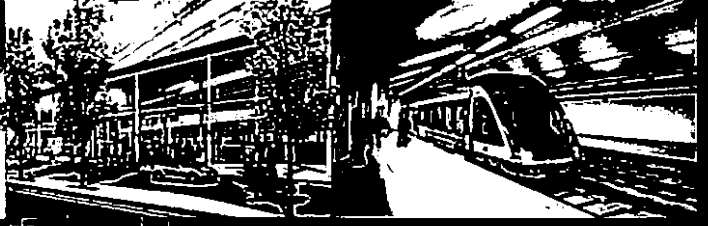


PLAN NO. PARTX/0017  
COMP. REC. 11/02/19

BAM Building Ltd

New Children's Hospital -  
Main Contract Phase B



Submission 001 Rev 03  
Construction Management Plan - PHASE B  
Live Working Document Amended As Works Progress



BAM Building Ltd  
December 2018

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Appendix A – site compound linear park

Appendix B – Environmental Management Plan (included)

Appendix C – Waste Management Plan (included)

Appendix D – Dust Minimisation Plan (included)

Appendix E – Noise & Vibration Monitoring Plan (included)

Appendix F – Vermin Control Plan (included)

Appendix G – Contractor's Mobility Management Plan (included)

Appendix H – Traffic Management Plans (included)

Appendix I – Central Access Road Layout (included)

Appendix J – Phase B Integrated Programme (included)

Appendix L - Access & Egress points (included)

Appendix M - Tower Cranes

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## 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 B 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, Linear Park and all public roads and areas in the immediate vicinity.

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 communications and resident/public engagement processes that will assist in bringing the main contract to fruition successfully in a harmonious manner. Stakeholder engagement 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 minimizing 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 will 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. A key restraint will be the provision of access through the site to the existing St. James's Hospital.

**St. James Hospital** – The existing St James's Hospital will remain fully operational during the construction period. Maintaining safe pedestrian, vehicular and emergency vehicle 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 Phase B scope of the proposed development on the St James's campus comprises:

- implementation of a new children's hospital building;
- implementation of a two-storey underground car park and shared facilities management hub below the new children's Hospital;
- 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 (Ronald McDonald House);
- 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 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, 22 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;
- 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 118,113m<sup>2</sup> with an additional 32,000m<sup>2</sup> provided for underground parking, bringing the total floor area of the building to 150,113m<sup>2</sup>. 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 commenced works on the Enabling Works Contract in July 2016. The Enabling Works Contract comprised of all works to clear the site, including service diversions and demolition of buildings, with works completed in August 2017.

### 2.4.2 Main Contract

The Main Contract is subdivided into Phases A and B.

#### 2.4.2.1 Phase A

Phase A works of the Main Contract including piling, excavation, diversion of services and commencement of construction of the structure up to lower ground floor level have been covered in an earlier submitted and approved CMP.

Phase A was completed in December 2018.

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#### **2.4.2.2 Phase B**

Phase B works will include all other works required to complete a fully commissioned children's hospital. This Construction Management Plan covers the works of Phase B.

Phase B is anticipated to start in January 2019.

Total duration of Phase A & Phase B is 58,75 months. The extent of Phase B works is set out in the Phase B Programme attached in Appendix J.

### 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. 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

BAM has developed a Level 3 Construction Programme as well as a Mobilisation Plan. It covers all aspects of the project including off site, on site, detailed engineering and design, procurement, submittals, staffing plans, resource plans, equipment plans etc.

The construction programme for Phase B has been developed together with all involved contractors (BAM, Mercury & Jones) in close coordination with the client side.

#### 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 B will grow from 150 for Phase A to a peak in April 2020, when there will be between 1,400 and 1,600 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 B:

**Contract Director** – Denis McCarthy

**Construction Director** – Howard McDonagh

**Project Manager (North Side)** – Aidan O'Connell

**Commercial Manager** – Pat Murphy / Seamus Kealy

**Project Frame Manager (South side)** – Eoghan Brannigan

**Site Agents** – Peter Martin / Padraic Brennan / Sebastian Schneider

**Site Foreman** – Ervins Karklitis / Barry Sheils

**Quantity Surveyor** – Brian Shanahan / Willet Ho

**Section Engineer** – Albert Traynor / Rafael Galan / Ben Janeke / Raphael Alade / Karol Jaworski

**Logistics Manager** – Jack Curley

**M&E Manager** – Sinead Rogan

**EDMS Manager** – Greg Byrne

**Safety Health & Environmental Advisor** – Derek Sheehan / Paul Mallon/Jim Kennedy

**MEP Coordinator** - Matthew Byrne

**Programme Manager** - Maria Chryssaki

**Communications Liaison Coordinator** – Garry Keegan / Chloe McHugh

**Temporary Works Coordinator** - Suzanne Hackett

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

<b>Activity</b>	<b>Name</b>
Noise & Vibration Monitoring Consultant	Murphy Surveys
Airborne dust monitoring	Environmental Efficiency
Archaeology	ASCU Limited
Condition Surveys	ABL Surveyors
Structural Monitoring of buildings	Murphy Surveys
Traffic Management	Total Highway Maintenance Limited
Mechanical Works	Jones Engineering (appointed subcontractors)
Electrical Works	Mercury Engineering (appointed subcontractors)
Hoarding	Clifton Scannell Emerson
Temporary Works	Byrne Looby / Clifton Scannell Emerson
Piling	PJ Edwards
Concrete Frame	Kwik Ltd.
Drainage Installation	COD
Scaffolding	McCrory Scaffolding
Materials Testing	BHP Limited / Roadstone
Domestic Waste Removal	AES
Bulk Excavation	McGuire Haulage
Dewatering (Ground)	BAM Civil
Dewatering (Run-off)	BAM Building
Classifying excavated material	Mulroy Environmental
Facades	tbc
Landscaping	tbc
Fit-Out	tbc
tbc	tbc

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.

As this is a live document, the above table will be updated in later revisions of this CMP to reflect the subcontractor procurement accordingly.



### 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 campuses in Dublin, it is crucial that safe and uninterrupted through flow for live Hospital traffic will not be compromised by construction works. 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 considering works impact, prioritising courtesy, minimising the impact of deliveries and protecting and respecting their environment.

To achieve such a culture and overcome the various challenges on the project, several 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 every morning @ 7.30am but will be reviewed as the project progresses.

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## Project Safety Goals & Objectives

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

- ❖ Supporting the NPHDB to secure their Health, Safety and Wellbeing Vision;
- ❖ 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, etc.
- ❖ 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, noise, vibration, discharge, etc.
- ❖ 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 Directors, 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 Managers, 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 (2<sup>nd</sup> 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 be 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
- 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 . Weekly Safety Steering Committee 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.

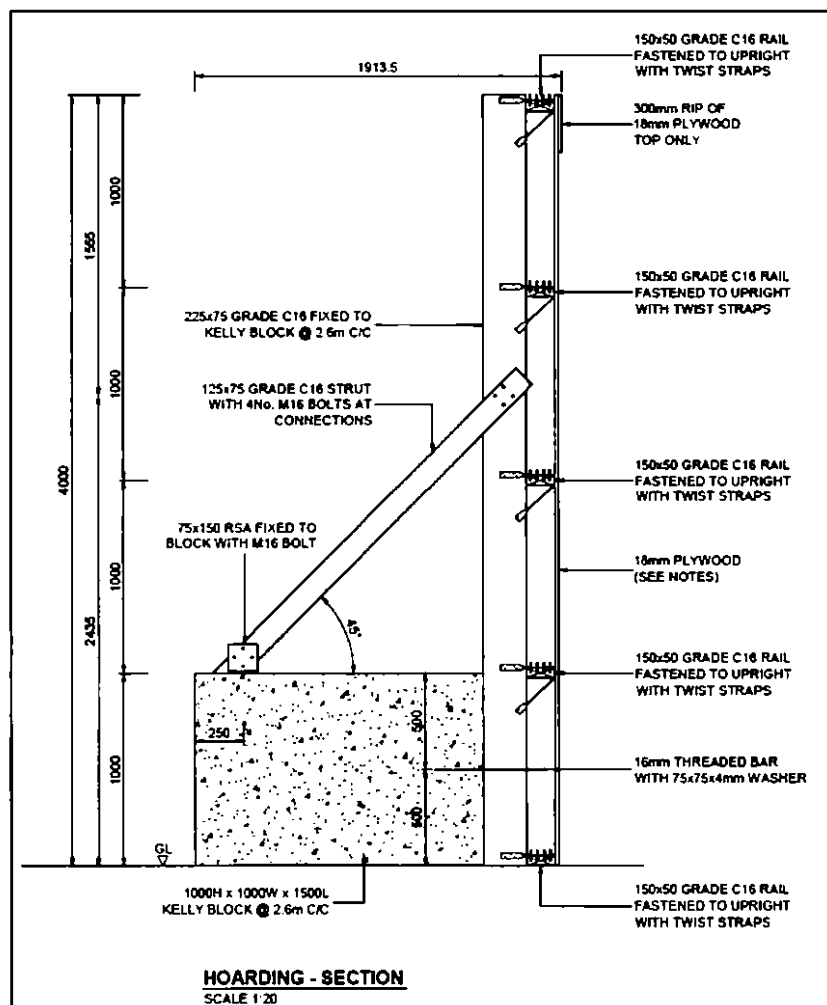
The 'Safety and Health Plan' includes means of communicating SHW needs with:

- 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 2.4m & 4.0m high boundary hoarding currently in place for Phase A will remain in place for the Main Contract Phase B as well. The temporary works design for the boundary hoarding structural supports has already gone through the Employer's Representative approval process.

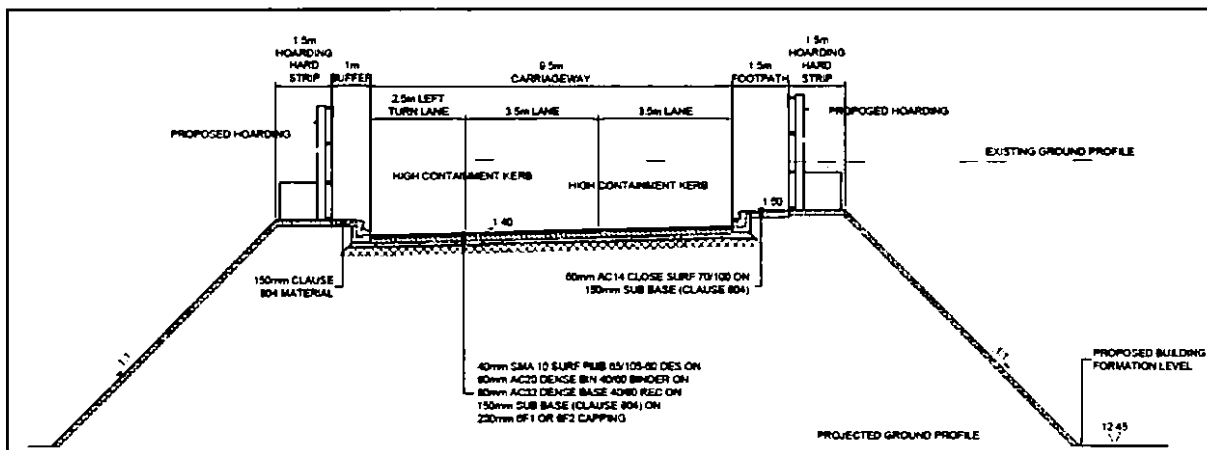


Extract from drawing no. 16\_132\_00\_2408 - C02, "4.0m Hoarding Details", refer to Appendix I

Additional 2.4m high hoarding was erected along the realigned Central Access Road (constructed in October 2018).

The same type of hoarding will be erected when the new Central Access Road will be demolished and excavated and after traffic is diverted to the permanent Northern Access Road around the northern side of the new hospital building, with works for same to be carried out as follows:

- i. A detailed works activities method statement (including temporary works design of structural supports) has been submitted to the Employer's Representative for approval;
- ii. Permanent hoarding 2.4m high hoarding was 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 has and 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, have been securely fixed to the external surface of the solid wooden hoarding;
- v. Regular inspections and maintenance has been and will be carried out on all elements of the hoarding to ensure that all are in a safe and suitable condition;
- vi. The hoarding line was set out by the BAM Engineer and the ER was 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, refer to Appendix I

BAM's site offices (accommodation and welfare facilities) are located in both the old Private Clinic area and at the Rialto entrance including the car park zone next to the Luas tracks at the Linear Park end of the site. BAM will add to these locations with site specific facilities within the building in order to provide sufficient space to accommodate for peak number projected to be approximately 1,400 – 1,600 construction workers in April 2020.

BAM recognise that the installation of the hoarding along the final access road will 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, 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.

In areas where boundary is required to be removable for the sequence of the works this will be accommodated by use of Heras fencing with acoustic blankets where required.

BAM will continue their inspection regime implemented for the Enabling Works Contract and Phase A for the Main Contract Phase B 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. Access will be granted by means of a swipe card system.

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:

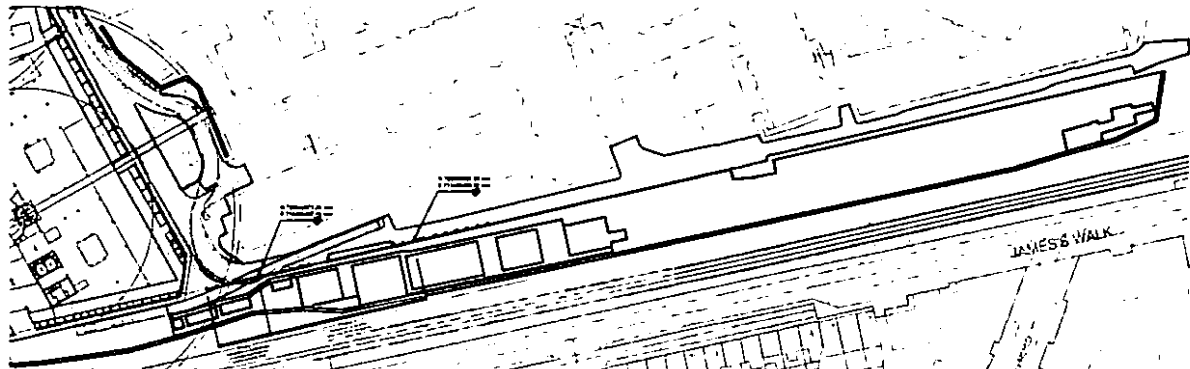
- Install and maintain adequate site hoarding to the site boundary with adequate controlled access and egress points;
- Maintain site security staff at all times;
- Install access security in the form of turn-styles and gates for staff;
- Ensure restricted access is maintained to the works;
- Operate a Site Induction Process for all site staff;
- Ensure all personnel have current project identity 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 following completion of the permanent Northern Access Road – Month 19 (June/July 2019).

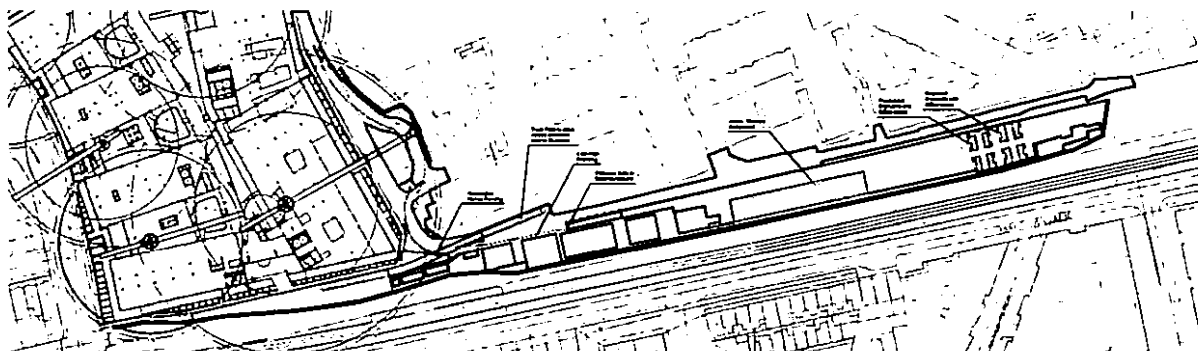
A fire watch system regime has been implemented and appointed fire watch supervisors will inspect the site at the end of each shift. At site inductions, all staff and operatives will be fully inducted into the security, health and safety and logistic requirements on site, and will be made fully aware of their individual responsibilities with regard to security and will undertake their work in line with guidelines.

### 3.3.3 Site Compound

The Site Compound has been established to the South of the proposed building adjacent to Linear Park in November 2017 where there will be sufficient space to accommodate facilities to cater for the planned 1,400 – 1,600 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. Additional facilities will be made available within the building footprint as the frame rises.



*Current site compound adjacent to Linear Park (November 2018), extract from NPH-CT-BAM-DR-00-XX-0054\_P00, see Appendix A*



*Proposed extension to the site compound adjacent to Linear Park, extract from NPH-CT-BAM-DR-00-XX-0054\_P00, see Appendix A*

The Site Compound is to remain near Linear Park for the duration of the Main Contract works. In addition to the main compound, an ancillary or secondary compound will be located at Rialto entrance at the location where the Old Clinic used to be situated. This compound facility will service the needs of site staff working on the north end of the site for a duration up to the construction of the Family Accommodation Unit.

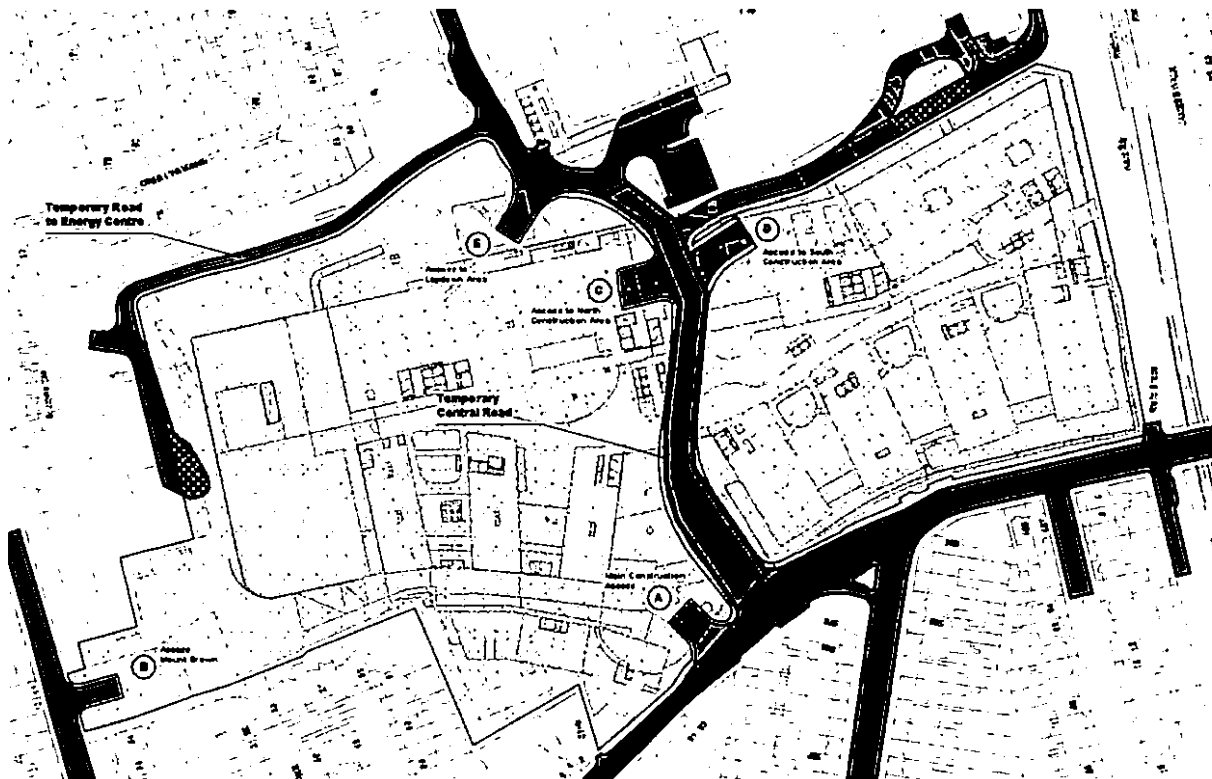
Additional facilities will be placed within the building frame as it rises, strategically located along access/egress routes and at both ends of the building. This will be primarily for the benefit of staff and to avoid long walks to the compound facilities and away from the work fronts.

These facilities will generally consist of canteens, toilets and will be set at every other floor. It is proposed to have the drying rooms /changing areas in designated areas on the Lower Ground, these areas will be located near Linear Park access point and Rialto Entrance point.



### 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 be 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). Temporary use will be made of additional access points during the extensive removal of spoil and also for concrete pours (C, D, E)



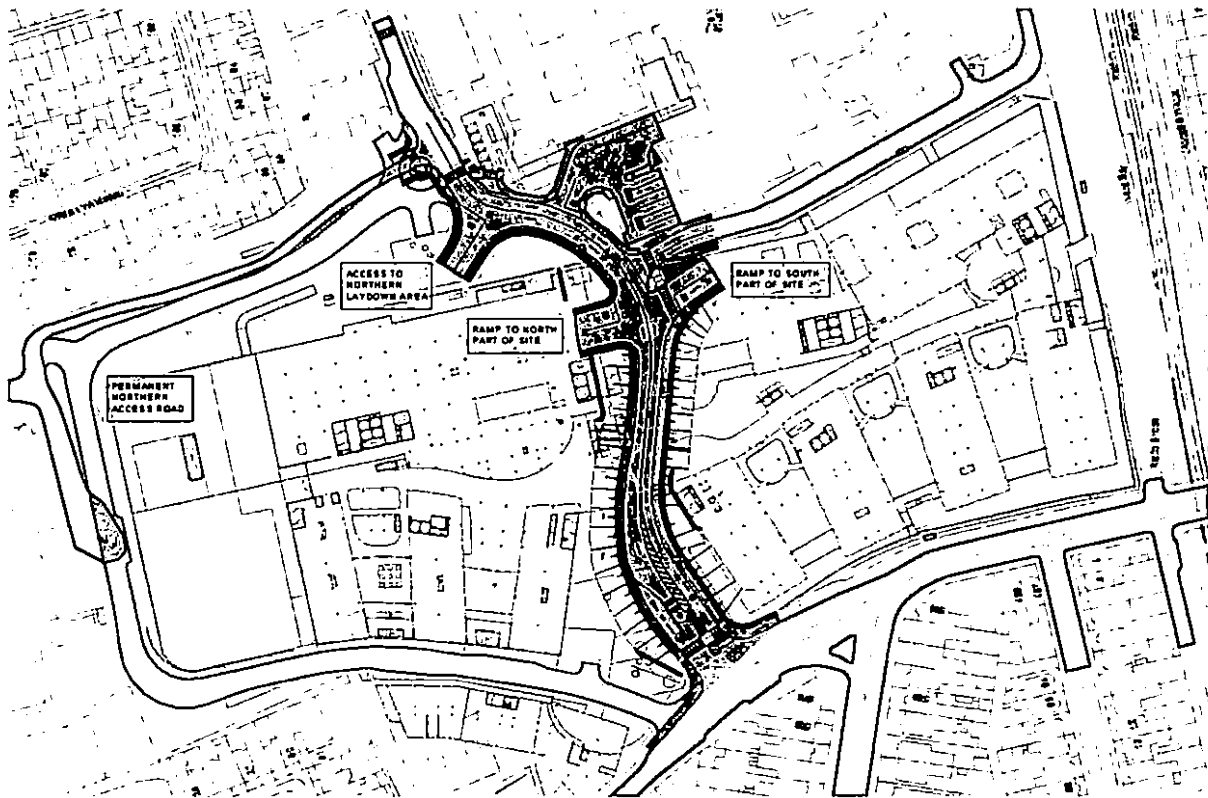
*Access & Egress points for construction traffic whilst the Central Road is active, see Appendix L*

During phase B of works, access for emergency vehicles and any appropriate through traffic will be maintained initially by means of the new temporary central access road (highlighted in blue) through the hospital campus. This will naturally split the site into 2 separate areas. 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 ongoing. 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. A temporary underpass underneath the central access road will connect both sides of the site for safe pedestrian access without crossing the road.

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.

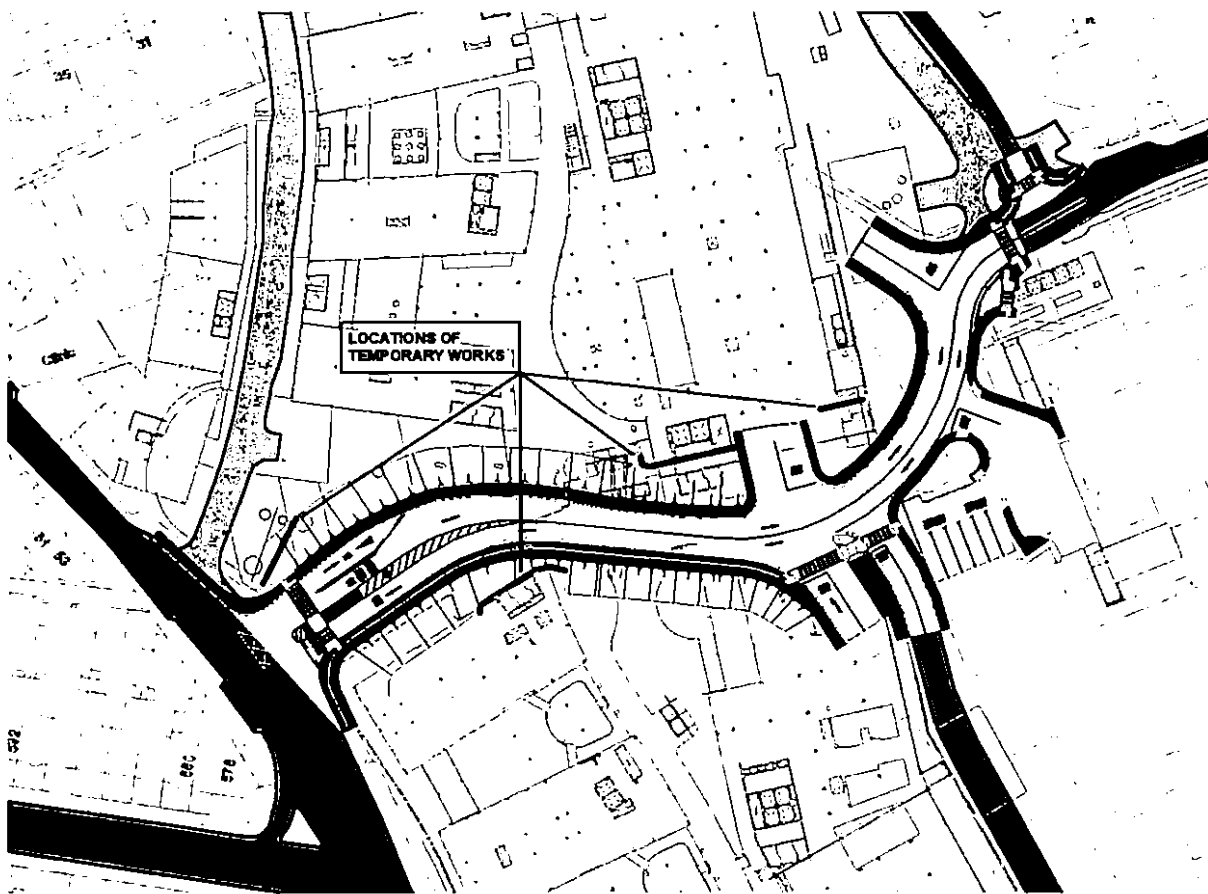
### 3.3.5 Central Access Road Realignment

The Central Access Road will be in place until such time as the permanent northern access road (in blue below) is constructed.



*Temporary Central Access Road & Permanent Northern Access road (blue)  
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.



*Temporary Works to facilitate Central Access Road  
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 space for storage of material on site. BAM are utilising a holding yard located 10 minutes from the Hospital Campus on Davitt Road. 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 when required.

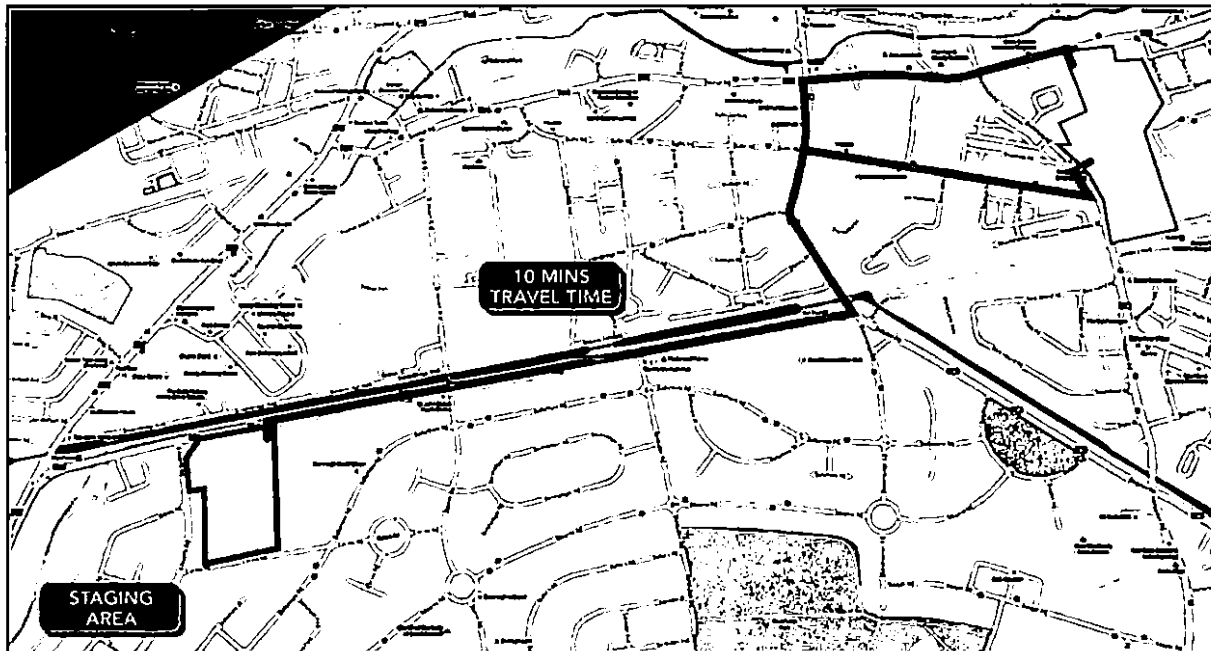
Works requiring multiple vehicle deliveries to site, such as large concrete pours, will be planned well in advance. Concrete pours of up to 2,000m<sup>3</sup> are expected on site, with planning of these pours to include the subcontractors' commitment to ensure that trucks don't queue on the public roadways 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.

Where BAM feel they need additional working hours outside those stipulated within the grant of planning (large scale concrete pours), BAM will liaise with DCC and notify all surrounding neighbourhoods through their representatives. BAM are at all times mindful of the impact that out of hours works can have on local residents.

Deliveries during Phase B to the south end of the site will be via the Central Access Road (until June 2019) and then via the completed northern access route. There will be offload areas located at A&E (TC3), at Hospital 7 on the fire tender perimeter road (TC4) and at Linear Park (TC9), at the utility tunnel on the North East of the site ( LC1 & TC2 ) These unloading points will be utilised until the completion of the project.

### 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 if required 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 bunded chemical storage cabinet unit or inside a concrete bunded 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.

#### 3.3.7.1 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 100 movements/day during the first 8 months of the project.

#### 3.3.8 Removal of excavation Materials from Site

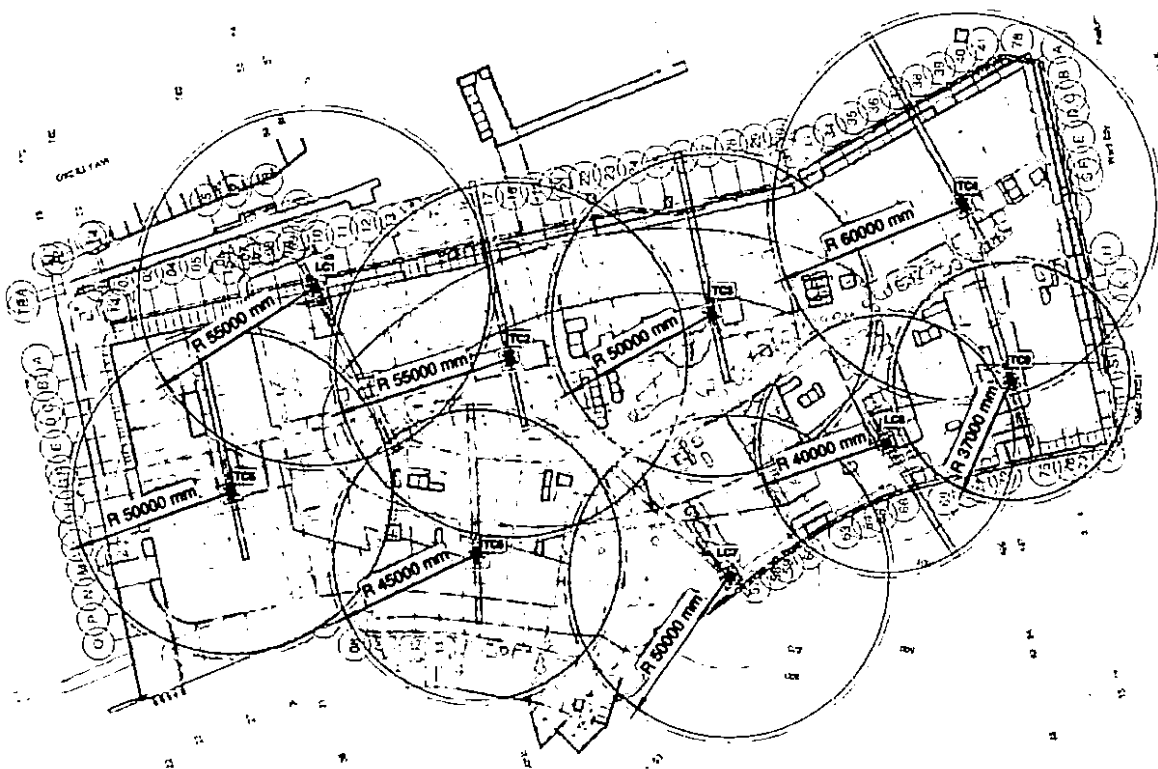
The most intensive period of material removal from site took place during the bulk excavation of the basement works in Phase A of the project. Excavations were required throughout the site to facilitate the formation to basement levels, ramp access, construction of the utility tunnel, modifications to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

In total, an estimated 413,000m<sup>3</sup> of material was excavated and removed off site with a remainder of less than 100000m<sup>3</sup> to be excavated in Phase B of the contract. All excavated material has been and 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. The same measure as described under the CMP for the Phase A excavation works are implemented and will be continued throughout the excavation for Phase B.

### 3.3.9 Cranage

Cranes will be required for moving building materials around site such as formwork for concrete, reinforcement for concrete and general building materials. The use of cranes will also be required for the erection of the facade and installation of plant.

Initially the Main Contract Phase A required the use of mobile cranes for construction of the utility tunnel and Drimnagh Sewer diversion etc. The first tower cranes (5 to date) have been erected end of 2018, with the programmed works requiring a total of 9 number tower cranes. A dedicated crane co-ordinator will be appointed and will have overall control of cranes in terms of lifts/sequences, etc. In this regard, lifting plans will be developed and assessed prior to lifting occurring.



Extract from drawing no. NPH-CT-BAM-Graphical\_0000 - Tower Crane General Overview, prepared by BAM, refer to Appendix M.

The New Children's Hospital Project will be served by 9 no tower cranes to ensure maximum coverage of the Project, these will be supplemented with mobiles as required. The following is a brief outline of the type of tower cranes proposed including the anticipated duration of use:

✓	LC1	Luffer Crane	Wolff 166B
✓	TC2	Tower Crane	Wolff 70/31
✓	TC3	Tower Crane	Wolff 60/31
✓	TC4	Tower Crane	Wolff 70/31
✓	TC5	Tower Crane	Wolff 70/31
✓	TC6	Tower Crane	Wolff 65/32
✓	LC7	Luffer Crane	Wolff 166B
✓	LC8	Luffer Crane	Wolff 166B
✓	TC9	Tower Crane	Wolff 60/31

NCH Frame Programme			Crane Usage																											
Activity ID	Activity Name	Duration (Start/End)	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
NCH Frame Programme		893 26-Jun-18 A	04-Feb-22																											
Crane Installation		833 26-Jun-18 A	04-Feb-22																											
Crane Usage		893 26-Jun-18 A	04-Feb-22																											
ICWP-21320	Tower Crane TC08 Crange Period	768 26-Jun-18 A	29-May-21																											
ICWP-21320	Luffer Crane LC08 Crange Period	893 26-Jun-18 A	01-Oct-21																											
ICWP-21320	Luffer Crane LC08 Crange Period	768 26-Jun-18 A	29-May-21																											
ICWP-21340	Tower Crane TC08 Crange Period	432 21-Jul-18 A	26-Feb-21																											
ICWP-21340	Luffer Crane LC08 Crange Period	767 03-Dec-18	04-Feb-22																											
ICWP-21360	Tower Crane TC08 Crange Period	753 23-Jan-19	04-Feb-22																											
ICWP-21318	Luffer Crane LC08 Crange Period	483 19-Feb-19	01-Oct-21																											
ICWP-21388	Luffer Crane LC01 Crange Period	483 11-Mar-19	29-Jun-21																											
ICWP-21388	Luffer Crane LC07 Crange Period	891 26-Jun-18	29-Jul-21																											

Extract from the programme: anticipated Crane Durations

Luffer cranes are used in lieu of tower cranes to avoid the intrusion of the air space over adjoining properties. All cranes will have a designated driver and banksmen and the lifting supervisor will coordinate all lifting operations.

Jibs will vary between 50m and 60m in length to provide the necessary site coverage.

These cranes will be supported on a mix of piled foundations and concrete pad foundations, these cranes will be erected during the weekend with special permission from Dublin City Council for out of hours works. Specialist crews will be deployed to erect and dismantle these tower / luffer cranes.

### 3.3.10 Water Supply

BAM's Site Compound in the Linear Park has mains connections.

Water will also be required for wheel wash and vehicle wash-down, dust suppression, curing of concrete in warm weather and general construction cleaning materials/equipment etc.

Water (grey water) will be recycled from the attenuation tanks for use during construction, toilets, and washing. Drinking water will also be brought to the work fronts.

### 3.3.11 Groundwater Control

As in Phase A, groundwater will be directed by BAM 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, during Phase B of the contract.

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 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 if required. 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.



In short, there will be a need to dewater both ground water and run-off water.

Ground water is being extracted from specific well points as constructed according to the issued Ground Water Control Plan. This discharge water is being monitored and filtered through 'Siltaway' systems, they are tested regularly for suspended solids, etc. and results issued. This methodology will continue to be implemented until the building has reached a specific point in its construction that the Client's Engineers believe that the dead weight of the building is greater than the uplift load. At this point, the discharge wells will be capped.

In respect of rainwater, all rainwater is being collected at specific points as the building rises, this water is also pass through the 'Siltaway' system and follows the same testing regime as the ground water. Once the building is sufficiently progressed (all concrete elements poured), the run-off water will be deposited down the permanent drainage system during the cladding and fit-out periods.

### **3.3.12 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 B 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 excavation works.
  - Noise – created during the course of the various elements of the works.
  - Vibration – ground borne and created, principally.
  - Waste Management – to ensure proper and correct disposal of construction related waste.
  - Vermin control

### 3.3.14 DUST CONTROL & MONITORING

BAM have developed a dust minimisation plan for the Main Contract Phase A which will be extended continuously through Phase B of the works. The method for measuring any dust particles generated will be by the Bergerhoff Method (jar collection) with an allowable limit of 350mg/m<sup>2</sup>/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 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 meetings which will be held on a weekly basis.

Bigger exposed areas not yet covered by concrete will be controlled by water spray guns which provide the best practicable means in mitigating dust. Dust deposition and visual monitoring are to be assessed constantly as Aspergillus poses a threat, particularly because the site is based beside Saint James' hospital. Although BAM intend on minimising dust at the source, these spray guns (in conjunction with the water storage tank installed on site) provide an effective secondary preventative measure in the reduction of dust. This dust suppression system comprises of a water storage tank, pump-set, distribution pipework and spray heads. The storage tank is filled approximately twice a day when in operation / at peak. Based on observational monitoring the spray guns / suppression system operates at a maximum of 10 minutes every hour in order to effectively soak the area to prevent suspension. This system can be used both manually or automatically. A log is kept on file of how often the system is used and how often the tank is filled. Also, a tractor and bowser system is used to effectively minimise the suspension of dust whilst simultaneously aiding road sweepers to effectively collect all soil and debris efficiently. This bowser is also used to transfer water to the dust suppression system and the vehicle wheel-wash system.

With regard to the control of Legionella, BAM prevent its growth via the use of biocide treatment in the form of Sodium Hypochlorite (NaOCl) addition. This process and the ratios established are outlined

in the Bam 'General Legionella Control Measures and Monitoring on NCH Site'. The dose frequency occurs weekly whilst the storage tank is flushed out on a monthly basis, this prevents water stagnation. Furthermore, BAM use water fittings and materials which do not promote the growth of Legionella. Further to this, there is microbiological analysis of the water for Legionella sampling on a weekly basis. (Ref: General Legionella Control Measures and Monitoring on NCH Site).

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. **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.
- iii. **Material Removal:** Materials that are 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 general 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.
- iv. **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. Power washes may also be installed at site gates pending they are required. Condition of the roads (internal and external) will be noted and any remedial actions required will be taken immediately.

In either of the above mitigation measures, BAM will ensure that the measure taken is adequate to suppress the dust created.

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 a notification 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.

### **3.3.15 Noise & Vibration Control & Monitoring**

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

Ian Byrne MIOA (Member of the Institute of Acoustics) shall support the SIMS/BAM team to ensure that all aspects of the NVMP are implemented and that all recorded Noise & Vibration data is correctly interpreted. Murphy Surveys have assumed the overall role of the Surveying, Instrumentation and Monitoring Specialist (SIMS) for the Main Contract Phase B. Murphy Surveys will continue to carry out all noise and vibration monitoring of the Main Contract Phase B following their involvement in the Phase A Contract. All monitoring equipment and associated specifications will be reviewed and approved by the SIMS. A key aspect of Ian Byrne's brief will be to review the implementation of best practice noise and vibration mitigation measures on an on-going basis in the form of site Audits. Where previously established project baseline noise and vibration levels are considered to differ from the current situation, revised baseline level shall be established to ensure the accuracy of the monitoring programme in terms of alert and limit criteria.

The proposed locations of the noise and vibration monitors are indicated on a layout plan contained within Appendix E (attached). Any amendment to the monitor locations required to accommodate the progress of the construction activities will be agreed with the ER before the location change takes place. To maintain the integrity of measurement and to afford general protection of these monitors throughout the course of the works we are obliged to follow the relevant standards and guidance documents as per Section 3.0 of the Noise and Vibration Monitoring Plan prepared by Ian Byrne.



Appendix E: Noise &amp; Vibration monitor locations rev. 21

In general, this type of monitor requires a 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 SIMS Engineer to ensure continuous monitoring. There is a contingency plan in place whereby the batteries of non-wired monitors are changed on Monday's, Wednesday's and Friday's by a member of the SIMS.

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.

An additional noise baseline survey was carried out during the Phase A works at specific monitor locations that were found to be consistently breaching the thresholds during out of hour periods. The results of the baseline survey recommended that the thresholds at those locations be raised to take account of the elevated ambient noise levels due to traffic and Luis movements. BAM's SIMS will make reference to these recommendations when reporting out on noise alerts during the monitoring reports for Phase B.

The N&V plan issued for the Phase B works sets out how both noise and vibration will be measured in accordance with the contract requirements. Measurements will be taken at the frequency and parameters required. Threshold levels will be as follows:

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<b>Noise: Monday – Friday</b>	<b>Day :</b>	07:00-19:00 = 70dB
	<b>Evening :</b>	19:00-22:00 = 60dB (only for agreed out of hours works)
<b>Saturday</b>	<b>Day :</b>	08:00-14:00 = 65dB

BAM recognise that an internal noise limit threshold of 45dB LAeq 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)
 

<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<sup>2</sup> – 0.005 m/s<sup>2</sup> (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. Where flexibility is required for the works Heras fencing will be used with acoustic blankets where required.

BAM will proactively implement noise reducing measures such as acoustic blankets in advance of any upcoming high noise works commencing on site and the BAM Environmental Officer will check that those measures have been implemented on site. Any noise alerts will be immediately investigated by BAM and if determined to be construction related then noise mitigation measures will be implemented to reduce the noise levels and avoid breaches of the thresholds.

In the event that a high noise level activity cannot be avoided or mitigated against due to the nature of the location, the equipment that must be employed and or programme constraints, then BAM will seek a short-term derogation of the noise limits from DCC to cover the specific activity for an agreed duration.

### 3.3.16 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

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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 / Phase A will remain effective until such time as the plan for Phase B 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 Phase B, 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 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:

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

This approach will be implemented as follows:

1 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.

2 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.

### 3 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.
- **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 Phase A will be maintained for Phase B is attached in Appendix F of this document.

#### 3.3.17 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.



**3.3.17.1 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.

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.

**3.3.17.2 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.

**3.3.18 Quality Management and Building Control BC(a)R**

BAM's accredited Quality Management System (QMS) in accordance with ISO 9001 has been developed and implemented for the Main Contract Phase B. BAM will 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.

The Quality Management System will demonstrate compliance with the Building Control (Amendment) Regulations BC(a)R and the Code of Practice for Inspecting and Certifying Buildings and Works. Materials will be selected in compliance with the Construction Product Regulations. The Designers will carry out stage inspections of the works in progress and certify on completion that the building is fully compliant with the Building and Construction Products regulations.

**3.3.19 Hours of Work**

Schedule of working hours (as per grant of planning permission):

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.

### 3.3.20 Public Relations/Community Liaison

BAM will continue to develop and implement a project Communications and Engagement Programme for Phase B of the works. This team will be led by the Community Liaison Officer and will include BAM personnel from the BAM site team to ensure consistent communication channels are maintained with the various project stakeholders.

The community liaison officer role will include:

- Participation and distribution of information notices for upcoming works to local residents;
- Briefing with neighbours on progress and issues;
- Liaison with Dublin City Council and emergency services as appropriate;
- Liaison with An Garda Síochána, particularly in relation to traffic movements and permits;
- Preparation of reports for the site meetings on neighbourhood issues.
- Attend monthly residents project monitoring committee meetings.
- Meet with individual residents and residents' associations upon request.
- Respond to queries generated from the residents 24/7 helpline and provide internal reporting on complaints management.

BAM in association with the NPHDB will also be organising another "Meet the Buyer" event where local businesses can meet with BAM to discuss potential supply chain opportunities. BAM will participate in client subcommittees with a view to developing opportunities for local SME's and new social enterprises.

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.

BAM will continue to implement the Community Benefit programme which was established at the outset of the project. BAM's Community Benefit Coordinator has formed close working relationship with the local community groups identified in the community benefit clause, and will continue to work closely with them to maximise the potential of the project in creating employment and training opportunities for the local community through the following measures:

- The community benefit clause is included in all contracts for sub-contractors that will be appointed for Phase B, to ensure the cooperation of all parties.
- Pre-start briefings will be provided to all sub-contractors to support their understanding of the requirements and agree clear procedures for recruitment.
- A programme of educational activities has been developed (in conjunction with Mercury and Jones) which will continue to be rolled out across schools, PLC's and 3rd level colleges within the catchment area.
- Site-visits have been offered to a number of schools and 3rd level colleges, to encourage engagement and interest of the students and bring the project to life for them.
- Work experience placements and internships have been advertised with local education providers, including return to education centres for adult learning, and these will be facilitated throughout the duration of the project.
- We have established a monthly reporting process with the client to report on the community benefit activities and provide up to date information on the progress of the programme to the board, and to ensure a regular review of the approach is undertaken so that continued improvements can be made where appropriate.

### 3.3.21 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.

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### 3.3.22 TECHNICAL SUBMITTALS

#### 3.3.22.1 Method statements

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

- Traffic Management for Other Works
- General Concreting Works
- Tower crane installation
- Hoists & Goods lift installation
- Scaffolding
- Frame Erection
- Façade Works (Punch Windows, Structural Glazing, Biome, Ward End, Unitized facades, etc.)
- Landscaping works
- Structural steel works
- Waterproofing Works
- Fit Out (partitions, ceilings, flooring, doors, internal glazing, etc.)
- MEP works
- Medical Equipment Installation
- Lift Installation
- Balustrade installation
- and others as necessary for the execution of Phase B

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

#### 3.3.22.2 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.

### 3.3.23 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.

### 3.3.24 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. Construction/alterations to Energy Centre – Falsework/Scaffolding;
3. Traffic Management;
4. Scaffolding erection works
5. Temporary supports for structural steel works
6. Shuttering & decking system for the construction of the frame;
7. and others as required for the execution of Phase B

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 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.

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### 3.3.25 ARCHAEOLOGY

#### 3.3.25.1 Archaeological Requirements

For Phase B there is only a very limited archaeological requirements at the remainder of the excavations in the Central Access Road area.

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.

#### 3.3.25.2 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 osteo-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 paleoenvironmental 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.

### 3.3.25.3 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.

### 3.3.25.4 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 have 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.

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.

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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 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 has been 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 is 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. This process has been in place for Phase A and will continue for Phase B.

### 3.4.3 Waste Management of 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 ensure that oversupply of materials is kept to a minimum. 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.

The BREEAM "Excellent" rating has been selected as the target for waste recycling on this project. The works will be planned, organised and co-ordinated so that the waste generated from the project will be segregated, separated and co-mingled to reduce, reuse or recycle the waste to meet the targets set out in the Environmental Impact Statement and the BREEAM Excellent target.

#### 3.4.3.1 Waste Management Strategy

- Communal waste facilities will be provided throughout the project where feasible and possible. This being the case, it will be the responsibility of the sub-contractor to 'clean as they go', keep all access routes and work fronts clear of rubbish and debris at all times and to bring all their rubbish or any other debris in their work zone to the communal skips.
- Waste team (provided by sub-contractors) will provide appropriate bins/skips and sub-contractors will dispose of all inert and non-hazardous waste and packaging off site. Waste / rubbish collection facilities will be positioned on each level of each block in centralised collection points. All sub-contractors shall get their waste to these points. These collection points will be located preferably near hoists points and the waste will be removed at designated times possibly near close of shift . The deployment of a waste management company will also be researched and all sub contractors will be required to contribute to the costs .
- There will be clearly labelled wheelie bins, showing which waste stream should be placed in each bin.
- Any elements that are returnable will be the responsibility of the relevant subcontractor.
- It is our Logistics team responsibility to manage and audit this process to ensure returnable items are returned including all/any liaison with Sub-Contractors.
- Hazardous wastes will be removed by the individual subcontractors.
- The positions of these collection points will be agreed with Sectional Managers prior to installation (to ensure that the construction process is not hindered by the works). These agreed positions will vary during the project duration to suit the progress of works.
- As many wheelie bins as required for the project will be provided by the Waste team and will be supplied in good condition (and to be replaced when damaged).
- Allowance to be made for food waste skips including the collection and correct disposal of all food waste from the canteen / welfare areas.
- Site wide waste management plan (drawing) for the project prior to commencement will be provided. There will also be a waste recycling management system for the duration of the project – to be installed in welfare offices and collected / recycled accordingly.

- 
- As part of their daily duties, our waste team would ensure that there are sufficient wheelie-bins on the floors stored within the advised designated areas / unoccupied units to allow for peaks in demand throughout the day.

**Waste Clarifications:**

Waste management team will police the use of sub-contractor rubbish bins ensuring bins are only used by the designated trades.

**Waste Monitoring and Management Service**

Typical Construction (Fit-Out) Waste - This is a general outline and should not be considered fully inclusive. Package will include all waste materials excluding those arising from the concrete frame package:

- Metal stud/Track (off-cuts only)
- Packaging; paper, cardboard, polystyrene, polythene
- Plastics
- Ceramics
- Glass
- Insulation
- Plumbing waste
- Electrical waste
- Cabling
- General site debris
- Flooring
- Plasterboard
- Temporary weatherproofing
- Temporary Protection materials
- Timber / Ply
- Paint Tins
- Roofing
- All Hazardous Waste
- Allowance for over ordered materials

Clearly labelled wheelie bins will be utilised showing which waste stream should be placed in each bin.

### 3.4.3.2 Waste Management Team

The Site Waste Management Team will be responsible for undertaking the following activities on a daily basis and the team will consist of Personnel provided by all sub-contractors or by the waste management company

- Delivering, Emptying and re-siting of wheeled bins to the designated floor areas of each zone.
- Ensure sufficient wheeled bins are available for each Sub-contractor at each designated collection areas to cope with the waste/rubbish arising at all times of each building.
- Wheeled bins are emptied / changed on a (at least) daily basis.
- Leave bins in the agreed collection points on each / every floor level ensuring waste is within a reasonable distance of all working areas.
- Cleaning of pedestrian access areas, corridors, staircases, access and emergency escape.
- Routes of dust and non-attributable construction waste on a daily basis (trade contractors are responsible for their own work areas).
- The cleaning gangs will liaise with all parties supervisor's regarding the site's needs and any particular "hot spots" that may require immediate attention.
- BAM is to be informed immediately if the agreed procedures are not adhered to
- Adequate brushes brooms, shovels, heavy-duty refuse bags, etc. are available on site at all times.
- No stock piling of rubbish will be permitted.
- Gritting of site footpaths / steps and site access areas.

### 3.4.3.3 Management of Site Cleanliness:

- The site will be patrolled at regular intervals to ensure that:
  - Waste is being put into the bins provided.
  - That waste is segregated into the correct bin.
  - Materials are stored in the correct location and are adequately protected.
- Items such as pallets, cable drums, packing crates and stillage which are deemed to form part of the waste stream are returned to the original supplier.
- Provide a jet washer and operator on a weekly basis.
- Any flagrant breach of these waste management protocols will result in the instigation of disciplinary procedures.

### 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 B

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 Roadworks 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 October 2018.

##### 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.

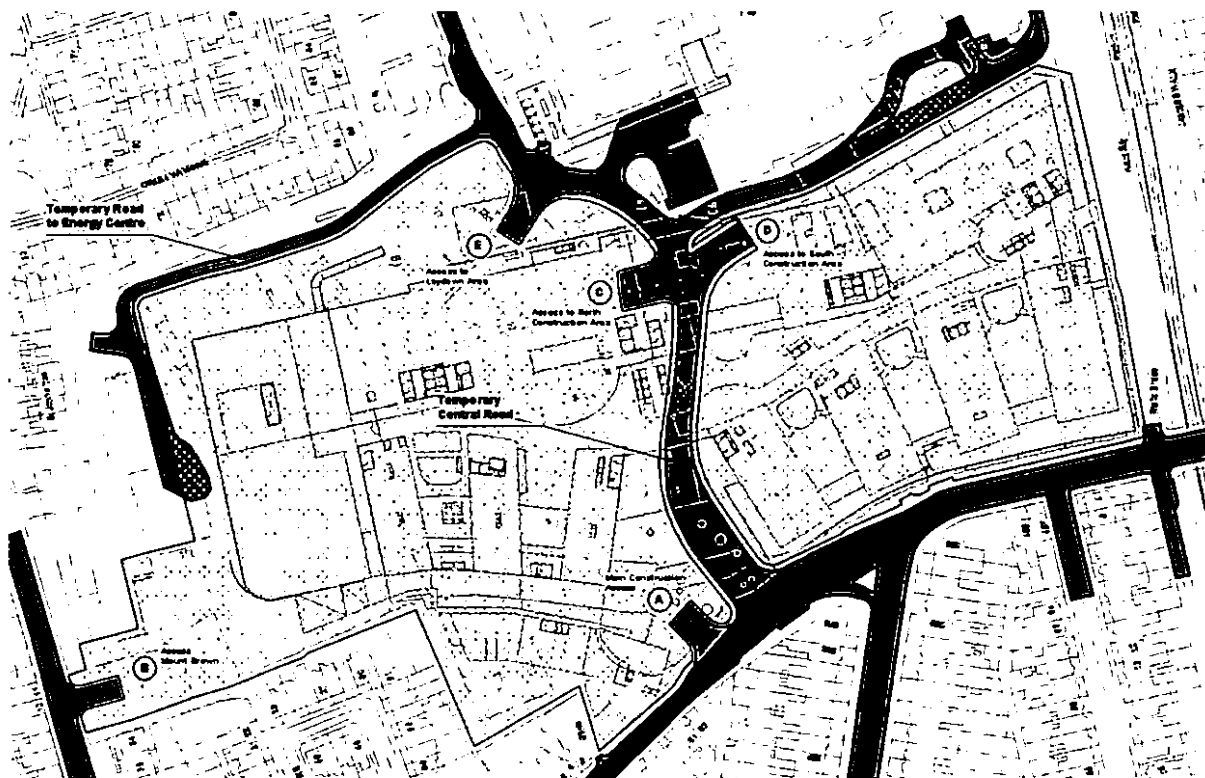
BAM will maintain protected vehicle and pedestrian/staff access routes as well as blue light and service vehicle access into and through the campus from the Rialto Gate, as well as to the Emergency Department, Energy Centre, Delivery Hub, south perimeter road.

Where feasible, TM proposals will be designed to minimize 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 minimization 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.

The proposed plan for the phase B works will consist of utilising the new constructed Central Access Road from Rialto entrance from October 2018. BAM will access into both the north and south sides of the site from the new campus road, all entrances into the sites will be manned by flagmen/security.

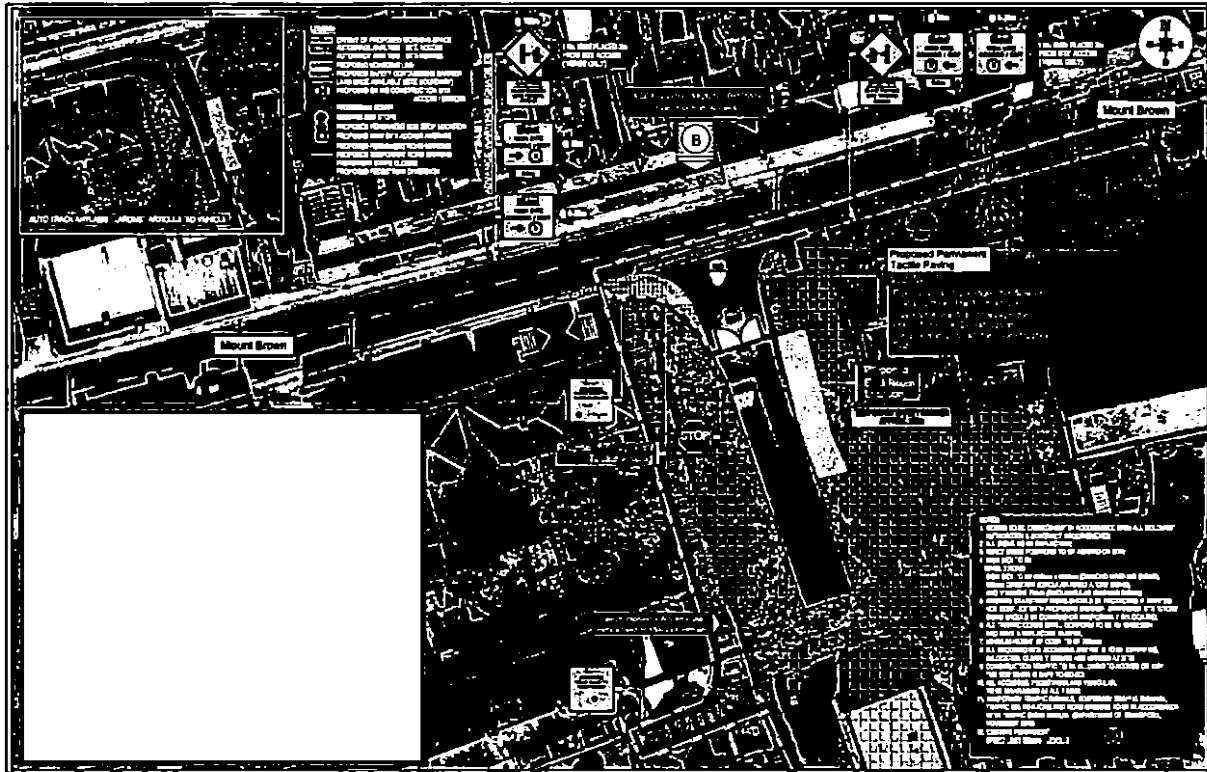
There are 2 designated construction accesses to be used during the Main Contract Phase B works. These are the existing Rialto entrance (Access A) and a new entrance at Mount Brown (Access B):



*Access & Egress points for construction traffic whilst the Central Road is active*

### 3.5.2.2 Access at Mount Brown

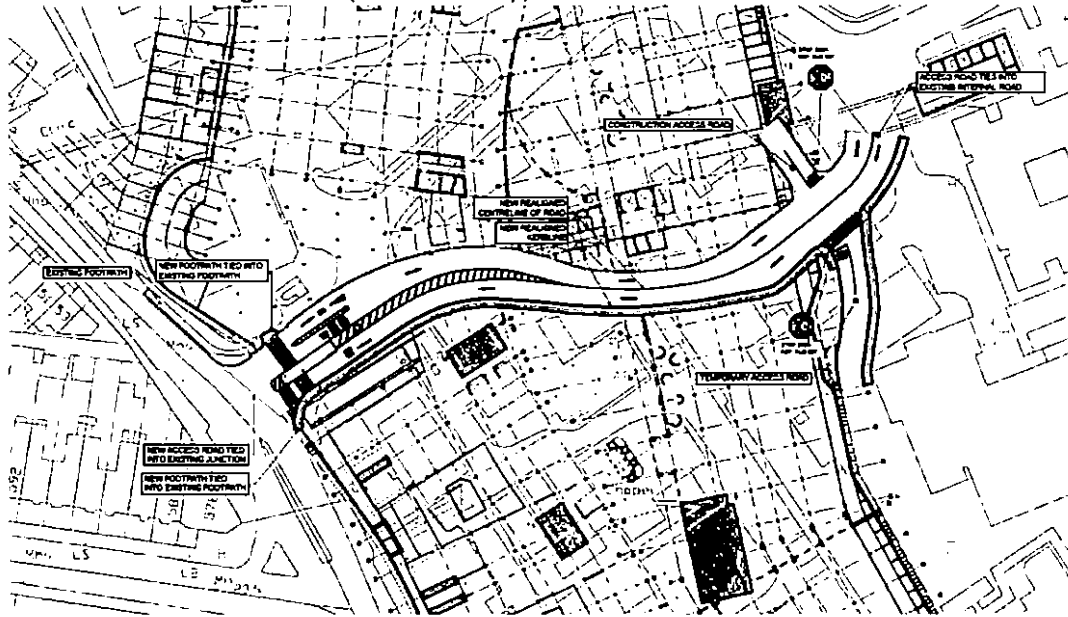
The Access B at Mount Brown was constructed and is operational since September 2018:



Extract from drawing 16 EM00x "Temporary Traffic Management Layout for the Temporary Mount Brown Access Arrangement to Facilitate Construction Access/Egress", included in Appendix H

### 3.5.2.3 Traffic Management through the Campus

#### 3.5.2.3.1 Current Arrangement (Phase A only)



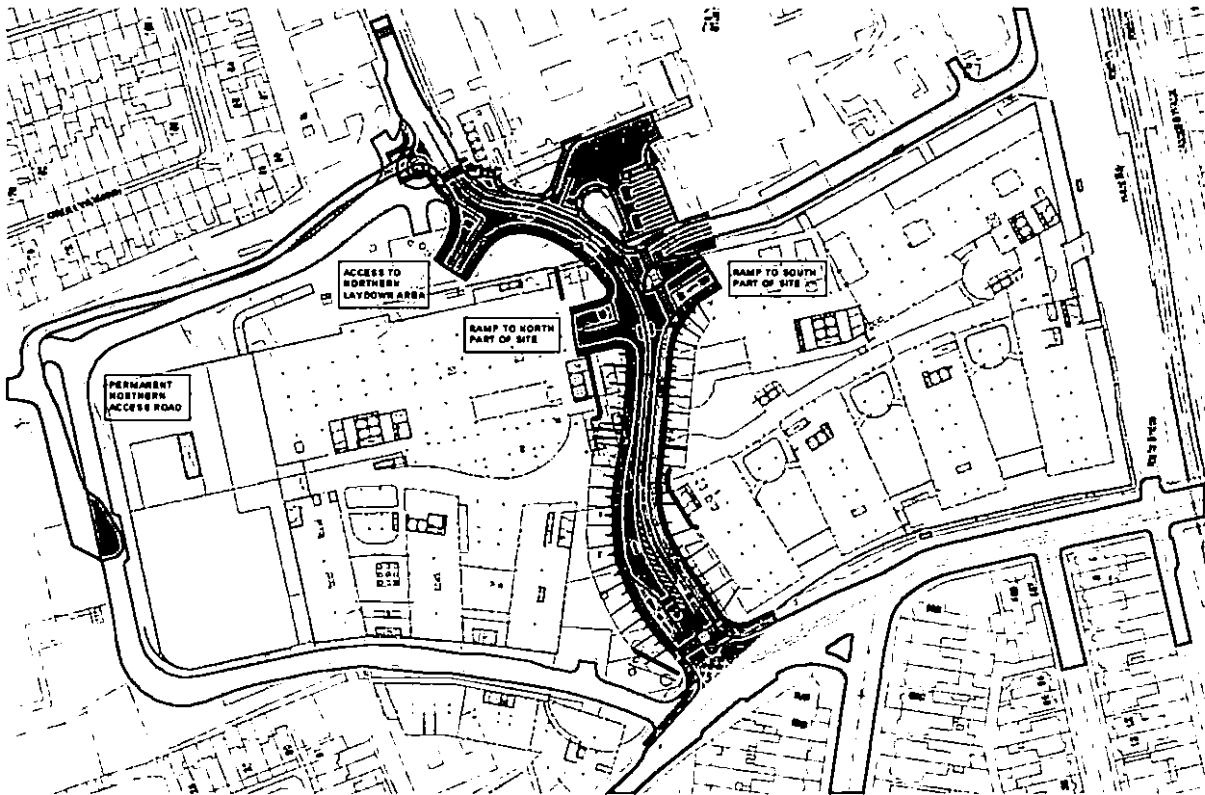
Refer also to Appendix H of this CMP

#### 3.5.2.3.2 Temporary Central Access Road)



Temporary Central Access Road & Permanent Northern Access road (blue)

3.5.2.3.3 From June/July 2019 (via Permanent Northern Access Road)

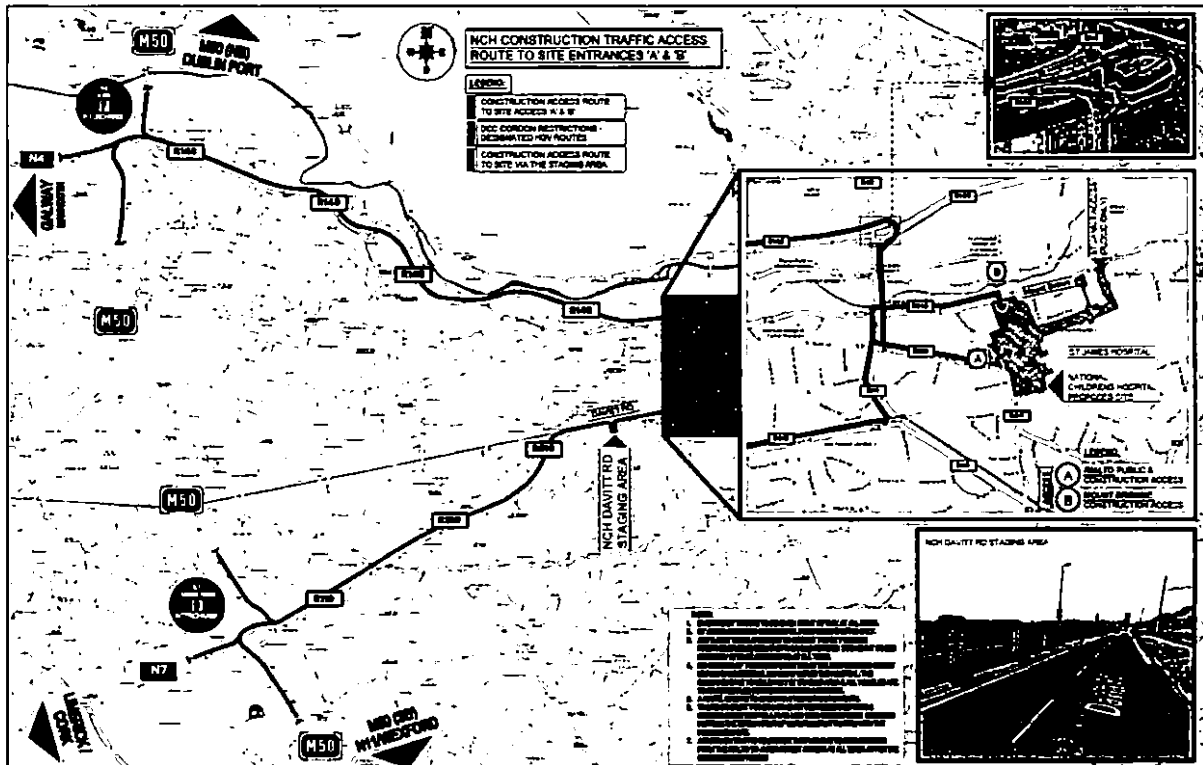


*Image above shows the Permanent Northern Access Road (blue)*



### 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

BAM has prepared a Construction Traffic Management Plan (refer to Appendix H) 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 B Traffic Management Plans is 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 north and south sections of the construction site
- iii. 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
- iv. Upgrade Works in Linear Park.
- v. Works associated with the completion of bulk excavation to the entire site. Current arrangement is to access/egress the site from the Central Access Road or Mount Brown site access.
- vi. TM plan to facilitate construction of the north circulatory road, in particular, the tie-in of this route to Brookfield Road, incorporating access to Hospital from Brookfield Road, blue light access to A&E, and services access.
- vii. TM plan for Central Access Road.
- viii. TM plan for access and egress to the Davitt Road compound.
- ix. TM plan for connection of Drimnagh foul sewer on Mount Brown Road including SJH storm connection.

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

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 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 ongoing. The construction vehicle generation will be from a number of sources:

- Hauling of excavated material off site;
- Concrete deliveries;
- Deliveries of reinforcement & formwork and other building materials such as drainage goods etc. to site.
- Deliveries of façade and structural steel elements (probably with large single piece elements) to site, such deliveries will be coordinated accordingly with all involved stakeholders and performed during out off peak traffic hours and probably out of permitted hours if directed by An Gardaí
- Deliveries of Mechanical and Electrical equipment and goods to site incl. bigger goods such as transformers, chillers and cable drums
- Deliveries of soil, gravel, plants, trees, paving goods for the landscaping works
- Deliveries of prefabricated bathroom pods and other general building goods for fit-out works

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, please also refer to chapter 3.5.7) 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 which is called the delivery management system

#### 3.5.4.2 DMS Booking System

- Delivery Management System is a bespoke software system developed around the Site requirements and specific delivery management constraints. It is a fully customizable software package that can be developed and updated to suit the various logistical phases throughout the build. It can be easily adapted to suit different phases of a project; with multiple users for subcontractors and suppliers to form a complete delivery booking system. It has the ability to record every single delivery received, turned away, unloaded or sent to storage, which can be utilized throughout the duration of a project.
- All Vehicle movements and materials deliveries to the site will be controlled by the above online Delivery Management System (DMS). Sub-Contractors will need to use the system to book all vehicle movements to and from site as well all material deliveries and collections and will be used as an overarching logistics management system to control and monitor numerous logistics activities. It manages and allocates project resources and capability to ensure that bookings are properly coordinated and supported with the necessary assets and resources. All bookings will be required to be made through the DMS, workshops will be held on a regular basis to teach all sub-contractors on how to use the system.

Construction Management Plan

- All relevant Personnel will be trained on the Delivery Management System (DMS).
- DMS software records data that captures all CO2 emissions from delivery vehicles to and from site, which is then issued to the contractor at the end of a project.

**New Children's Hospital (NCH)**

All Deliveries For 30/11/2018

Printed:  
20/11/2018  
17:43:45

Time of Delivery	Duration	Delivery Vehicle Type	Description of Load	Destination of Load	Final Destination	Hoistage Company	Means of Offload	Tower Crane	Vehicle Edge Protection	Company	Contact	Contact No.	Ref Code
Gate: Gate 1													
00:00:00	1:0	Concrete Lorry	1 load of concrete for pipe bedding on B1	No Laydown Area	B1 South	Roadstone	Excavator	No Crane	N/A	COO	Peter Martin	087 7325621	DS/123527
00:00:00	4:0	Artic	MINI TRUCK SHUNTING MATERIALS FROM DAVITT ROAD COMPOUND TO NCH SITE	No Laydown Area	B1 South	Kwik	Crane	TC4	Handrails	Kwik	Brian Kirwin	088 8665724	DS/123532
10:30:00	3:0	Concrete Lorry	120m3 of concrete for Mezz 4 Pour	No Laydown Area	B1 South	Roadstone	Concrete pump	No Crane	N/A	Kwik	Peter Martin	087 7325621	DS/123531
11:00:00	1:30	Artic	1 load of Rebar from Fairyhouse Road	No Laydown Area	B3 North	Templetown Transport	Crane	TC3	Other	Kwik	Sean McNamee	087 1325371	DS/123529
11:00:00	0:30	Waste Removals	1 20' Roll on Roll off skip exchange	No Laydown Area	OFF Site	AES	na	No Crane	N/A	AES	Tommy Doyle	087 3314933	DS/123533
12:00:00	1:0	Artic	Crawler Crane off site for P.J Edwards	No Laydown Area	Rebar Entrance near wheel wash	BREW	na	No Crane	N/A	P.J Edwards	Glen Akerman	087 8180467	DS/123525
12:00:00	0:30	Van	Delivery of brackets for rotating wall in Linear park	Laydown opp Pharmacy	Linear Park	KH Engineering	Portlift	No Crane	Other	COO	Tommy Doyle	087 3314933	DS/123528
13:00:00	0:30	Artic	1 load of JB Sections off Site	No Laydown Area	OFF Site	Bree Construction	na	No Crane	N/A	P.J Edwards	Glen Akerman	087 8180467	DS/123526
14:00:00	0:30	Waste Removals	1 no 20' roll on roll off skip exchange	No Laydown Area	OFF Site	AES	na	No Crane	N/A	AES	Tommy Doyle	087 3314933	DS/123534
14:30:00	2:0	Concrete Lorry	3 loads of concrete for walls on B1	No Laydown Area	B1 South	Roadstone	Concrete pump	No Crane	N/A	Kwik	Peter Martin	087 7325621	DS/123530

*Typical extract from Delivery Management System*

### **3.5.4.3 Initial works of Phase B, January – June (Months 16-21)**

During the first 6 months of the Main Works Contract Phase B, works will be largely the construction of the R.C. frame with worker numbers of approximately 500 persons.

Works will also consist of the remaining bulk excavation of material (excluding the Central Access Road), mostly extracted from the north side of the site. This will be removed through the Central Access Road and out the Rialto entrance.

In the south of the site (Zone 2) this will consist of ground bearing slabs above drainage being placed at B1 level and suspended slabs being placed on PC columns from B1 level to 4<sup>th</sup> floor (in places).

In the north side of the site (Zone 1), construction of the building frame will consist of B2 level ground bearing (under drainage) and suspended slabs, B1 level ground bearing and suspended slabs and suspended slabs to LG level.

Additional cranes (4 no.) will be erected in that period to the total of 9 no. As referred to earlier. It is envisaged that at the end of this six-month period, the perimeter access road through the north side of the site will be completed allowing all access to the existing hospital campus to transfer to this route thus allowing the existing Central Access Road to be removed. This road will then be excavated, and the middle section of the hospital frame located in the road's footprint will be constructed in the 2<sup>nd</sup> half of 2019.

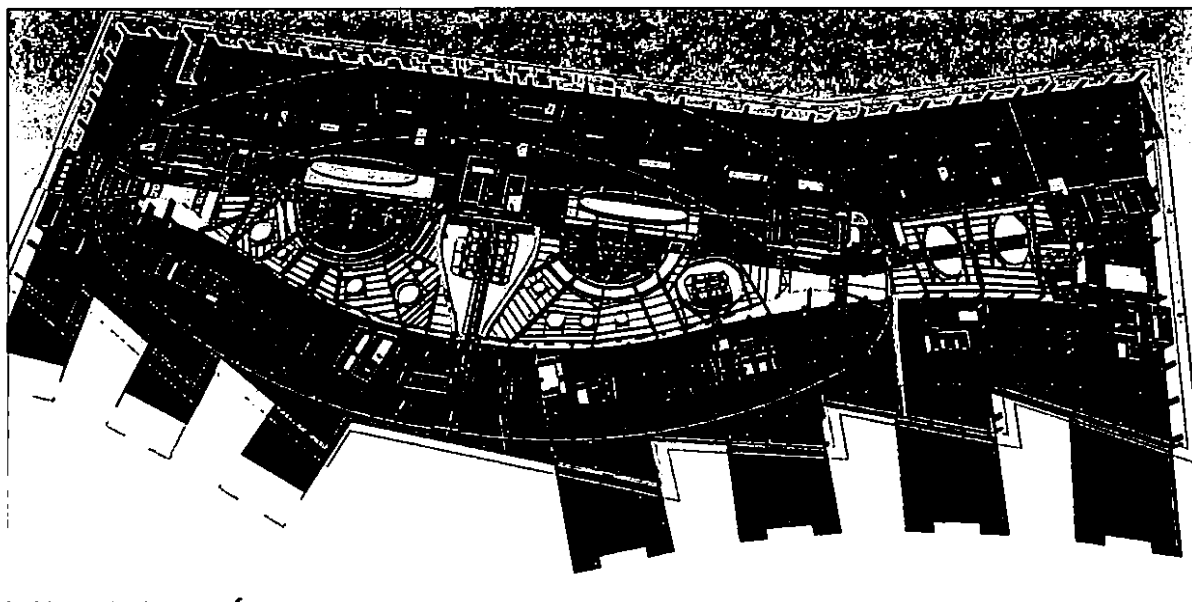
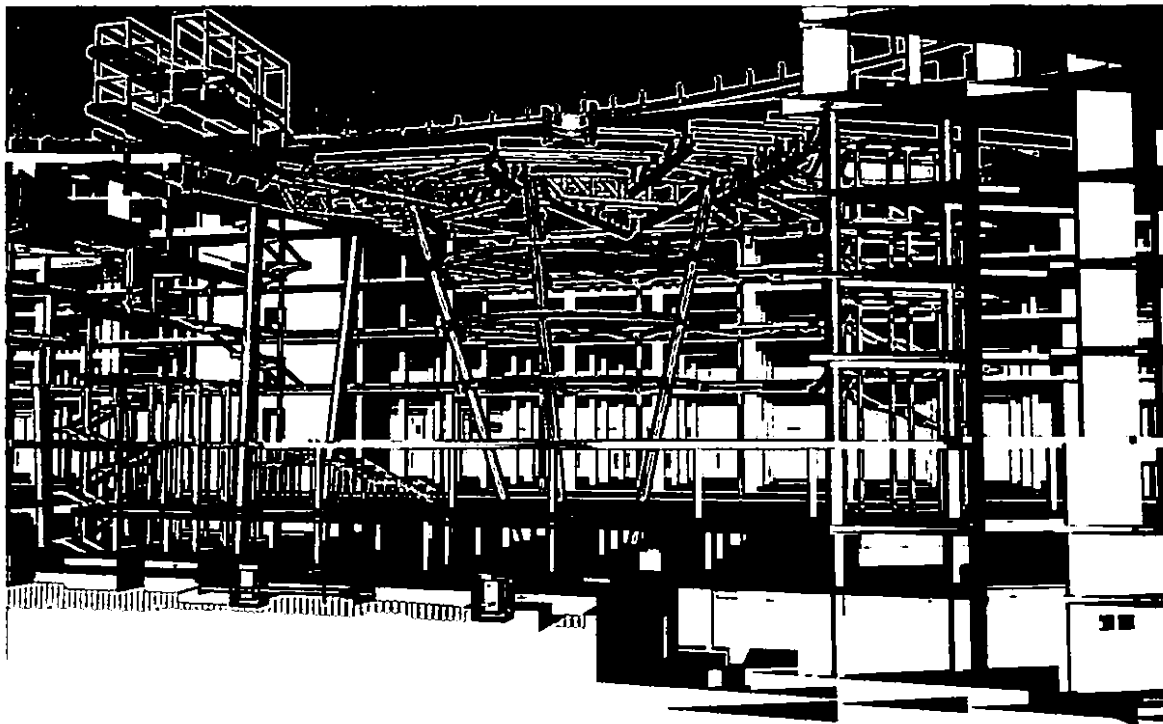
### **3.5.4.4 Main Construction works of Phase B (Months 22 - 60?)**

During the 2<sup>nd</sup> half of 2019 and beyond, the Central Access Road will be to removed and construction of the building section located within this footprint will commence.

After Central Access road demolition the remainder of spoil (approx. 30.000m<sup>3</sup>) will be brought off site. Then the remaining drainage under B1 level will be placed and the building frame fast-tracked to meet the rest of the building as quickly as possible.

The north side of the building will continue to be constructed up to the general level of ground floor, the south side will progress to the 4<sup>th</sup> floor.

Included with the concrete frame erection is a significant element of structural steel located throughout the entire building footprint but with the main parts being that of the cone (located centrally in the building B1 to 4<sup>th</sup> floor) and the 4<sup>th</sup> floor level structural steel. The placement of this key structural steel is fundamental to the continuation of the building frame erection from 4<sup>th</sup> to 7<sup>th</sup> floor.



As soon as elevations become available, facades will commence placement (June 2019). These will be placed by means of spider cranes and loading decks.

M&E commencement and fit-out will commence site wide once weathered and watertight areas are available.

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### 3.5.5 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; (NPH-CT-BAM-PN-XXXX-0001)
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
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.

### 3.5.6 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 a Mobility/Logistics Manager.

The following measures are to be implemented by BAM's Mobility/ Logistics 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

### 3.5.6.1 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.

### 3.5.6.2 Car Park Management During the Works

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. BAM will also emphasize to 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 envisages staff to use the public park and ride facilities to be established in Saggart/Tallaght/Red Cow which will allow for personnel to park cars and use the Luas or bus routes to the site. BAM has established a staff parking facility at Good Council GA Center in close proximity to the Red LUAS line and to the site.

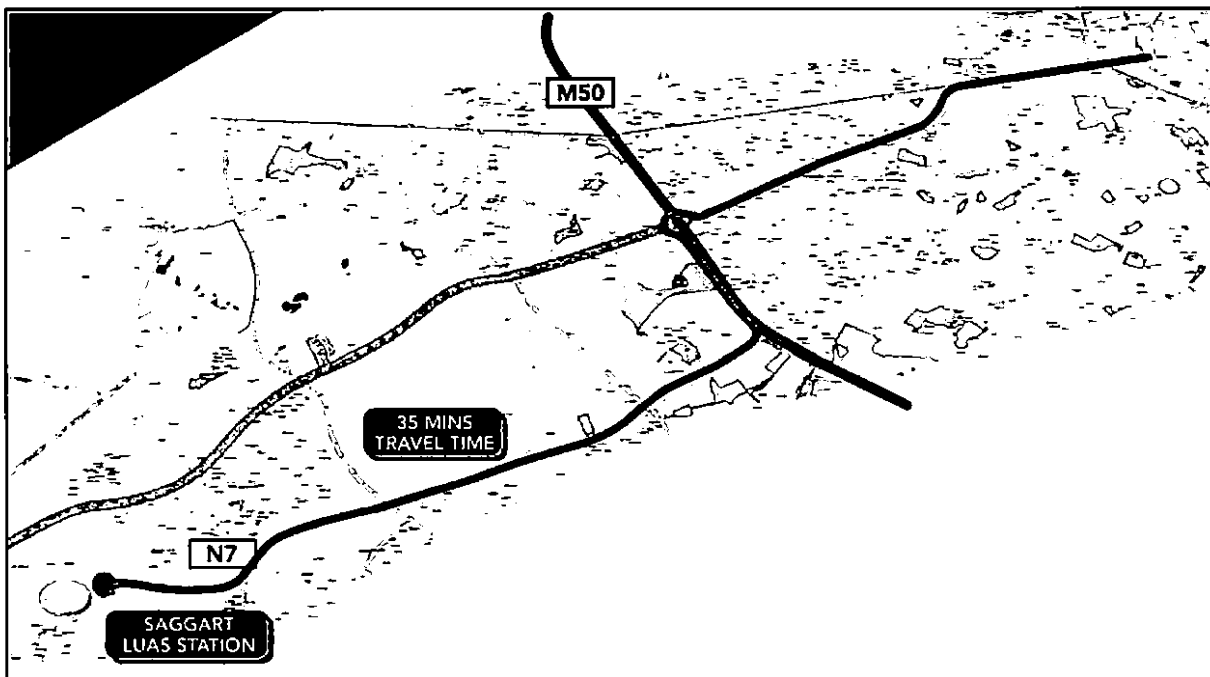


Image above shows location of Saggart LUAS station relative to Saint James's Hospital. Tallaght, and Red Cow have similar / shorter travel times.

### **3.5.6.3 Registration of Contractors' Vehicles and Drivers with SJH**

All contractors' vehicles accessing the site shall be registered. 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.

## 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 in-situ frame with concrete foundation slab, concrete walls and pre-cast columns together with suspended concrete slabs at each floor level.

The basement construction is happening on both sides (North and South) of the site, separated by the Central Access Road, at the same time. At first, the south side B2 basement works commenced ahead of the north side. As B2 south basement slabs were poured (using static mast pumps), folded walls and B1 ground bearing basement slabs commenced construction.

In the 3<sup>rd</sup> quarter of 2018, basement works within the North side of the site commenced with the excavation and construction of the B3 slab (attenuation tank base). It is progressing through the B3 construction and then B2 lid and expand out into the ground bearing B2 slabs.



*Temporary Works to facilitate Central Access Road  
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, and before any basement construction works could commence the building footprint must be contained within a secant piled wall. This design is essentially a sequence of interlocking piles, reinforced piles 'locking' with unreinforced or soft piles (every second one) which when placed, become a watertight retaining structure. Once the piles are placed, the top section of each pile is cropped and then blinded making a smooth working platform on which the capping beam is built. The capping beam itself is a structure or element that ties all the piles together and restrains them from moving in or out. In some locations, anchors are also required (at zones of exceptional load). These anchors are drilled by machine, through the capping beam into the ground outside the building perimeter (into ground rock). They are then grouted and when the grout is sufficiently strong, the anchors are tightened or locked off thus holding both piles and capping beam in position. Only then, can the material within the site footprint and adjacent to the pile wall be excavated down to formation level.

The detailed design of the secant pile wall is a Contractor Designed Element. On appointment of a specialist subcontractor and designer, the detailed design was completed and issued to the ER for approval.

In respect of the anchors mentioned already, BAM submitted to the Client and PSDP the necessary temporary works design. A method statement detailing the propping requirements was also submitted to the Client for each relevant stage.

2 piling rigs and 2 tie-back anchor rigs were mobilised to site and piling commenced and the piling works site wide have been substantially completed.

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 bored each day did vary depending on the ground conditions. The rotary boring of piles has generated spoil which was 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 required 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 took place in close proximity to services including BAM's own temporary services in specific areas, particularly along the footpath of South Circular Road and Rialto Gate entrance. All services were fully investigated and the alignment of same fully determined prior to piling operations commencing.

#### 5.3.1 Secant Piling – Waterproofing Requirements (FM-Link Tunnel only)

The FM-Link Tunnel required very limited piling activities.

*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 to be protected to a Grade 3 Level (where indicated on drawings) in accordance with Table 2 of BS 8102:2009.

It must be noted that the client has changed the waterproofing detail under all B1 level ground bearing slabs where the water proof membrane has been removed from the design and the slab itself is now designed as a fully watertight structure.

Based on this premise, BAM proposed to use a Rascor (watertight concrete solution, <https://rascor.com/en/products/>) design for the construction of the liner wall.

### 5.3.2 Testing Requirements of Piles

Sonic logging 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 pile tie-back anchors is also described on drawings NPH-C-OCSC-DR-ZZ-00-1010-0150 to 0152.

### 5.3.3 Excavations

Excavations are ongoing throughout the site to facilitate the formation to basement levels, ramp access, modifications to existing services including the Drimnagh Sewer and to facilitate construction of new services, drainage and road formations.

Remaining clay material that currently has to be excavated and removed from site totals approximately 100,000m<sup>3</sup>. Included in this total is the volume of material that is contained within the extents of the central access road (30,000m<sup>3</sup>) and which will not be excavated until mid-2019.

Excavation of material is ongoing and it is anticipated that the vast majority of the excavation from site will be completed by mid-March 2019. Most of the material will be transported from site via the South Circular Road with considerably less being moved via the Mount Brown Road, with part of the removal of the Central Access Road.

Any areas requiring temporary retaining works will be determined by BAM and their temporary works / geotechnical designer (Byrne Looby). Secant piles are propped in some instances where tie-back anchors cannot be installed. BAM together with Byrne Looby carry out slope stability checks on cut faces during excavation. 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 i.e. heavy rainfall.

In addition to the operational sequence of work and safety measures adopted, all access/egress points, measures to prevent stacking of trucks, wheel wash implementation, dedicated areas where

tarpaulin covers will be fixed before leaving the site and details of the excavation / stockpile register are maintained by BAM.

BAM have employed an Environmental consultant and have developed a watching brief for contaminated material. This brief details how potentially contaminated material is excavated, segregated and stockpiled in a contained manner and characterised by a competent professional through laboratory testing before removal from site.

Excavations are undertaken 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 have a built on tarpaulin that covers the excavated material (in the body of the truck) as it is being hauled off site and the truck is required to pass through the wheel wash spray facilities provided. There is also a facility to manually wash vehicles using jet washers should the quantity of material on truck wheels not be entirely removed by the wheel wash. In addition, BAM employ road sweepers and tractors fitted with high powered spray bars to maintain the public routes and SJH campus road in a clean state. As the depth of excavations increase, tie-back anchors/ temporary propping/supports as per BAM / Byrne Looby's temporary works design specific to each location will be provided to support the secant pile wall.

As material is excavated, it is loaded directly into trucks for transport off site, with no large scale or bulk stock piling of excavated material being 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 note 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 which is submitted as part of the Project Execution Plan. Soil sampling is carried out by a competent person (engaged Environmental Consultant) 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". Currently, all areas identified in the report have been assessed and the material classified by the engaged Environmental Consultant. WAC testing is 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 is disposed of in an approved manner and to an approved licenced location. Copies of all collection, delivery and acceptance at approved licence location documentation are kept on site.

#### **5.4 BELOW GROUND SERVICES**

The project will require a wide range of new below ground services to be installed. 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 including BAM's own temporary construction 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 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.

### 5.5.1 Level B3

The level B3 is in the northern portion of the site and works will be concluded as part of Phase A. 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;
- Placement of temporary props;
- Dewatering of excavations by the Main Contractor;
- Immediate placing of a concrete blinding layer to protect the foundation formation;
- Installation and placing of waterproof membrane & drainage;
- Placement of anti-floatation anchors;
- 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 (a bulk number of generic columns will be done in precast concrete off-site);
- Erection of formwork to columns and walls;
- Casting / placing of vertical elements.

### 5.5.2 Level B2

The Level B2 consists of plant space, loading bay and storage space and is located sitewide. The structure is a mixture of a foundation slab bearing directly onto the formation stratum (north and

south sides of the site) 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 (north side only) with:

- Backfilling of excavations around the perimeter of the B3 rising walls with leanmix blinding or similarly approved;
- Completion of excavations to the formation level for remaining footprint;
- Dewatering of excavations by the Main Contractor;
- Immediate placing of a concrete blinding layer to protect the foundation formation;
- Installation of anti-floatation anchors;
- 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 and is located sitewide. 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 vast majority of the suspended slabs will be done using Bamtec prefabricated carpets. 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:

- Placement of underground drainage and services, manholes, etc.
- Placement of anti-floatation anchors;
- Backfilling of all services and excavations in lean mix or similar approved;
- Backfilling behind folded walls with lean mix or similar approved;
- Cleaning down of liner wall piles;
- Placing of propping and laying of formwork;
- Fixing of steel reinforcing bars or Bamtec carpets 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 and will be formed using Bamtec carpets in the main.

### 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. Again, much of the Level 00 will be formed using Bamtec carpets. Where this is not possible due to loading parameters that are not conducive to Bamtec, loose bar will be used as designed by OCSC.

#### **5.5.6 Level 01-04**

Levels 01 to 04 consist of (01) Family Units, dedicated clinics, Cardiac Ward, CCU, (02) Operating Theatres, Surgical Wards, Corporate Services, (03) Therapy Units, Plant Areas, Pharmacy, Education rooms, and (04) Haematology/Oncology, Nephrology, Urology, Haematology, Oncology, and Renal transplant blocks.

All of these areas from a frame perspective consist of suspended slabs placed on a majority of PC columns (all non-standard columns will be built in-situ).

#### **5.5.7 Level 05-Roof**

Levels 05 to roof consists of suspended concrete slabs and PC columns. This part of the structure will be erected in distinct quadrants up to roof level. The roof which is a structural steel frame will then be constructed using the tower cranes TC5 and TC6 but only after specific mechanical plant has been positioned on the 7<sup>th</sup> floor slab first.

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## 5.6 WATERPROOFING (below ground)

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

- Basement B3 Level (no waterproofing membrane)
- Basement B2 Level incorporating Facilities Management & Plant, Corridor, Link Tunnels (full membrane)
- B1 level (no membrane, slab designed to act as the waterproofing barrier, only anchor points have membrane patches applied)
- Liner wall (preferred system is Rascor)
- 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 BAM's chosen Specialist Waterproofing Sub- Contractor and Sub-contractor/Installer.

## 5.7 CONCRETE PLACEMENT

Concrete shall be transported from the place of mixing (Fortunestown and Tallaght Roadstone batching plants) 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 joints in one operation.

During the works, BAM shall complete post-pour check sheets after concrete placement, and carry out post-pour surveys. Tolerance criteria to be in accordance with OCS *Cast In situ Concrete Specification*.

In the main, all concrete will be placed by static pump.

### 5.7.1 Concrete Finishes

All structural concrete finishes will be as set out in the contract documents and drawings.

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.

### 5.7.2 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 pre-camber 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:

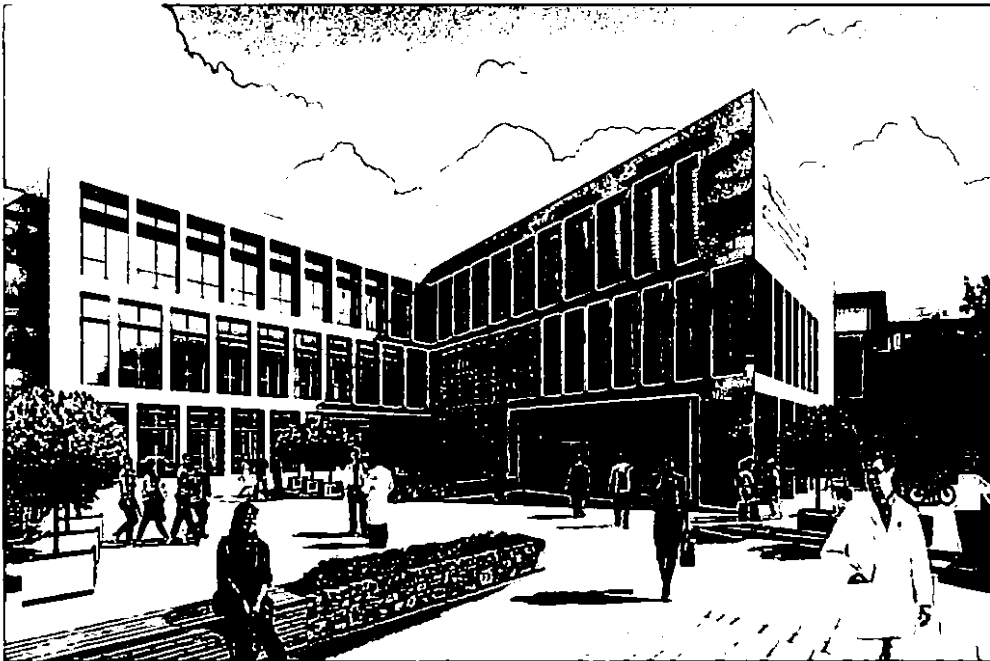
- Grid 50-57 transfer slabs on L03 and L04 above the Main Entrance;
- Level 02 and 03 above the South Entrance;

- 
- L04 transfer slab;
  - Slab bays supporting heavier loads in general;
  - Localised bays.

## 7.0 CRIC Building

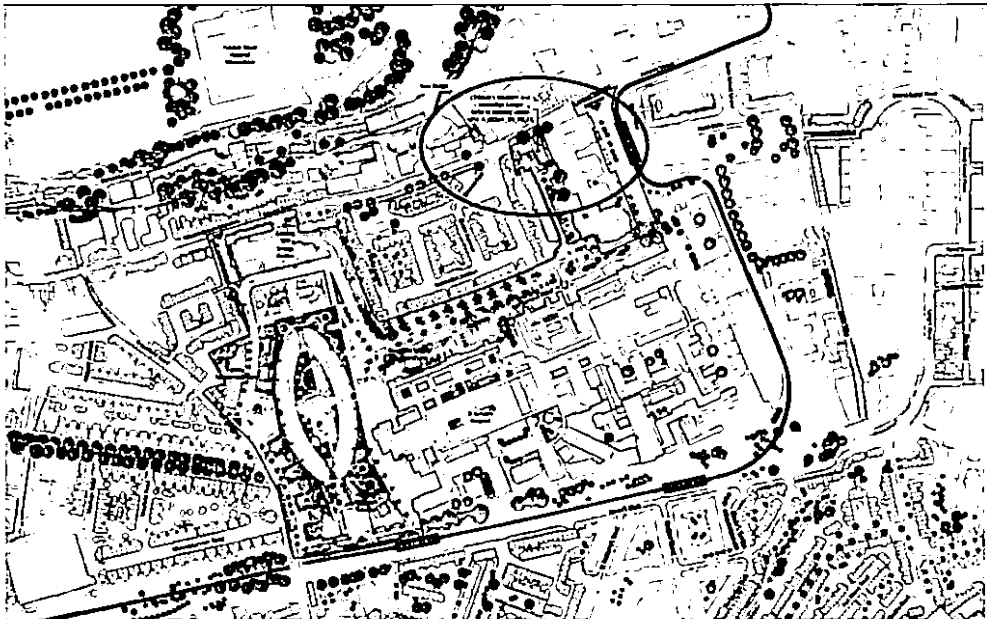
The Childrens Research Innovation Centre (CRIC) does not currently form part of the BAM scope of Works in connection with the National Childrens Hospital.

The proposed CRIC will be located to the west side of and adjacent to the Trinity Translational Medicine Institute on James Street. An existing partially demolished structure will have to be removed in full in advance of the Works.



National Paediatric Hospital Project - Children's Research & Innovation Centre

VIEW OF MAIN ENTRANCE - COURTYARD

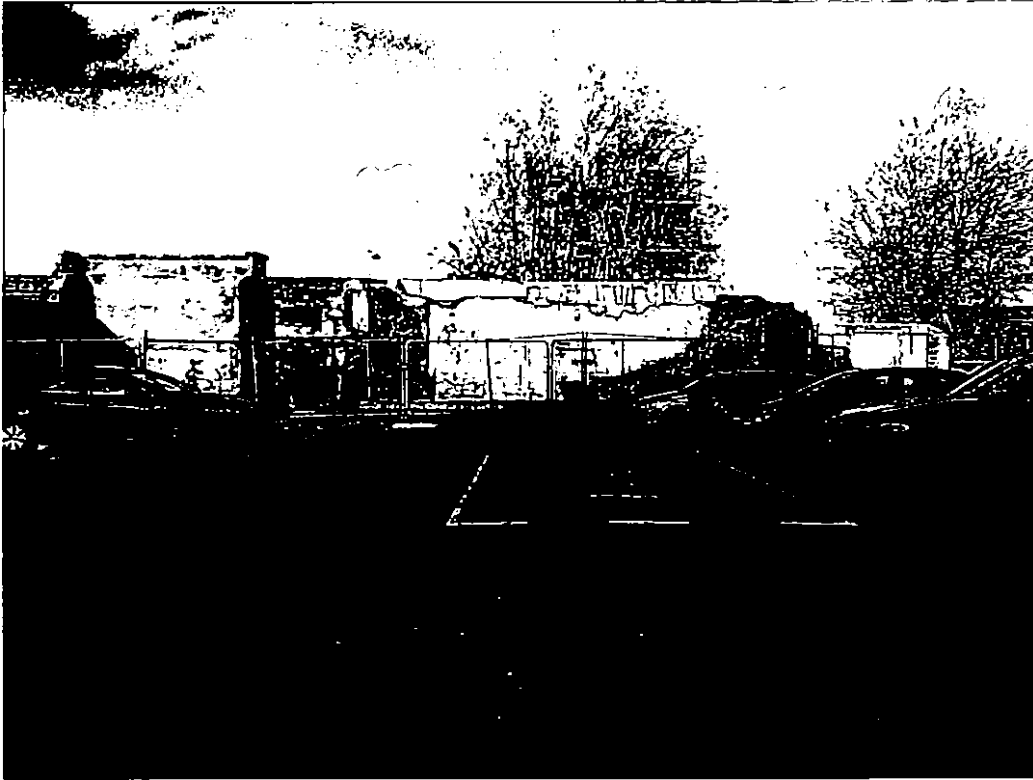


Although the CRIC building does not currently form part of the BAM scope of Works in connection with the National Children's Hospital, BAM have under instruction of the NPHDB have carried out some stabilisation / make safe works to the existing partially demolished building located on the proposed foot print of the future CRIC building.

The works consisted of the taking down to safe level part of the existing structure and weathering exposed faces of brick and stonework to limit future deterioration. Works were carried out in accordance with and to the satisfaction of the NPHDB's Structural Engineer OCSC.



*Saint James Street View – Post Making Safe*



*Car Park View – Post Making Safe*



*Car Park View – Pre-Making Safe*

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In accordance with the planning conditions in consultation with the NPHDB project heritage advisor any element of the demolished work of architectural significance has been salvaged where possible and set aside for future use elsewhere.

## **8.0 Family Accommodation Unit**

The family accommodation Unit is a facility that is situated outside the main building of the NCH along Brookfield Road and adjacent to the existing Brookfield Clinic. The purpose of the building is to provide accommodation to families of ill children that require long term care/treatment. Under the auspices of the contract BAM are required to install the load bearing piles and construct the ground slab of the future building.

The piles are a smaller diameter to the main NCH perimeter secant piles and are installed from the site side of the works i.e. all works are contained within the curtilage of the site perimeter hoarding.

On completion of the piles the ground will be excavated to basement level and the slab will be constructed.



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## 9.0 Hospital

### 9.1 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. The method statements will be split into;

1. North side construction
2. South side construction
3. Central Road Frame construction.

Due to the need for the Central Access Road to service the existing hospital until the new 'north' road is complete, the frame will be built in 3 sections as listed above. This means that the north and south ends of the site will be constructed and continue to rise until the middle of 2019 whereby once the north road is open, the Central Access Road will be excavated out and the Central Road Frame (item 3 above) will commence construction and catch up with both the north and south sections.

The building frame will consist of in-situ ground bearing slabs consisting of 70% GGBS concrete. These will be placed by both static and mobile pumps, depending on pour sizes. Suspended slabs will be an amalgamation of loose bar and prefabricated carpets. These will sit on erected tables. It is BAM's intention to use Bamtec carpets (roll-out reinforcement carpets) for all generic floor slabs within the building. Bamtec carpets are prefabricated bespoke rebar carpets made specifically for each floor. They come to site pre-slung and are lifted into position on the tables and rolled out into final position. All suspended floor slabs will be constructed from 30%GGBS concrete. Again, these will be placed using static and mobile pumps.

In respect of rising elements, BAM will use precast columns for all generic rectangular columns within the design floorplate. These will also contain 30%GGBS concrete and will be made off-site, being brought on a 'just in time basis' before being lifted in by tower crane into position.

Both Bamtec and PC columns will be designed in advance and issued for review and sign off to the Clients Engineers.

In specific areas where Bamtec carpets are not viable due to the complexity of rebar design, loose bar will be used as per OCSC designs. In the same way, where columns are not generic, i.e. square or rectangular in nature, the columns will be cast in-situ.

Certain concrete loadbearing and non-loadbearing walls will also be constructed in a mix of twin-wall and blockwork, blockwork primarily within basement areas, twin-wall precast walls at core locations.

Cores in general will consist of a variety of in-situ concrete and twin wall, these are design dependent. All concrete stairs will be precast and lifted into position by crane.

In relation to perimeter facades, structural walls will consist of either blockwork/in-situ or precast backing walls or Metztec, depending on location and façade type. These will be fed by a variety of ways, e.g. spider crane, scaffolding, hoists, etc.

All elements of the frame will be fed by the site tower cranes and from specific laydown areas. Deliveries as addressed earlier will be done on a 'just in time' basis due to the logistical challenges of the site.

All concrete deliveries will be from off-site batching plants as will mortar for blockwork. Steel erection is explained in the next section.

## 9.2 Structural Steelwork

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.

BAM have a preferred sub-contractor/fabricator on board and have engaged this company to commence review of the overall design of the primary steel package. As of January 2019, this company have sent design engineers to Dublin to work with BAM and OCSC to review the primary steel package and attempt to rationalise it to make it 'buildable' within the parameters of the site logistical constraints.

BAM's sub-contractor will have to develop their own design model and commence review of all steel elements. The primary focus will be that of;

1. Holding down bolt arrangements
2. Cone section
3. 4<sup>th</sup> floor level roof steel.
4. Portalised section.

Lead in time for steel elements from issuance of IFC will be circa 26 weeks for the more complicated elements and 16 weeks for the less intricate sections.

BAM have raised queries about finishes such as fire paint, intumescent requirements, bolted connections v fully welded site connections, etc. These have been issued to the DT for answering.

In terms of steel erection, all steels need to be designed to be lifted into place by use of tower cranes and so, all sizes and weights need to fall within the lifting capacities of the cranes. This is to be taken on board by OCSC.

### 9.2.1 Steelwork Contractor

... TBC

## 9.3 Scaffolding

BAM will develop a detailed scaffolding plan and method statement once the scaffolding subcontractor can provide the required detailed input.

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This section of the CMP will therefore be updated once the subcontractor is appointed and whilst the structural steel design progresses.

Please refer to the façade section 10.0 below for some preliminary information on intended scaffold use for façade erection works.

## 10.0 Façade Works

The fact that this project will take place on a live hospital campus must be incorporated into the construction methodology. This is especially true in relation to the façade works, as these constitute the outer extremities of the construction and require extensive working space, which may have a direct impact on the neighbouring hospital. BAM has considered all of these factors in our methodology for the delivery of the Works. A key factor in the management of the façade works will therefore be logistics and ensuring a timely delivery of the façade elements. In order to achieve this, we will utilise an experienced BAM logistics team that will work closely with the façade subcontractors to ensure that the manufacturing process, delivery and storage of elements are optimised throughout the project. To this end, we have identified suitable specialist facade subcontractors during the GMP-Phase of the project and have sought their involvement to create a fully integrated programme, which will set the baseline for the delivery and control of the works.

The installation of the works will be managed and controlled by our experienced BAM façade team, who have a sound engineering background and can coordinate the numerous interfaces between the frame, fit-out and multiple façade types. Our façade team has experience in planning, design, procurement and site supervision of the associated works. We will implement our know-how and lessons learned from previous BAM projects. Furthermore, regular reviews of the specifications will be conducted to ensure that we will always meet the clients' requirements.

Where appropriate we will consider improving the constructability of the façade, which will lead to significant savings in terms of both time and cost. We will review all interfaces between the works and assess if the use of prefabricated façade systems and / or pre-assembly of steel structures can enhance the construction process. We will adjust our practices to suit the field conditions as required in order to adhere to the construction programme.

In addition to interfaces to fit-out, frame (concrete and steel) and other façade types including Stud Frame Walls, there is also the additional aspect of landscaping and waterproofing works to consider.

A further important aspect will be the temporary weathering and numerous protection measures required during the various stages of the works. Here we will call upon the combined construction experience of the Royal BAM Group to adequately plan and monitor such measures to ensure the works can continue as programmed in almost all weather conditions.

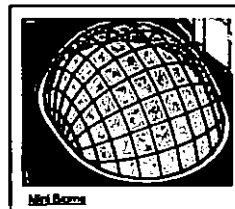
### 10.1 Façade Types

The design is incorporating various façade types on the New Children's Hospital project which require different installation methods. For each façade type BAM will develop further detailed Method Statements which will be coordinated with the different subcontractors and issued to the ER to seek approval.

The various façade type are as follows and can also be seen in the 3D Model snapshot below:

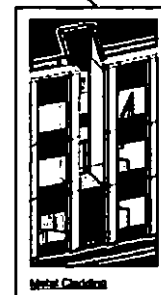
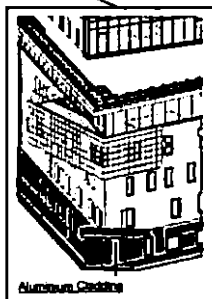
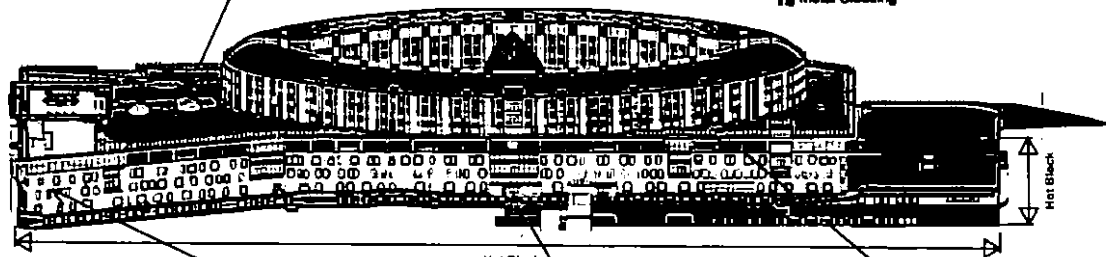
- 1) Unitized Curtain Wall
- 2) Toggle Glazed Curtain Wall

- 3) Punch Windows
- 4) Rainscreen Granite Cladding
- 5) Aluminium Panel Rainscreen Cladding (walls & soffits)
- 6) Insulated Render
- 7) Louvers
- 8) Roof Glazing Works (BIOME, Ward END, Roof Lights)
- 9) HPL soffits
- 10) Standing Seam Roofing system



**Legend**

- EWR - 501 (EW1) - Rainscreen Granite Cladding
- EWR - 201 (EW3) - Aluminium Panel Rainscreen Cladding
- REN - 500 (EW4) - Insulated Render
- EWG - 151 (CW3) - Toggle Curtain Wall Glazing, L00-L03
- EWG - 251 (UV1) - Unifised Curtain Wall Glazing, L04-L07
- EWN - 001-016 (VT1-VT4) - Windows
- LVR - 100 (VL1) - Louvered Vents to Plant Area
- EWR - 202 (MS1) - Metal Soffit under Protrusions
- RFG - 201 (RW1) - Roof Glazing Ward Block
- RFG - 500 (n/a) - Circular & Elliptical Roof Lights
- EWG - 700 (RW2) - Biome Glazing
- GLP - 641 - High Pressure Panel Soffit
- Katzip Roof
- Metal Cladding



In general the installation works will be by means of the Tower Cranes, Hoists / Winches, spider cranes, MEWP's, mobile cranes (only if required).

Where there are no concrete frame infill walls (mainly in the Finger buildings), the design calls for steel frame stud walls. These will be stick build in-situ on site. These walls will be installed from scaffolding and receive an outer waterproofing (EPDM) layer.

The main cladding to the SFS walls is Granite cladding and insulated render. It is intended to install the Rainscreen Granite Cladding from a Working and Goods scaffold including various (28) loading bays around the building for the supply of the granite cladding to the work fronts. The Granite will be installed on the outer faces of the North & South Fingers and the Hot Block.

The rendered facades will also be applied from working scaffolds which are mainly in the North and South finger courtyards and along the Hot Block.

The scaffold for the Granite Cladding and the insulated render works will be installed in a manner, that it can be easily adjusted with scaffolding consoles to allow for the different façade zones during the installation of the facades (to close the gap between the concrete face and final façade face (approx.. 270mm).

The Unitized Façade will be installed by means of a spider crane positioned on the roof of the Ward (Level 4-7) and will be stacked up element by element without the use of scaffolds. The slab edges will be protected by temporary fencing / balustrades.

The Toggle glazing in the entrance areas and around almost the whole perimeter of the building in level 3 (except the plant room areas in the Hot Block) will also be installed from the same scaffolding which will be adjusted accordingly to the top of the Finger buildings. For the entrance building the supporting steel structure for the toggle glazing will be installed by means of smaller cranes / winches and MEWP's.

Where there is no toggle glazing in Level 3, it is planned to install Louvers and insulated render (in the plantroom spaces) which will also be installed using scaffolding erected around the perimeter of the building (Level 00-03).

The Metal Cladding and Soffit cladding (around the whole perimeter of the building at Level 3) shall also be installed utilizing the same scaffolding.

For the BIOME it is envisaged to stick-build the freeform steel structure in-situ using a platform scaffold. As the void underneath the BIOME expands into the basement areas, the scaffold will also be starting in the basement and "fill" the void up to the top of the BIOME structure for safe installations. Glazing works will be performed from the outside utilizing the tower cranes and/or smaller spider cranes on the rainbow garden slab.

As the mini BIOME is erected with a more "standard" type of steel structure it is envisaged to pre-assemble the structure as much as possible on the ground and lift it into position split into 3-4 parts which will be bolted together.

Whereas the Ward End glazing is a structural glazing façade similar to the Toggle glazing in the entrance areas and Level 3, the glazing in the Ward Ends is fixed to an architecturally design "T-shape" primary steel structure which extends into the roof. It is comprised of mainly fixed glazing and glazed AOV's for smoke ventilation purposes. The glazing will be installed from the outside using MEWP's and the scaffold for the installation crew to reach the specific installation positions. The glazing will be put in place using the tower cranes.

As soon as the steel structure for the roof Level 8 has been put in place (most likely after the installation of the large MEP equipment like chillers and transformers), the standing seam cladding / screen will be installed. The sheets will be cold roll formed on site using a roll former, this allows to this specialized material to be delivered in coils which will save both, transport as well as storage space.

The roll former will be placed on the roof level 4 at the South End of the roof (future Helipad area) where the sheets will be formed on site.

The formed sheets will be lifted just-in-time to the Level 8 roof area by means of tower cranes. Due to the length of the sheets it is intended to utilize a lifting beam.

BAM will provide more detailed method statements to all of the above described facades which will be developed together with the relevant specialist facades subcontractors at a later stage of the project, but with sufficient lead time for review and approval by the ER before start of installation.

## 11.0 Airtightness Testing

At the end of construction and short before final handover, a building Airtightness Test will be performed. The test involves pressurizing the building using mobile fan equipment to generate differential pressures between inside and outside of typically between 15 and 60 Pa. The fan units will be powered by a combination of on site power sockets by and mobile generator.

Fan equipment will be mounted in suitably located external doorways at ground floor level. Instruments will record differential pressure and airflow rate into the building at a number of intervals at pressure differences of between 15 and 60 Pa. Internal and external temperature measurements are also taken and averaged for the period of the test. In addition local wind speed is monitored together with barometric pressure.

Vehicular access will be required to the areas outside the main ground floor entrance doors for unloading equipment

- 1) Equipment will be unloaded and set up at ground floor level entrance doorway(s).
- 2) A walk round inspection of the building will be conducted to ensure that all necessary preparation requirements have been completed.
- 3) Measurements of wind speed, barometric pressure, internal and external temperatures will be taken and recorded.
- 4) All fans will be fitted with covers and the no flow pressure difference between inside and outside of the building will be measured and recorded.
- 5) Fans will be started and their speed varied to create a differential pressure difference of approximately 60Pa. Fan pressure and differential pressure will be recorded for ten data sets between 15 and 60 Pa.
- 6) Measurements of wind speed, barometric pressure, internal and external temperatures will be taken and recorded.
- 7) All fans will be fitted with covers and the no flow pressure difference between inside and outside of the building will be measured and recorded.
- 8) Collected data will be analysed together with the building envelope area and target air permeability using laptop computer and data analysis software.

### 11.1 Smoke Test

A Smoke Test could be performed (only if the airtightness test shall fail)

The air leakage audit is carried out only if the building fails to meet the required specification. It will be carried out on the same day as the airtightness test.

The building will be logged with persistent oil based food safe smoke using a mobile smoke generator(s). The building will be pressurised to a moderate differential pressure and location of emerging smoke will be observed from outside the building to identify leakage paths.

The leakage paths will be recorded using a video camera. However emerging smoke is not always easily photographed. Manual observation and written records will be made in conjunction with the main contractors/sub contractors' site staff.

Thermographic Survey (optional)

The objective of the survey is to review the thermal performance of the external envelope through use of Thermographic photography.

The Thermographic equipment used for the survey will be a FLIR systems Thermocam S65 which has the ability to record simultaneous photographic and thermographic images of areas surveyed. The thermographic engineer is UKTA Level 2 qualified and has over 1000 hours camera time. The thermographic engineer will be assisted by one engineer again with extensive experience in carrying out thermographic surveys. Differential pressure and temperature will be monitored to the accuracy limits required by BS EN 13187 1999 with manometers and temperature sensors calibrated to national traceable standards.

The method of conducting and reporting the survey will follow the requirements and recommendations of BS EN 13187 1999 relevant to the use of thermography for identifying air leakage through external building envelopes. The survey report will follow the format for simplified testing. The buildings temperature will be raised above the external temperature by 10 deg C. It is proposed that this be achieved using the buildings heating systems subject to confirmation that they are operational. The extent of areas that can be surveyed will be limited to those areas where the buildings heating system can be operated to provide the required 10 deg C temperature difference.

The building will be depressurised to create a differential pressure of between -5Pa and -10Pa with respect to outside in accordance with the recommendations of BS EN 13187 1999. This differential pressure and inside/outside temperatures will be monitored throughout the duration of the survey works.

Openings in the external envelope (doorways to outside, any open ventilation louvers) will be closed and if necessary temporarily sealed to enable this differential pressure to be created by mobile fans. Colder outside air will be drawn through any leakage paths in the external envelope by the negative pressure created allowing identification by the Thermographic camera of leakage routes.



## 12.0 MEP

We are working collaboratively with three of the market leaders in their field to undertake the co-ordination, construction and activities associated with delivering a successful project.

- Schindler – Lifts
- Jones Engineering – Mechanical
- Mercury Engineering – Electrical

BAM identified that the key to a successful delivery of a project of this complexity requires an in depth knowledge and experience within the healthcare field. The design intent has been undertaken by Arup, it is the responsibility of the contractors to then produce a co-ordinated model for construction and a construction plan by identifying challenges associated with the project.

### 12.1 Co-ordination

Whilst each individual discipline completes their own co-ordination elements, the mechanical sub-contractor JEG have been appointed as the lead co-ordinators for the services allowing a cohesive model to be developed. There are a number of platforms being utilised to lean the processes during this phase of works.

Revit is used to develop the model which is a robust architectural design and documentation software application utilised to develop the overall BIM model.

BIM360 Field/Navis works, facilitates the teams to quickly identify and address clashes within the model and allow for these single instances be resolved while allowing the users to quickly communicate and resolve individually. This support platform is key in keeping momentum on the co-ordination process and also allows for full traceability of development and clash resolution.

RFI, request for information workflow is used widespread within the industry and is a key process for technical queries to be resolved.

Technical submissions is another widely utilised workflow system within the industry, it allows for the design team to review and approve empirical plant/systems for the project.

Biweekly there is a 16WLA, week look ahead extracted from the programme and issued to all design and co-ordination teams, this keeps all parties informed and focused on the sequencing of works and required dates.

### 12.2 Scope of Works

Arup have developed a robust design, within their scope, but there are also a number of design packages that need to be integrated to the model that fall within the remit of the subcontractors themselves.

Scope of works including contractor design packages:

- Building heating system
- Steam system
- Flue package

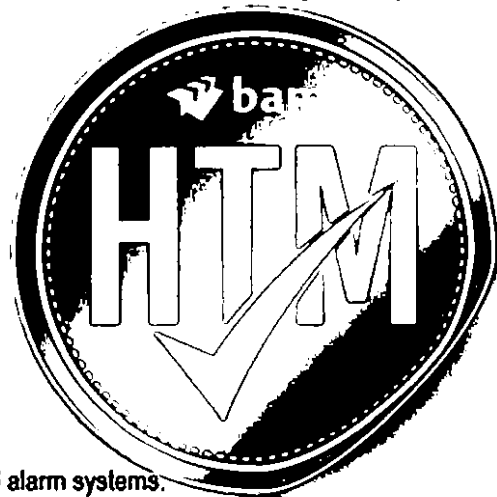
- 
- Building Cooling system
  - Domestic water system – including water treatment
  - Sanitary Plumbing
  - Mechanical ventilation including specialist systems
    - Specialist systems ie Theatres and isolation rooms
    - Clinical – consultation/exam rooms, wards and imaging
    - General – staff support and offices.
    - Kitchens, aseptic suites, labs etc
  - Natural ventilation methods including façade interfaces ie actuated louvres controlled via the BMS system.
  - Smoke extract ventilation
  - Stair depressurisation system
  - Medical gases
  - Laboratory gases
  - BMS – Building management system
  - Fire protection Systems
  - Irrigation
  - Lifts
  - CHP – Combined heat and power
  - Underfloor heating
  - Sprinkler system – Atrium deluge system
  - Wet riser system
  - Gantry platform access systems
  - Flues
  - Ductwork cleaning system
  - Pipe work cleaning and flushing
  - Generators
  - MV/LV transformers / switchgear
  - Power management system
  - UPS – uninterruptible Power supplies
  - Theatre control panels
  - Medical equipment – ultra clean canopies, pendants and lig lights
  - Lighting and lighting control system
  - Emergency lighting
  - Small power
  - Electric vehicle charging stations
  - Pnuematic tube system
  - Fire detection and alarms
  - Security systems
  - Nurse call systems

- Bed head trunking
- Master clock system
- Smoke Damper control system
- Lightning and surge protection / earthing and bonding of services and structure
- Fire stopping
- Signage
- Commissioning & testing
- System Integration

### 12.3 Standards

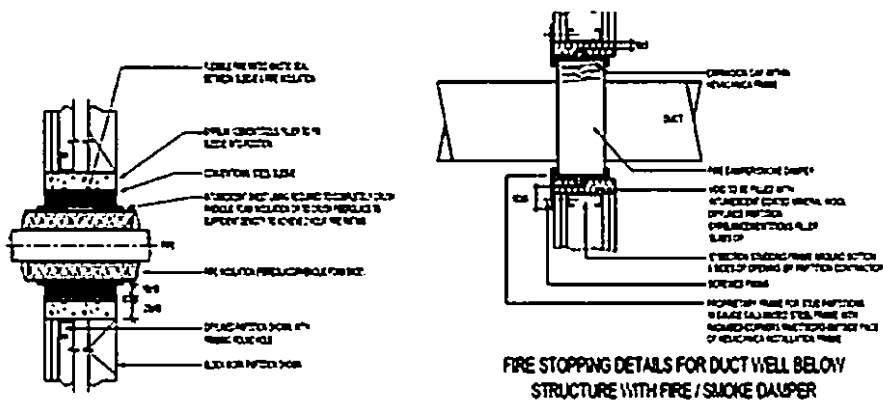
There are a number of governing regulations that are used within the construction industry such as the BS standards and the EN standards but within a healthcare project the HTM, the Health Technical Memorandums developed by the Department of Health in the UK, are specific to healthcare installations and take cognisance of the bespoke functionality of the healthcare environment. Refer to non-exhaustive list below.

- All Health Technical Memorandums (HTMs) produced by the Department of Health in the UK.
- Health Technical Memorandum 04-01 The control of Legionella, hygiene, 'safe' hot water, cold water and drinking systems
- Health Technical Memorandum 02-01 Medical gas pipeline systems
- HTM 04-01: The control of legionella, hygiene, "safe" hot water, cold water and drinking water systems.
- HTM 00 Best Practice Guidance for Healthcare Engineering
- HBN 26 Facilities for Surgical Procedures
- HTM 2010 Sterilization
- HTM 64 Sanitary Assemblies
- HTM 67 Laboratory Fitting Out System
- HBM 13 Sterile Services Department
- HBN 4 Supplement 1 Isolation facilities in acute settings
- HTM -02-01 – medical gases
- HTM 03-01 – Heating and Ventilation systems
- HTM 08-01 - Acoustics
- HTM 2022 – Dental compressed air
- ET101, Section 710 (Medical Locations)
- HTM 05-02: Fire safety in the design of healthcare premises
- HTM 05-03 Operational provisions. Part B: Fire detection and alarm systems.
- HTM 06-01: Electrical services supply and distribution, Parts A & B
- HTM 06-02: Electrical safety guidance for low voltage systems
- HTM 06-03: Electrical safety guidance for high voltage systems in healthcare premises
- HTM 08-01: Health sector buildings: acoustic design requirements
- HTM 08-02: Lifts
- HTM 08-03: Management of bedhead services in the health sector



### 12.4 Fire Stopping

Fire stopping is also a critical system due to the mobility and density of patients/ staff and members of the public. The fire zones are developed with the fire consultants in this case MSA Consultants, they define the compartment, sub compartment and fire escape routes. The mechanical and electrical systems support this design through various integrated warning and fire safety systems such as fire alarm, CSFD's, FD's and sprinkler. All services that pass via a fire rated wall will have a benchmarked and signed off detail by all parties to ensure that the solutions are communicated to the teams on site and adhered to.



### 12.5 Off site fabrication

The advantage of the team working collaboratively is that there is a wealth of experience to be drawn upon not only for developing the constructability plan but also being a considerate contractor and appreciating the impact a project of this calibre has not only on the neighbouring campus but also to the residents within the locality. With this in mind the team is endeavouring to utilise in offsite manufacture for elements of work such as

- Riser modules
- Infrastructure modules
- Plant skid equipment



Factory based working improves:

- Planning
- Accuracy in production
- Quality control

- Waste
- Safety management
- Product quality
- On-site logistics
- On site waste
- Reduces the number of labour required
- Reduces number of deliveries on-site enhancing logistics
- Controlled safer environment

Other considerations implemented is the sharing of the existing crange on site and reducing individual crane set ups to specialist lifts only for items such as chillers etc.

### 12.6 QA

There are a number of measures introduced on the site to ensure that the highest quality is achieved in the install and signed off and checked prior to the initiation of commissioning.

- Area managers to oversee install of all services
- System managers to ensure continuity across the systems
- Wall closure certs
- Void closure certs
- Area closure certs
- OITP – inspection test packs

These sign off processes are supported on BIM360 field, this is a cloud based system that allows the users to raise issues instantly on their lpad and communicate actions and all sign off processes are also completed for record using this system.

### 12.7 Co-ordination

All individual systems will be commissioned by their suppliers/manufacturers or an independent commissioning company and use a colour tagging system to track the progress of the commissioning activities such as

- Plant install and complete, comprises of both horizontal and vertical walk down of systems
- Power available
- System commissioned, witnessed and signed off
- Automatic control – this is achieved after full system integration

Once the above is completed there is a 2 step sign off process

- System owner commissioning
- Two levels of witnessing, as an independent system
- Construction team witnessing
- Client / designer witnessing

#### Commissioning Integrated control

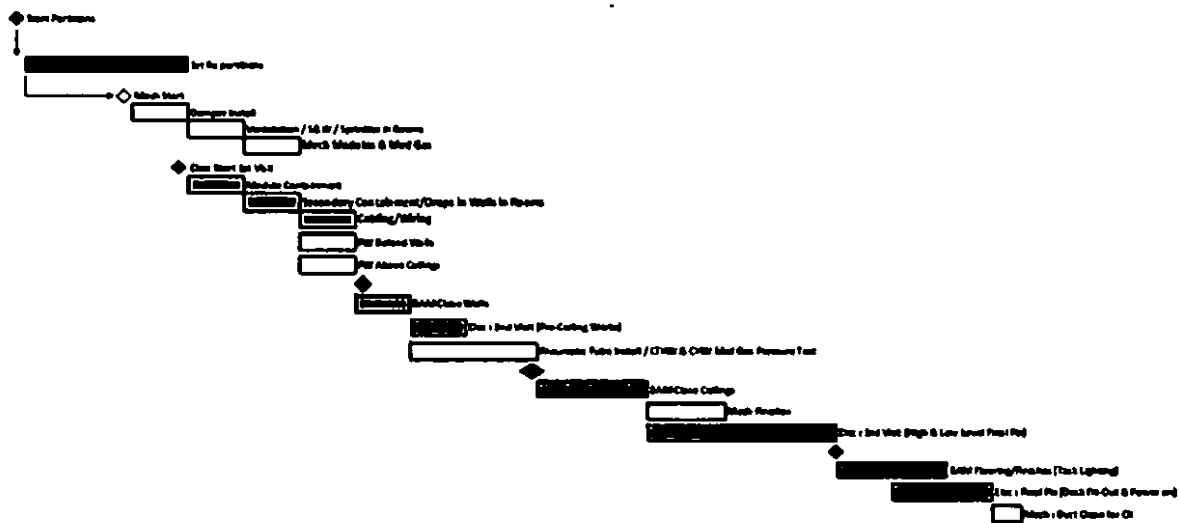
Integrated control is the integration of all the systems across the project, which is designed and tested to work as part of an intelligent system via the Building Management System, BMS. From the front end computer you can review how the system works in unison to create a comfortable environment for the occupier and staff. It allows all the controllers and actuators to communicate and react to the building's needs, it also instigates the cause and effect in a fire situation.

## 14.0 Fit-Out

The building has been separated in 127 separate zones as shown in the NCH High Level Integrated Fitout Programme (Appendix J). This gives a graphical representation of the intended fitout of the National Children's Hospital.

Internal fit out zones are defined by BMS/AHU zones and it expected that both internal fitout progress and handover will be broadly in line with these zones.

BAM intend to follow the following general trade sequence for the fitout of all the zones, as depicted on the integrated programme excerpt below:



The fitout commences with the installation of the partitions first fix followed by the first fix of dampers, ventilation/ S&W/ Sprinklers and them Med gas and Modules.

Once the partitions first fix has been completed, the electrical first fix commences with module containment, secondary containment/drops in walls in rooms and then cabling and wiring with the mechanical PW behind walls and above ceilings.

Wall are closed followed by the electrical second fix (pre-ceiling works) and in tandem pneumatic tubes installed with LTHW & CHW Medi gas pressure tested.

The ceilings are then closed after which mechanical finishes second fix and the electrical 3<sup>rd</sup> visit to complete the high and low final fixes.

On completion of the ceilings the flooring and floor finishes is carried out followed by the electrical final fix with desk fitout and power on and final the ducts are cleaned for CX.

This process is then repeated thought the building in line with the zones.

The Integrated Fitout Programme shows a graphical representation of the fitout expectation in all areas of the building on a month by month basis. Following on from the fitout is 6 to 12 months of testing, commissioning, qualification and validation along with a Soft Landing.

North Fingers



South Fingers



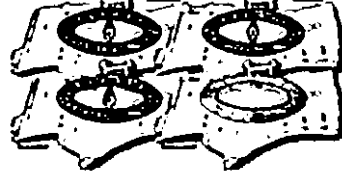
Hot Block







Concourse



Ward Block



-  Fit Out Start
-  Fit Out Ongoing
-  Fit Out Unoccupied
-  Fit Out Complete

*Example of High Level Fitout review of programme -*

## 15.0 Landscaping

The landscaping is formed in a mixture of hard, soft and site fitting elements to the areas immediately adjacent to the National Children's Hospital and to the defined roof garden levels and internal courtyards.

The hardscaping will consist of a mixture of finishes inclusive of:

- Concrete flag paving and step units.
- Granite paving and step units.
- Resin bound gravel.
- Tarmacadam.
- Rubber crumb safety surfaces.
- Loose gravel surfacing.
- Metal planter riser walls.
- Decorative drainage channels.
- Associated kerbs and the like.

The soft scaping will consist of a mixture of the following three main elements of open lawn areas, shrub / herbaceous planting and trees either newly planted or conserved.

Plant species have been carefully selected for their suitability for use both in an Irish and Hospital environment.

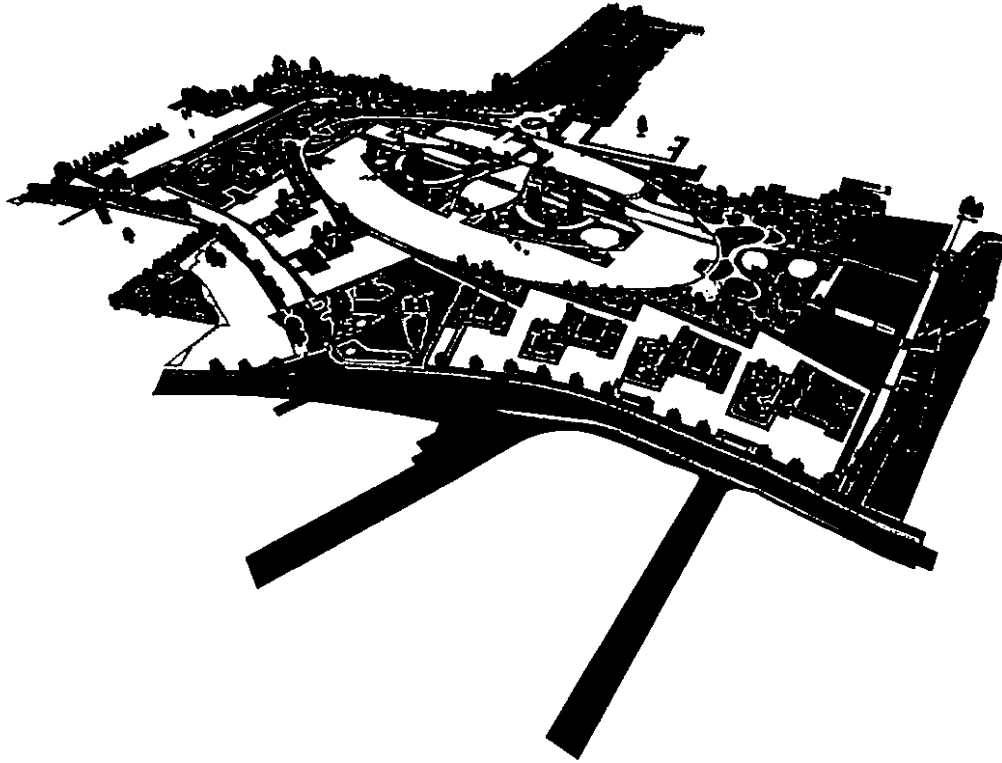
Landscape areas will be irrigated using a centralised drip feed irrigation system both to the lawn and bedding areas.

Site fixtures and fittings are yet to be defined in detail however will be in keeping with the overall design ethos of the Hospital.

Landscaping works will be delivered in zones and phased towards the end of the project after the completion of the make ready needs and in particular the roof finishes package. The landscaping will likely be one of the last elements of work completed before handover of the project due to the need to use these areas as laydown for frame and fit-out works. Therefore, landscaping works activities will occur late in the programme.

Works to the higher levels will require significant lifting and the use of the tower cranes for bulk lifting for the placement of soils and large tree specimen planting.





*Snapshot of the landscaping 3D model -*

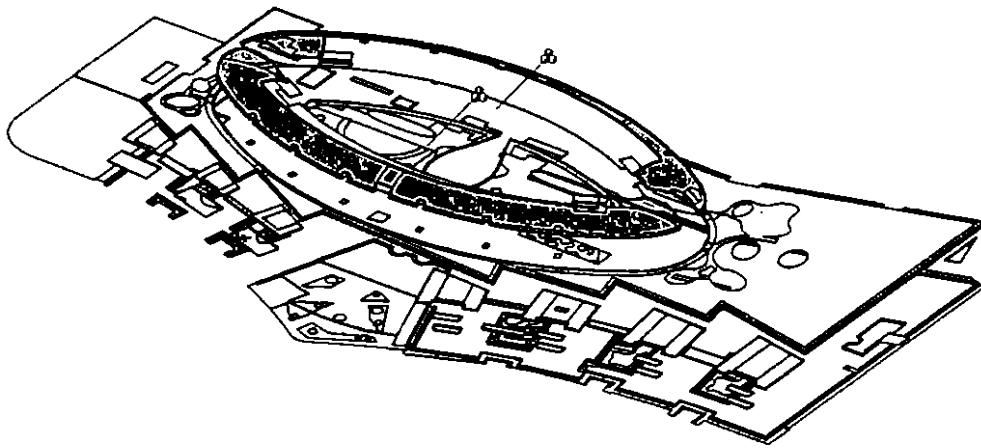
## 16.0 Waterproofing (above ground) (Roof Finishes)

The waterproofing above ground (Roof Finishes) is a Contractor design element of the Works.

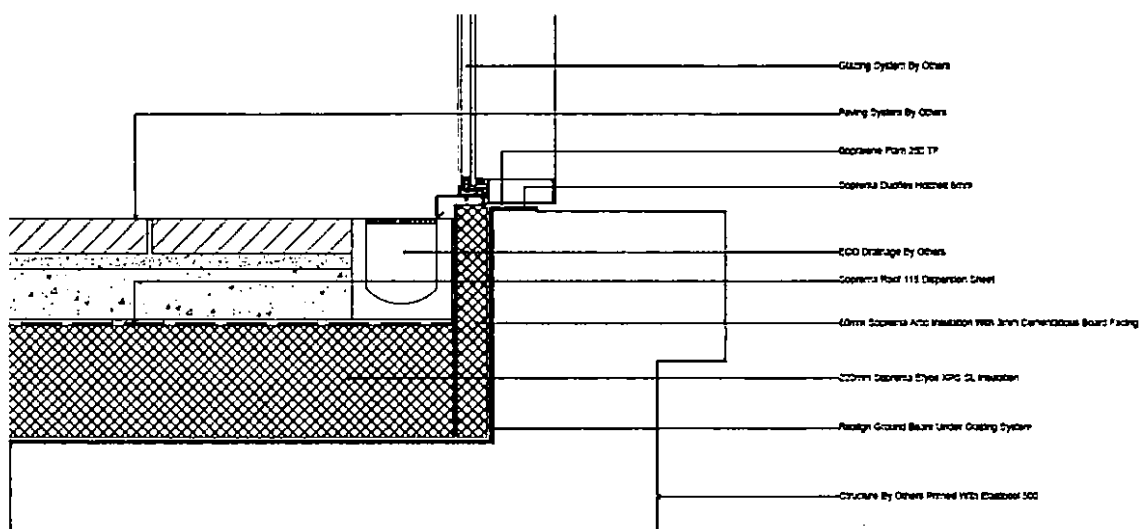
BAM have proposed a Bitumen Hot Melt System suitable for use on a concrete deck. This system is widely used throughout Ireland.

The roof finishes will be applicable generally to all levels above ground namely to Levels L00, L01, L02, L03, L04, L05, L06, L07. All below ground waterproofing is considered elsewhere.

A decorative standing seam at roof level is used to conceal roof mounted plant will also be installed at the L07 roof level over and above the weathertight roof finish.



*Waterproofing (above ground) (Roof Finishes) - Standing Seam Element in Blue*



*Soprema System Typical Section Detail*

The waterproofing above ground (Roof Finishes) will commence shortly after the completion of the concrete frame and along with the facade package is critical in the completion of the envelope to achieve weather tightness in order to proceed with the internal fitout and MEPL elements of the works within the building.

## 17.0 Packages

### 17.1 Helipad

The current design includes for an elevated helicopter pad at roof level to the south end of level 4 which will service both the new National Childrens Hospital and the adjacent Saint James Hospital campus.

When reviewing the alternatives with the Irish Aviation Authority, they strongly recommended against a ground helicopter pad due to the constrained flight paths and obstacle clearance.

The design of the proposed elevated helicopter pad has been undertaken in consultation with the appropriate regulatory bodies namely the Irish Aviation Authority, National Ambulance Service, Dublin City Fire Brigade, Air Corps and Dublin City Council by the NPHDB.

The design and construction of the helicopter pad will be in accordance with the following rules and regulations:

**CAP 1264** Standards for helicopter landing areas at hospitals.

**ICAO Annex 14** Volume II Heliports Fourth edition.

**HBN 15-03** Health Building Note HBN 15-03: Hospital Helicopter pads.

**ISEN 1999** Design of Aluminium Structures.

**ISEN 1993** Design of Steel Structures.

**ISEN 1990** Basis of Structural Design.

**ISEN 1991** Actions on Structures.

Relevant parts of Irish Aviation Authority Operations Advisory Manual (OAM) No. 08/100 which refers to ICAO Annex 14 Volume 2 will also be considered.

An application will be made to the Irish Aviation Authority to licence the use of the Helicopter pad.

The Design Helicopters for the purpose of the Application is the Agusta Westland AW 13 and the Eurocopter EC 135.

Firefighting requirements will be in accordance with the Irish Aviation Authority OAM 08/00, HBN 15-03 and CAP 437. The firefighting requirements have been agreed in principle with Dublin City Fire Brigade and will form part of the Fire Certificate Application.

The structural frame of the helicopter pad, the supporting structure and the 4th floor roof will have appropriate fire resistance. The helicopter pad will not be used to refuel helicopters.

The helicopter pad will be a Specialist installation element which will likely be designed, supplied, installed, tested and commissioned by a single competent sub-contractor due to its specialist nature.

The scope of the Helicopter pad will include the following main elements:

1. Full Design & Engineering.
2. Helipad Pancake (Landing Deck) consisting of:
  - a. Aluminium Helipad Planking.
  - b. Marking on Deck Surface.
3. Aluminium Helipad main support frame fixed back to the concrete frame with holding down assemblies.
4. Foam retaining bar.
5. Tie down points.

6. Gutter / rainwater control.
7. Access ramp and stairs.
8. Foam collector.
9. Specialist lighting and control systems inclusive of:
  - a. FATO/TLOF Perimeter Lights.
  - b. Flood Lights.
  - c. Wind Direction Indicator.
  - d. Access System Lights.
  - e. Circle and H-lighting. (If Required).
  - f. Status Light System / Heliport Beacon.
10. System Control Panel.
11. Associated Electrical and Mechanical provisions.
12. Uninterrupted Power Supply (UPS).
13. Fire Fighting and Rescue Equipment system inclusive of:
  - a. Deck Integrated Firefighting System (DIFFS).
  - b. Water/Foam Hydrants.
  - c. Fire Extinguishers.
  - d. Crash/Rescue Equipment.
  - e. Fireman's Equipment.

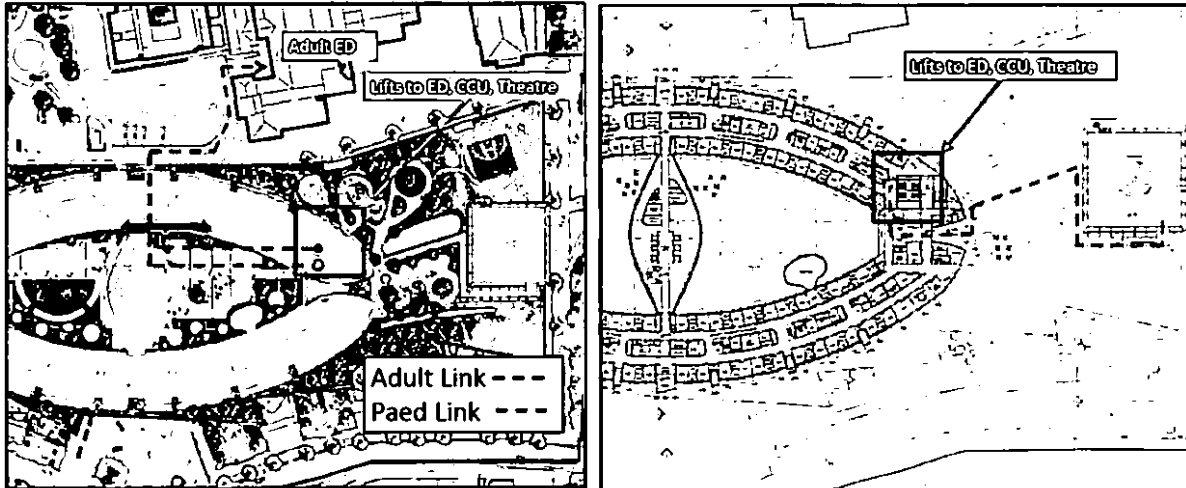
The helicopter pad will arrive onsite mostly prefabricated in a kit format and be installed by the Specialist Sub-Contractor under the supervision of BAM by mobile crange towards the end of the project programme likely during the completion of both the hard and soft landscaping elements on the roof level.

The exact Client requirement is currently in development and BAM will be able to provide furthermore detailed clarifications once the Client requirements are confirmed and a Specialist sub-contractor has been appointed.

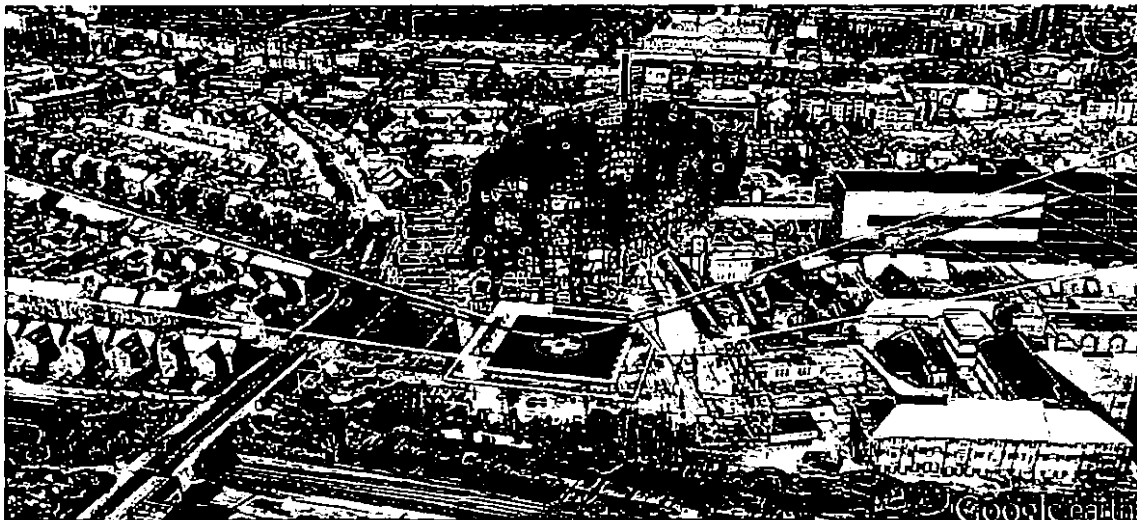
## Proposed Helipad



## Helipad Access



## Helipad Flight Path Obstacle Clearance



### 17.2 Theatres and Imaging

The imaging area is located on level 00 and 22Nr theatres located on level 02 and these contain most of the specialist equipment. These areas will accommodate the specialist equipment, access, larger builders work and specialist floor and wall finishes including the provision of shielding.

Major structural provisions for the MRI loadings, purge pipes, laminar flow ventilation routes and installation access routes have been determined and incorporated into the design.

Procurement of the major medical equipment, which consists mainly of the imaging equipment, is a Group2A item which means it will be procured and installed by NPHDB's Selected Specialist Suppliers

with BAM providing coordination and general and special attendances. This equipment will be installed in near clean room environments with all live services, utilities, HVAC, chilled water etc. available at time of installation. These areas are fitted out during the last months of construction programme, but early enough to ensure that the required validations are achieved. Secondary steel for MRI shielding will be installed early in the programme and prior to any fit out of the building.

The imaging equipment is generally all located on level 00 which means that other than offloading the equipment, there will be on other specialist crange and hoisting requirements. Access for the larger pieces of imaging equipment such as the MRI's has been incorporated into the design and will be done either through existing door openings or directly through window openings and placed into the require rooms. The windows and doors in these areas are easily removeable to allow for future proofing.

Theatre equipment including the pendants, luminaires, UV canopies and control panels are contractor supplied and installed and will be procured through Specialist Suppliers with BAM managing and coordinating same. No special crange and hoisting will be required. All equipment that is ceiling hung will be fixed directly to the in-situ concrete soffit with their own fixing brackets. These brackets will be first fixed to the soffits early in the programme. The coordination of the services and utilities in the ceiling space above the theatres is a priority and BAM are working closely with the Reserved MEP Contractors to ensure that this is proficiently achieved.

The imaging and theatre areas will be isolated from the rest of the building as early as possible to ensure stringent stepped cleaning protocols and the areas completed in time to allow the required validation time, integration with the BMS and Category 1 life safety systems.

### 17.3 FF&E

Furniture, fittings and equipment are grouped generally into 4 categories.

Group 1: FF&E procured and installed by BAM. The procurement of same is broken down into packages: Patient hoists, clocks, laboratory benchwork, bedpan washers, mortuary equipment, catering equipment, clinical cold and warm rooms, fumed cupboards, safety cabinets, joinery, casework, curtain tracks, blinds, sundry fittings, etc.

Group 2: FF&E procured by NPHDB and installed by BAM. These items generally are components such as artwork, brackets, dispensers, entertainment and AV equipment, holders, safes, screens, operating tables, telephones etc.

Group 2A: FF&E procured and installed by NPHDB with BAM providing general and special attendance and coordination. These items generally consist of components such as AV equipment, CDU equipment, general medical equipment, scanners, image gantry tracks, image generators, etc., monitors, MRI's, SPECT scanners, imaging and theatre tables, UV phototherapy cabins, autoclaves, hatches, etc.

Group 3 and 4: FF&E procured an installed by NPHDB. This is generally considered to be unfixed, smaller and standalone components.

All Group 1, 2 and 2A FF&E components will be modeled in the BIM. BAM will be procuring the services of industry leading Specialist Supply and Install subcontractors who specialize in FF&E supply and install. Other than the major medical equipment that has already been identified in Section 17.1 Theatres and Imaging above, there is no special crange and hoisting required for the FF&E components. Generally, the FF&E is installed once the walls ceilings and floors are completed.

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#### **17.4 FM Link**

The FM link tunnel works have not yet been defined and will be developed further in this document at a later date.

#### **17.5 Emergency Department Canopy**

The current design includes for a feature ambulance canopy sheltering a walkway between the ambulance drop off area to the East side of the National Childrens Hospital at level 1 and the Saint James Hospital main building / campus.

The canopy will have a PTFE (Polytetrafluoroethylene) tensile fabric covering fixed to a feature steel structure frame supported on reinforced concrete pad foundations.

The fire resistance of the fabric covering us to be to BS 476-6, Class 0.

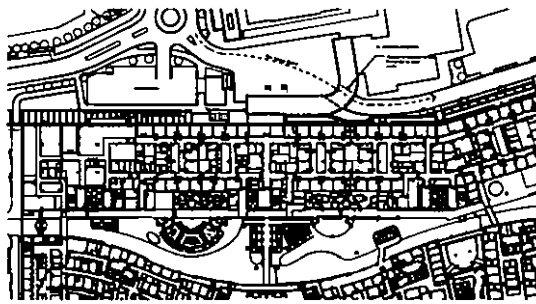
The canopy will be a Specialist installation element which will likely be designed, supplied, installed, tested and commissioned by a single competent sub-contractor due to its specialist nature.

The ambulance canopy will arrive onsite mostly prefabricated in a kit format and be installed by the Specialist Sub-Contractor under the supervision of BAM by mobile crane towards the end of the project programme likely during the completion of both the hard and soft landscaping elements. The exact Client requirement is currently in development and BAM will be able to provide furthermore detailed clarifications once the Client requirements are confirmed and a Specialist sub-contractor has been appointed.





① Cross Section



② Appearance Company Street View  
Legend:  
- Area of Addition and Change  
- New Addition

