizontal waterproofing (to Architects specification).

All components comprising the waterproof system shall be designed, detailed, supplied and installed by a single Specialist Waterproofing Sub- Contractor (Supplier) and Sub-contractor/Installer and their Agents. All materials used in each of the waterproofing systems shall be manufactured by a single manufacturer.

5.6.1 WATERPROOFING SYSTEM REQUIREMENTS

All materials shall have a current British Board of Agreement Certificate or Equivalent. All materials shall have the necessary CE Marking and Certification with Declaration of Performance Certificates to be furnished with all submissions. All waterproofing and waterproofing jointing material shall have a certified Declaration of conformity/performance in compliance with the Construction Products Regulations.

BAM shall submit for approval drawings indicating the positions of joints and details of water bars to be used for all watertight construction.

BAM understand the preparation of surfaces and jointing of water bars and hydrophilic strips along with robust fixing to withstand the pouring process are key elements to achieving watertight joints. At slab and wall junctions, BAM will cast kickers at the same time as and integrally with the floor slab (unless otherwise noted on the drawings).

5.7 CONCRETE PLACEMENT

Concrete shall be transported from the place of mixing to the place of final deposit immediately upon discharge from the mixer agitator by methods that will prevent segregation or loss of constituents. When transported in truck mixers or agitators, concrete shall be placed (delivered) within 2 hours after the time of loading or within 1.0 hours after the time of loading when non-agitating equipment is used. These periods are subject to review depending on weather conditions and mix constituents. No additional water or admixtures are to be added to the concrete to assist placing.

BAM shall complete pre-pour inspection sheets prior to the Employer's Representative inspections before placement of any concrete. All concrete shall be placed continuously between predetermined square butt joints. Each unit of construction or each section of work shall be completed between predetermined and approved construction joints in one operation. Concrete shall be deposited in layers of not more than 600mm which shall follow one another within thirty minutes. Each layer shall be mechanically vibrated subject to other clauses in the concrete specification. Horizontal slabs shall be laid in one operation to the full thickness and beams in one operation to the full cross section.

During the works, BAM shall complete post-pour check sheets after concrete placement, and carry out post-pour surveys, in particular the concrete level survey of all floor plates within one week of concrete casting. Tolerance criteria to be in accordance with *OCSC Cast Insitu Concrete Specification*.

5.7.1 Crack Control & Constraint

BAM will submit concrete mixes under the MAR system for the Client's approval, ensuring the exposure classes and minimum cement contents are in compliance with those set out in *Table ST.05 of OCSC Specification for Structural Engineering*. The concrete mix designs submitted by BAM shall allow for crack control in accordance with the limits set out in *OCSC Movement and Tolerances Report*.

5.7.2 Concrete Finishes

All structural concrete finishes to be as per *OCSC Cast Insitu Concrete Specification* and the detail design drawings. All finishes to structural concrete shall be in accordance with Table F.4 to I.S. EN 13670.

BAM will prepare sample panels of R.C. elements to have a "special" finish concrete surface. Sample locations and finish to be agreed with the Architect/Employer's prior to full construction of element on site. Some typical "special" finish elements are as follows:

- exposed R.C. columns and walls in aesthetic sensitive areas;
- raking biome and 'Cone' structure columns;
- biome support beam;
- FM/Marshalling Yard entrance wall, etc.

All floor slabs except car-park ramp slabs and FM/waste marshalling area (TBC) to have power floated finish and treated with an epoxy dust sealer or alternatively power floated and treated with proprietary paint finish specified by the Architect. Car-park ramps are to have a tamped concrete finish. A sample panel will be constructed and reviewed by the ER/Engineer prior to construction of the ramp slabs.

5.7.3 Precamber

Some areas of reinforced concrete flat slabs require pre-camber to limit final downward deflection where floors do not receive a screed finish. The precamber shall be provided in the flat slab tables and striking times shall be extended and agreed with the Engineer/ER following a series of trials prior to the final construction. The contractor shall allow for the cost of the inclusion of any adjustments to table forms following the outcome of lower level pours. Pre-cambers are required at the following locations:

- Grid 50-57 transfer slabs on L03 and L04 above the Main Entrance;
- Level 02 and 03 above the South Entrance;
- L04 transfer slab;
- Slab bays supporting heavier loads in general;
- Localised bays.

5.8 FRAME

BAM will prepare a method statement detailing the methodology and construction sequence to be adopted during frame erection. This will be submitted to the Employer's Representative for approval in advance of works commencing.

5.8.1 Structural Steelwork

OCSC *Steelwork Specification* and general notes on drawing NPH-C-OCSC-DR-XX-00-2028-0000 set out all clauses covering the structural steelwork on the new hospital. All steel products and fabricated steel products must comply with the CE marking requirements of the relevant harmonised standard, e.g. I.S. EN 1993-1-1 and I.S. EN 1090. The building is classified as Execution Class EXC4.

However, localised or specific areas of structure may be reduced to EXC3 only if agreed between the main contractor and the Engineer due to industry readiness.

5.8.2 Steelwork Contractor

The Steelwork Contractor shall be subject to the Client's approval, and will provide a full time, senior, experienced and qualified representative to direct work on site.