Chau Chak Wing Museum

Preliminary Construction Management Plan

Document History

Issue	Change Type	Amendment Summary	Author	Checked	Approved	Date
01	Draft	Preliminary Plan for SSDA	CB	AG	SB	24.03.17

Introduction

The University of Sydney is undertaking the design and construction of the F01 Chau Chak Wing Museum. The building is to consolidate the current Macleay and Nicholson Museums, and the University Art Gallery and associated collections to a new purpose-built museum facility. The site is located on the north eastern section of the Sydney Campus (on the current Fisher tennis court site), surrounded by the Great Western Highway/Parramatta Road to the north, and University Place and University Avenue to the west and south respectively.

The building is a six levels with three levels underground. Indicative site area is 1,500sqm (approx. 6,800sqm GFA). Key architectural response requirements include the building massing and proximity to the iconic heritage Great Hall building, and approach to streetscape the public realm in this key location.

This preliminary Construction and Traffic Management Plan has been prepared to accompany a State Significant Development Application (SSDA) and Secretary's Environmental Assessment Requirements (SEARs) Application for the Chau Chak Wing Museum project (CCW).

The DA and SEARs seek consent to construct a new five level facility comprising of:

- Gallery, Exhibition, display spaces;
- CERC (Collections Education Research & Conservation Facility) space;
- Collection storage and workshop areas;
- Staff offices, facilities and boardroom;
- Project and study rooms;
- A 130 seat Auditorium;
- Café with terrace facilities;
- Loading dock;
- Plant rooms.

This preliminary construction and traffic management plan will be further developed as design progresses and will be updated by the successful main building works contractor prior to construction works commencing.

Contents

1. Stakeholder Management

1.1 Summary

A project specific stakeholder engagement plan will be developed for Chau Chak Wing Museum project upon Contract Award. The plan will be divided into two sections, Part One being the Initial Strategy, and Part Two will be the Delivery Stage Stakeholder Engagement Strategy and Action Plan.

Part One of the plan will address the following items;

- Objectives and Scope;
- Stakeholder list;
- Issues and Risks;
- Innovation, Opportunities and the Value Add;
- Mapping;
- Recommended Tools and Activities; and
- Final Considerations.

Part Two of the plan will identify the actions during Delivery stage of the project.

1.2 Stakeholder List

The preliminary list of key stakeholders and initial list of risks and opportunities for future consideration for the project have been identified in the following table. This list will be developed as the project progresses through the concept phase and at delivery phase.

Theme	Key Issue	Impacted Stakeholders	Mitigation Strategies
Construction impacts (noise, dust, vibration)	• Impact of construction noise on University Graduations which are held in The Great Hall within the (A14) Quadrangle	- University Graduates - Visitors and Guests	• Early engagement with Student Services to understand upcoming schedule of Graduations
	• There are two official examination periods in June and November each year; rooms within the (A14) Quadrangle are used as an examination venue • There is an increase in students at the (F03) Fisher Library during Stu-Vac and examination periods • There are noisy works to be conducted when exams are being held nearby	- Students	• Consultation with University Timetabling to schedule exams in rooms away from the site during noisy works. • Early engagement with Student Services to understand the schedule of exams
	• The Quadrangle is a heritage listed building	- The Quadrangle	• Consult CIS Heritage Architect on construction

		- CIS Heritage Architect	methodologies to ensure no impact is caused to building
	• Proximity of worksite to residential area	- Arundel Street residents - Parramatta Road residents	• Ensure residents are informed on the progress of the project through the provision of timely and accurate information • Ensure works are conducted in accordance with approved working hours and when any out of hours work is required, residents are appropriately notified
Transportation and Movement	• University Avenue and Place are often used for VIP and supplier entrances for any events held in the Great Hall or within the (A14) Quadrangle	- Visitors and Guests - Event suppliers and contractors - University Venues Team - USU Events Team	• Collaboratively develop traffic management plan with CIS' Security and Traffic to ensure minimal impact is caused to campus network • Work with the University Venues team and USU to ensure we can adequately plan for upcoming events in the area
Safety	• (F03) Fisher Library has recently become a 24/7 facility which means there could be an increase in students in the area outside of hours	- Campus Security - University students	• Ensure site is appropriately secured and work with Campus Security for any works outside of typical hours.
	• The Front Lawns are often used to house marquees for University events such as Information and Open Days, O'Week activities and as such there is often an increase in pedestrian traffic during these times	- University Venues Team - Students - Visitors and new students - USU Events Team	• Work with the University Venues team and USU to ensure we can adequately plan for upcoming events in the area • Ensure site is appropriately secured and plan works around these events

2. Site and Project Description

2.1 The Site and Surrounds

The development site is located to the northeast of the University's grounds adjacent to the Parramatta Rd entrance, within the area currently used as the Fisher Tennis Courts site.

Parramatta Rd runs in an approximate east to west alignment and borders the site to the north. University Place that runs in a north south direction is located to the west, beyond which is the University's main Quadrangle Building. University Avenue borders the site to the south, with Victoria Park located beyond the University grounds to the east.

The main portion of the site consists of three tennis courts, to the north of which is a small weatherboard tennis pavilion building. An area of lawn is located to the east of the site.

The northern boundary between the University campus and Parramatta Rd features a retaining wall above which is a linear garden bed containing significant trees. Ground conditions of the area consist of a sloped garden bed.

The development site is bound on all sides by trees of varying significance.

Figure 1: Aerial view of site

3. Construction Traffic Management Plan

3.1 Introduction

This report details the Preliminary Construction Traffic Management Plan (CTMP) for the Chau Chak Wing Museum project. This plan has been drafted in coordination with the findings from the Traffic Impact Assessment prepared for the CCW Museum SSDA and SEARs submission.

The purpose of the CTMP is to assess the proposed access and operation of construction traffic associated with the proposed development with respect to safety and capacity. This plan will be further developed by the Head Contractor prior to commencement on site.

The site is located within the University of Sydney's Camperdown Campus close to Parramatta Road/Great Western Highway. Figure 2 below illustrates the location of the proposed development site for the Chau Chak Wing Museum project.

Figure 2 Site Location

3.2 Description of Proposed Development Works

The proposed development of the Chau Chak Wing Museum will consist of the following building elements:

- Lower Level 01 (RL 20.00), CERC, plant rooms, outdoor courtyard;
- Lower Level 02 (RL 25.50), Gallery, Collection Stores and Loading Dock;
- Lower Ground 03 (RL31.00) Café, Amenities, Gallery, Study;
- Ground Level 04 (RL35.50), Arrival, Shop and Cloak Room, Gallery, Auditorium and Project Rooms;
- Upper Level 05 (Upper Floor, RL39.20), Gallery, Amenities and Boardroom;
- Plant Level 06 (R43.350), Plant Rooms.
- Roof Level 07 (RL48.50)

The building on completion will consist of approximately 6,800m^2 of Gross Floor Area.

3.3 Programme

The following key milestones are identified for the construction of the Chau Chak Wing Museum:

- Commencement of Construction Works – 16 October 2017;
- Base Building Completion - 04 April 2019; and
- Fitout of Exhibition Space Completed, and Museum Opening - 6 June 2019.

The concrete structure and the building envelope trades will represent the peak construction vehicle movements with an average of 20 to 30 per day. During each of the 12 major concrete pours there will be up to 45 deliveries.

The construction phase will involve bulk excavation of the two lower levels, the building foundations, Six levels of concrete structure from the basement level through to the roof level, building fit-out complete with services and external works to the public realm around the ground floor areas.

3.4 Hours of Construction

Development approval is still to be sought, however it is anticipated that working hours of construction will be:

- Monday to Friday: 7:00am to 6:00pm;
- Saturday: 7:30am to 5:00pm; and
- No work on Sundays or NSW Public Holidays.

3.5 Access Management

Entry to the project for construction vehicles will be off Parramatta Road via the University Avenue Entry. The site will be accessed from within the Campus road network with a single vehicle entry gate off University Place.

This gate will be closed at all times and supervised by Traffic Controllers who will facilitate safe movement of vehicles, in accordance with the approved traffic control plan.

Due to limited construction vehicle space, all deliveries will be booked in 24 hours in advance to coordinate movements of vehicles and prevent backing of vehicles onto Parramatta Road. Communication to traffic controllers for vehicles on approach will be via mobile phone, whereby the designated traffic controller located at University Place will be contactable by delivery drivers to ensure access is provided.

Approaching from the East construction vehicles will approach the site by heading West on Parramatta Road, they will then turn left into University Avenue and right into University Place before entering the site gate.

From the West, construction vehicles will approach the site by heading west on Parramatta Road, turning left onto Pyrmont Bridge Road, right into Ross Street, left onto St Johns Road and right into Derwent Street, across the intersection on Parramatta Road into University Avenue and right into University Place before entering the site gate.

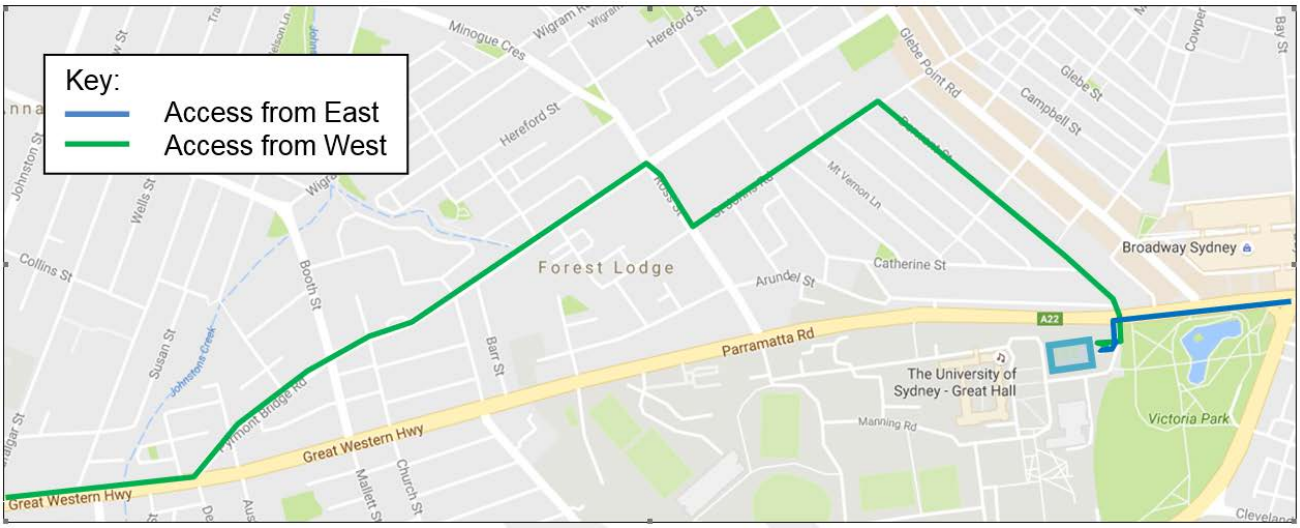

Figure 3: Vehicle Access Plan

Pedestrian paths of travel will not be impacted Parramatta Road, University Avenue or the Western side of University Place. Pedestrian access ways will be maintained around the site on existing pathways. Pedestrians will be controlled at the time of vehicles exiting the site entry gate on University Place by Traffic Controllers utilising accordion gates, signage and flashing lights. Vehicles leaving University Avenue to Parramatta Road will be in line with the signalised operations of the existing intersection.

Single unit trucks and flatbed trucks will be utilised for the majority of deliveries during the excavation, structure and fitout phases. However during the structure phase there may be some requirements for semi-trailer deliveries for cranes, steel reinforcement and structural steel. The following turning path diagrams indicate how a semi-trailer will access the University Avenue Gate. Traffic controllers will be required to control traffic upon entering and existing the gates due to the turning circle required. This will be developed in the traffic control plan.

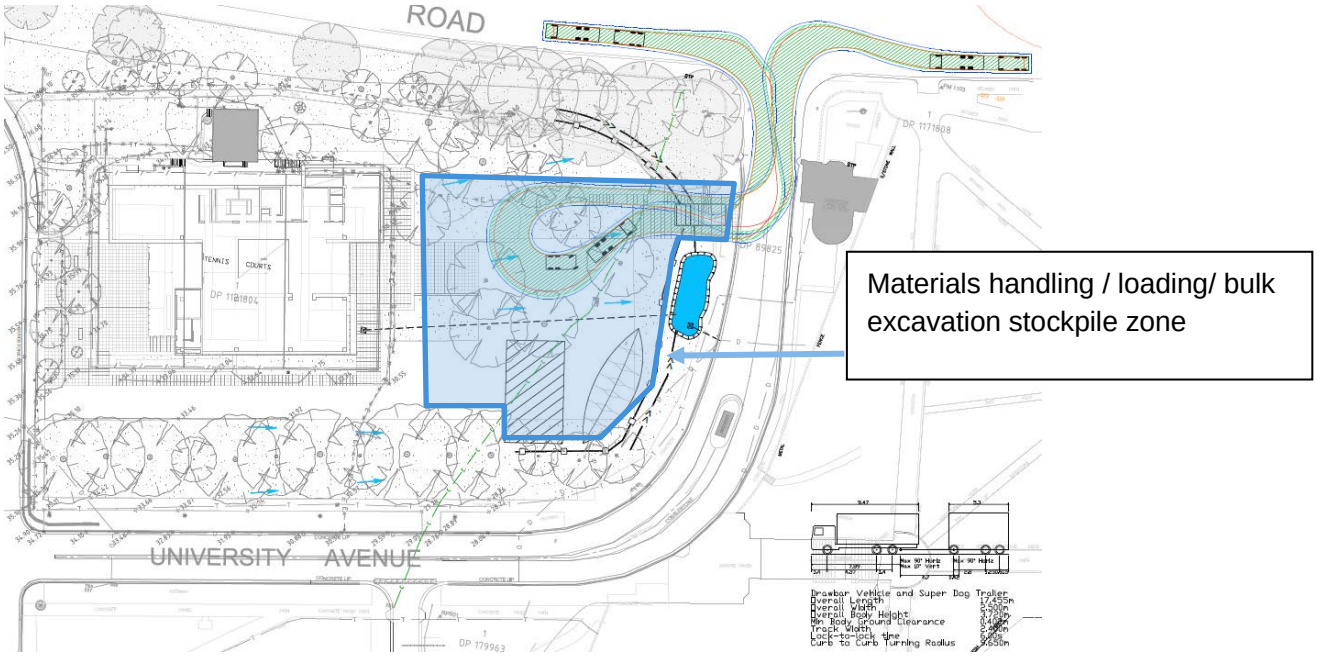

Figure 4: Semi Trailer entering the site gate under traffic control

3.6 Construction & Pedestrian Interface

The challenge of this project will be to maintain segregation of construction vehicle operations and pedestrian foot traffic within the Campus. Pedestrians approach via buses, and foot from Parramatta Road, utilising the footbridge over both Parramatta Road and the signalised pedestrian crossings at the Derwent Street intersection. It will be imperative that traffic controllers control vehicle movements and pedestrians to ensure safe entry of vehicles into the site.

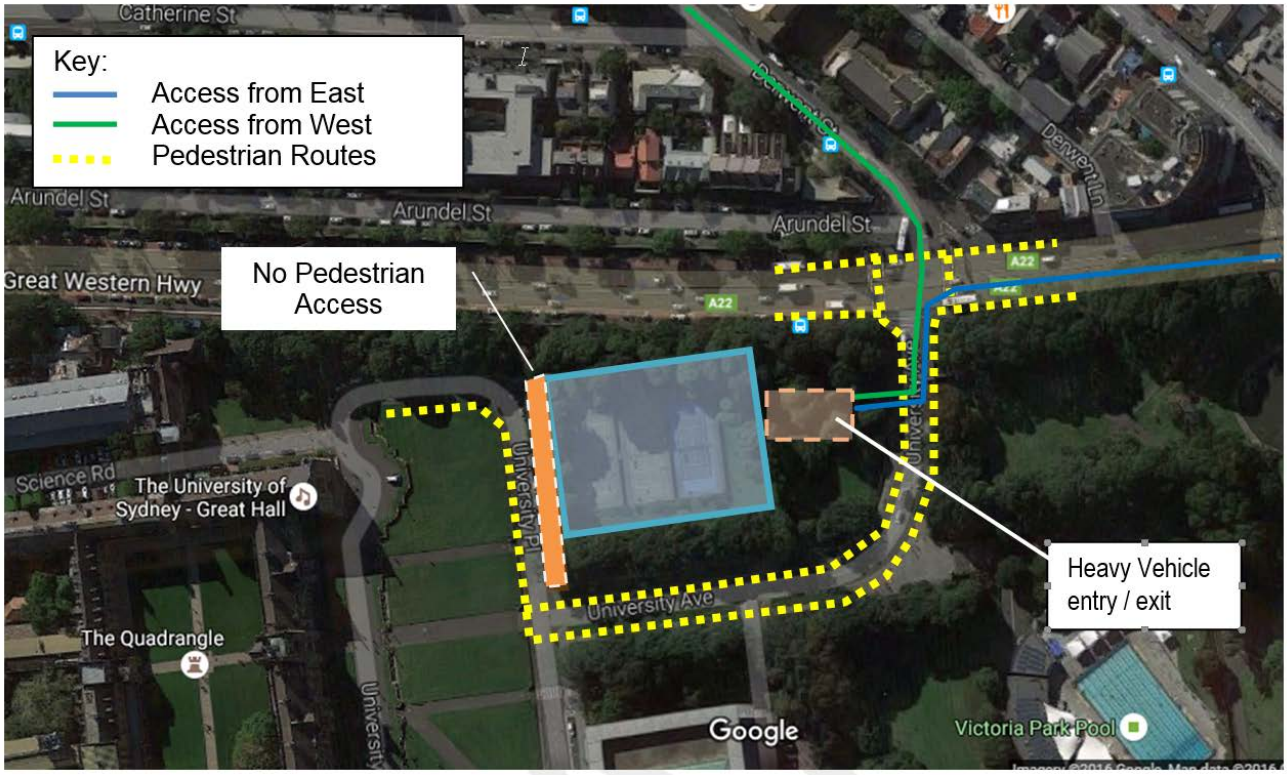

Figure 4 Pedestrian Path of Travel

3.7 Heavy Vehicle Routes

The expected construction material will be from the greater Sydney metropolitan area, with the bulk of deliveries in the form of concrete trucks considered to be from Blackwattle Bay or St Peters.

The primary construction traffic routes for heavy vehicles accessing and exiting the site are outlined below.

West:

- Vehicles approaching from the west will travel on the M4 Motorway entering Parramatta Road at Concord East veering left onto Pyrmont Bridge Road and then turn right onto Ross Street, left onto St Johns Road and right onto Derwent Street and straight into University Avenue.
- Vehicles travelling from the construction site to the west will exit the University access onto Parramatta Road from the left turn at University Avenue./12

North:

- Vehicles approaching from the north, will travel along the Bradfield Highway onto Harris Street, turning right onto Broadway, onto Parramatta Road and left to enter at University Avenue.
- Vehicles exiting to the north will turn right onto Parramatta Road from University Avenue and left onto Wattle Street, right onto Upper Fig Street and onto the Western Distributor.

East:

- Vehicles approaching from the east are proposed to approach from Botany Road, through to Cleveland Street and right onto City Road and left onto Parramatta Road and left to enter at University Avenue.
- Vehicles exiting to the east will turn right onto Parramatta Road from University Avenue, right onto City Road and left into Cleveland Street and right onto Regent Street and onto Botany Road.

South:

- Vehicles approaching from the south are proposed to approach from the M5, Princes Highway, turn right onto Sydney Park Road, left onto Euston Road and left onto Botany Road, through to Cleveland Street and right onto City Road and left onto Parramatta Road and left to enter at University Avenue.
- Vehicles exiting to the south are proposed to turn right from University Avenue onto Parramatta Road, right onto City Road and left into Cleveland Street and right onto Regent Street and onto Botany Road, right onto Euston Road through to Sydney Park Road and left onto the Princes Highway.

Figure 5 shows the proposed heavy vehicle routes related to the construction traffic. The approach routes are shown in purple and the egress routes in orange for the north, south, east and western directions.

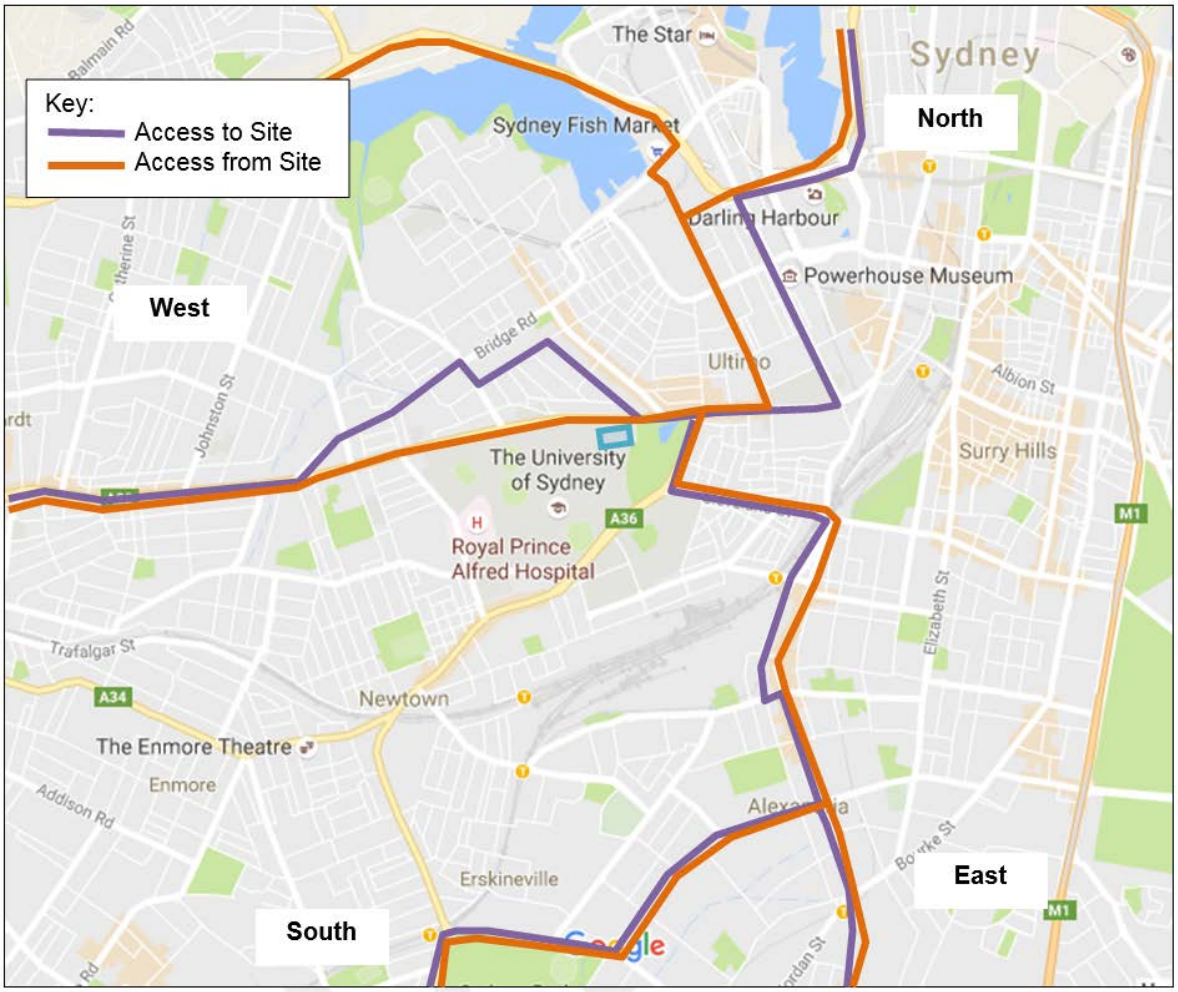

Figure 5 Vehicle Access Routes

3.8 Traffic Management & Control

Vehicle management will be controlled by the traffic controllers ensuring construction will have no effect on Parramatta Road. Communication to traffic controllers for vehicles on approach will be via mobile phone, whereby the designated traffic controller located at the University Avenue entry will be contactable by delivery drivers to ensure access is provided. At no times are deliveries permitted to park on Parramatta Road.

3.9 Construction Traffic Volumes

It is expected that the peak movements during the structure phase of construction will be bogies removing spoil from the excavation and supply of concrete trucks. The peak movements are calculated as follows;

- Approximately 25 truck and dog loads of spoil removal per day for 12 weeks during excavation – 27,560m^3 net.
- Approximately 35 concrete loads per major concrete pour - 40 of.
- On average we anticipate approx. 10 to 15 truck and 5 to 6 courier/van deliveries per day.

All general deliveries will be organised to mostly take effect outside peak traffic periods.

3.10 Parking

There will be no facility for parking on site. Public Transport will be encouraged to all site staff and operatives. There is significant public transport infrastructure servicing the campus including buses to City Road and Parramatta Road, and trains to Redfern and Central Station.

3.10 Public Transport Services

No bus services would be impacted by construction traffic as the work is confined to off street works with the University of Sydney campus.

Redfern Railway station is located nearby and will be used by construction workers who cannot access the site via bus. The bus and rail services in the vicinity of the site are shown in Figure 7. The horizontal line represents the Parramatta Road Services, which include 436, 438, 439, 461, 480, 483, L38, L39, and M10.

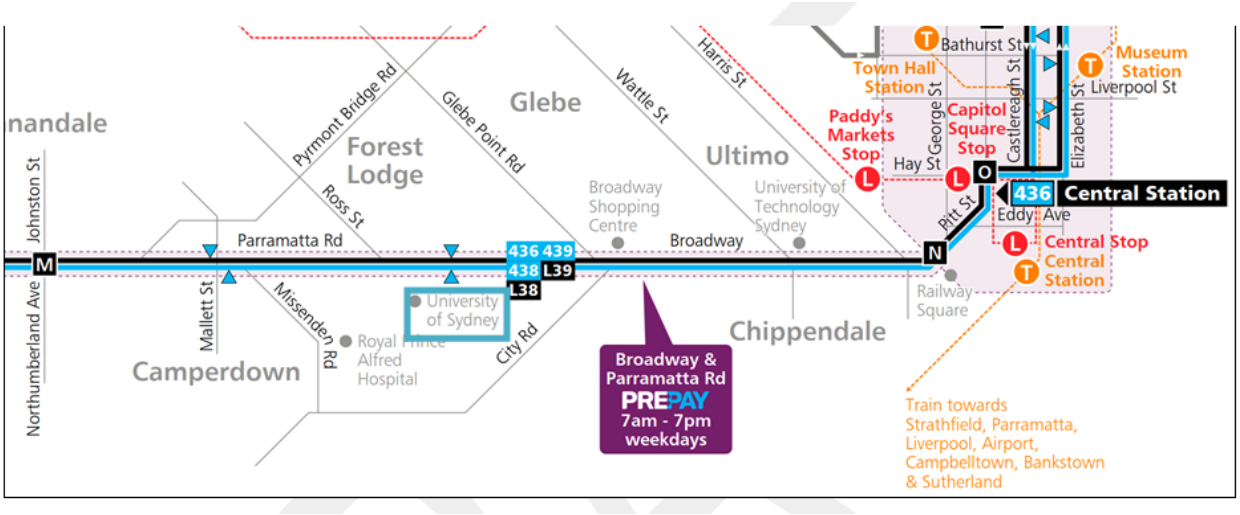

Figure 6 Bus and Rail Network Map

3.10 Mitigation Strategies

3.10.1 University Grounds

Parking on campus is controlled through the issuing of parking permits. No construction related vehicle will be issued this permit and the parking is regulated by Campus security. The likelihood of construction vehicles parking within the campus is low. Access will be provided within the construction site for required vehicles delivering or providing services on site however, significant numbers of the workforce will travel by train and bus outside the morning and afternoon commuter peak.

3.10.2 Pedestrians

A detailed pedestrian control plan will be prepared by the Head Contractor prior to commencement to identify how pedestrian access will be managed around the construction site. Refer to the diagram in Figure 4 earlier.

The University Avenue Entry is a major thoroughfare to the campus, and is heavily pedestrianised from access from Parramatta Road and Bus zones along Parramatta Road.

Pedestrians will be managed by qualified traffic controllers and accordion gates to maximise pedestrian safety at the University Avenue access point.

Pedestrians will be managed so that they will not conflict with heavy vehicles accessing the site using appropriate warning signage and verbal direction by traffic. Pedestrians will have right of way at the access when delivery vehicles are exiting the site. When vehicles are entering the site, vehicles will have right of way to avoid cuing of vehicles on Parramatta Road.

3.10.3 Driver Code of Conduct

During the peak vehicle movements, construction traffic will be managed so that construction vehicles will only exit the site in the beginning of the morning peak. Exiting vehicles give way to through traffic on Parramatta Road and construction traffic will therefore have minimal impact on Parramatta Road during the morning peak.

To manage driver conduct the following measures are to be implemented:

- All deliveries are to be pre booked;
- All deliveries are to check in with the traffic controller;
- Vehicles are to enter and exit the site in a forwards direction along the travel;
- Drivers inducted to follow the paths shown on delivery maps;
- Drivers are to give way to pedestrians and plant at all times; and
- Drivers are to be respectful of other road users and observe the Campus traffic conditions.

3.11 Consultation with RMS

The CTMP will require consultation with RMS and Sydney City Council. Upon authorisation of the University, the Head Contractor will commence discussions with RMS about traffic management and the changes to the existing conditions. The Traffic Consultant will be used to lead and facilitate these discussions with RMS.

The CTMP should be coordinated with the traffic management for any other building works undertaken by the University of Sydney at the time on construction, as there may be many construction vehicles approaching the campus at one time, and coordination of these activities is required to minimise the impact on the operating campus and Parramatta Road.

3.12 Conclusions

The CTMP assesses the proposed access and operation of construction traffic associated with the proposed development with respect to safety and capacity.

The site is located within the University of Sydney's Camperdown Campus close to Parramatta Road; a significant arterial route to the Sydney CBD.

The main construction works is scheduled to commence from October 2017 for a period of 17 months.

A Traffic Control Plan (TCP) will be developed by the Head Contractor prior to site works commencement. The TCP will outline the controls and measures which will be in place.

All general deliveries will be organised to generally take effect outside peak traffic periods. Pedestrians will be managed so that they will not conflict with heavy vehicles accessing the site using appropriate warning signage and verbal direction by traffic Pedestrians will have right of way at the access when delivery vehicles are exiting the site. When vehicles are entering the site, vehicles will have right of way to avoid queuing of vehicles.

It is expected that the construction of the Chau Chak Wing Museum will have negligible effects on the operation of Parramatta Road and surrounding streets. Heavy vehicles are managed to be separated from pedestrians and non-construction related vehicle movements in the vicinity of the site and as such the construction traffic is expected to have negligible effect on the safety of the area.

4. Environmental Health & Safety

4.1 Introduction

A detailed Environmental Health & Safety plan will be prepared for the Chau Chak Wing Museum Project by the Head Contractor prior to commencement.

4.2 Construction Waste Management Plan

A sub plan to the EHS plan is the Construction Waste Management Plan. The purpose of this plan addresses the SEARs Conditions and also is a management tool for the team to effectively manage waste ensuring compliance with project targets on recycling and reducing the impact on the environment. The SEARs conditions require the following to be addressed which is intended in this section of the CMP.

- Likely waste stream classification;
- Indicative quantities of waste (per classification); and
- An overview of potential site practices that would contribute to a reduction in waste volumes through avoidance, reuse and recycling.

WASTE MANAGEMENT PLAN	
Scope:	This Waste Management Implementation Plan details management measures for solid and liquid waste generation during the construction phase. It defines mitigation measures to be implemented, a monitoring program that enables control of the impacts of construction activities on potentially affected areas, and contingency measures that may be implemented to minimise waste generation.
Objective:	The objectives of the Waste Management Plan are based on the hierarchy of avoidance/reduce, reuse, recycle, treat and/or dispose. To reuse and/or recycle a minimum of 80% of all Waste Material generated on the construction site, thus achieving up to 80% reduction/avoidance in waste to landfill. The key areas to avoid where possible on a construction site are the generation of: Demolition materials, Construction materials, Excavated materials, washout, Domestic and Human wastes and Litter. The project aims to: • To minimise impacts from waste generation; • To maximise beneficial re-use of excavated materials, thereby minimising off-site re-use or disposal of waste to landfill; • To ensure that all project personnel are aware of the importance of sound waste management practices and the actions they can take; • All waste generated on site is tracked to ensure compliance with relevant legislation, conditions and guidelines; • Minimise contamination of recyclable waste streams; • Waste volumes are recorded and managed to allow for identification of areas for potential waste reductions, recycling and / or cost savings; • Liaise with contractors or other workers to identify areas where they can reduce water and reuse materials in their respective trades; • Prevent pollution and damage to the environment;

	• Prevent excessive concrete waste accumulation on site and other natural watercourses or stormwater inlets with concrete washings; and • Protect the safety and health of our employees, site personnel and the public.
Risks:	Waste materials generated on site are to be managed such that recycling is maximised and the volume of waste transported to landfill is minimised. The use of building materials that are fully recycled and/or include recycled material in their production will be maximised where practicable. Materials selected must be fit for use. All disposal documentation from construction processes should be supplied to LL Building and filed in the site records for verification purposes. The implementation of the Waste Management Plan is intended as mitigation measures and strategies in order to reduce waste disposal issues /incidents such as: • During excavation, a variety of spoil fill material will requiring disposal of site in accordance with local authority requirements; • Inappropriate disposal of waste and not receiving the correct documentation to verify disposal to appropriately licensed facility; • Identification of any Hazardous building materials that may exist on the site; • Concrete waste is unnecessarily accumulated on site with some potential for entry into other natural watercourses; • Uncontrolled discharges of paint waste and/ or wet trade washout occurring from the site impacting upon sensitive receptors including surrounding waterways; • Inappropriate storage of wastes on site with the need to segregate and storage of construction/demolition and domestic waste prior to offsite disposal; and • Inappropriate transport and handling of demolition/ construction waste and domestic waste. • General solid construction waste is unnecessarily accumulated on site with some potential for escape beyond the site boundary and entering the surrounding local environment, e.g. Litter off site.
Key Legislation / Standards / Guidance	A list of the applicable legislation for the locality / State - will be included in the EH&S Management plans prior to construction commencing.
Site Control Measures:	A general waste management contractor will be involved in the early stages of the project to ensure the effective planning of waste Management. The installation and maintenance of Concrete Waste controls during the construction and demolition phase if applicable and priority will be given to concrete washout operations being performed off-site at the concrete supplier facility with agreement from the supplier the concrete truck deliveries. Identified Key Waste Streams for the project are detailed in the following Table 1.

Table 1 - Identified Key Waste Streams

Key Waste Stream	Segregation Areas / Containers Commonly Available	Re-use/ Recycling/ Disposal Method
Construction Sites		
Concrete Wastes (solids)	10m^3 bins	Reused in temporary works or site levelling where practicable, or sent off site for recycling as building and demolition waste.
Concrete Wastes (solids)	15m^3 bins	Off-site recycling
Liquid wastes from concrete washout.	Dedicated washout facility	Off-site recycling of solids (slurry). On site recycling of waste water if possible.
Scrap metal	10m^3 bins	Off-site recycling
Organic food scraps	240L bins	Off-site to landfill with other non-recyclable municipal waste
Food packaging / cans /bottles /wrappers	240L bins	Recyclables sorted for off-site recycling
Paper and / or other office based wastes from onsite offices	240L bins	Off-site recycling
Asphalt	10m^3 bins	Reused in temporary works or site levelling where practicable, or sent off site for recycling or disposal
Green waste	Wood chipped (trucks)	Green waste to external recycling centre
Cables and parts	10m^3 bins with other miscellaneous construction wastes	Any metal components are to be segregated and the remainder taken off-site to landfill
Timber	15m^3 bins	Timber found during excavation is to be segregated and recycled off-site or disposed
Excavated spoil	Stockpiles	Reuse on site if possible , reuse off-site under a resource recovery exemption or licence, or disposal off-site,

Liquid wastes from wet trades (paint, dry walls, renderers, tilers etc)	Dedicated washout device / plant /facility Treatment system	Off-site recycling of solids (slurry). Specifically design plant to enable recycling of water from solid wastes (slurry) which maximises water reuse and minimises solid waste generation.
Sediment controls	Stored on site	Reuse controls where possible on other sites
Sediment build up behind erosion and sediment control structures	Keep behind control structures until they are at capacity	Respread on site, unless obvious contamination with hydrocarbons or other chemicals evident (by sight / smell)
Chemicals Storage and Management		
Drums and containers (empty and containing no residue)	Stored in bunded areas.	Taken off-site by licensed contractor for suitable rinsing and disposal at licensed landfill
Waste oil, grease, lubricants	Sealed drums / containers in bunded area	Off-site recycling by licensed waste oil recycler
Oily rags and filters	200L (or thereabouts) bins	Off-site recycling by licensed waste oil recycler
Used spill management materials such as absorbent pads / booms, used absorbent materials used to mop up oil spills / contaminated dirt from dripping machinery or other hydrocarbon / chemical sources.	Bins and / or tanks suitably bunded	Taken off-site to landfill.
Site Office & Worksites		
Glass/plastic/ cans/paper/ cardboard - potentially recyclable	240L bins specified for 'Recyclables Only' as per domestic recycling bins	Off-site recycling
Plastic wrapping/containers - collected and littered	240L bins specified for 'Recyclables Only' as per domestic recycling bins	Off-site recycling or landfill as appropriate

4.3 Erosion & Sediment Control

An erosion and sediment control plan has been prepared in accordance with Landcom's Soil and Construction manual (commonly known as the Blue Book), Volume 1, March 2004. In accordance with Table 2.1 of the Blue Book, an erosion and sediment control plan is required. The area to be disturbed is greater than 2,500m2. Prior to commencement of works, the erosion and sediment control measures will be finalised with the Civil Contractor to meet the requirements of the Blue Book, ensuring the design and phasing the installation of the measures to suit the construction staging. A stormwater sump and pump will be required during the basement excavation and construction to capture and discharge trapped stormwater. The Head Contractor will complete a detailed soil and sediment control plan prior to commencement.

The attached diagram is the proposed controls for the site.

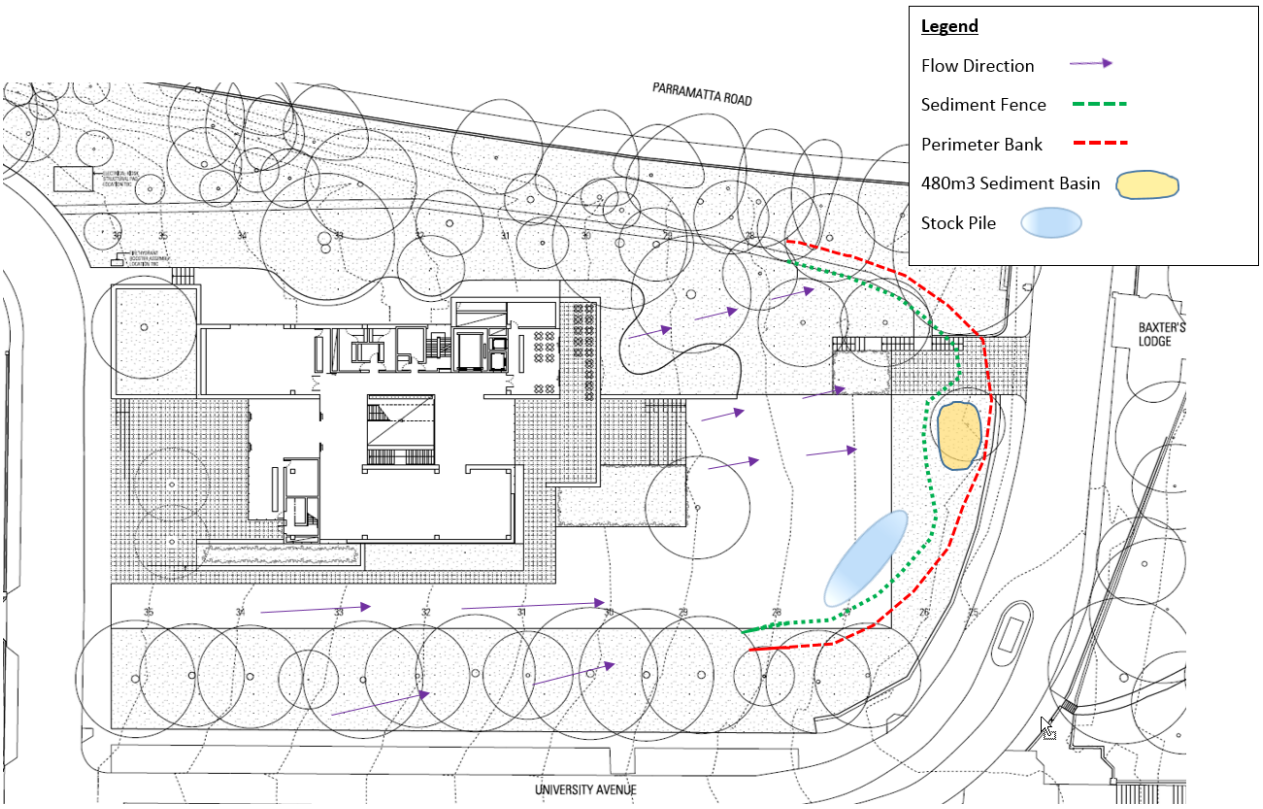

Figure 7 Erosion & Sediment Control Plan

5. Construction Methodology

5.1 Site Location & Access

The site is bounded by Parramatta Road to the North and University Avenue to the South and East with access via University Place to the North. The current site is the location of the Fisher Tennis Centre, which includes the wooden tennis centre building and three terraced concrete tennis courts.

Figure 7 Site Location

5.2 Site Establishment plan

The establishment of the site is to ensure that the site works are securely separated from the University population. To achieve this segregation, an 'A' Class hoarding will be erected to the work zone perimeter. Concrete Jersey kerb barriers will be utilised for areas where there is segregation between people and vehicles and where there is a risk adjacent excavations.

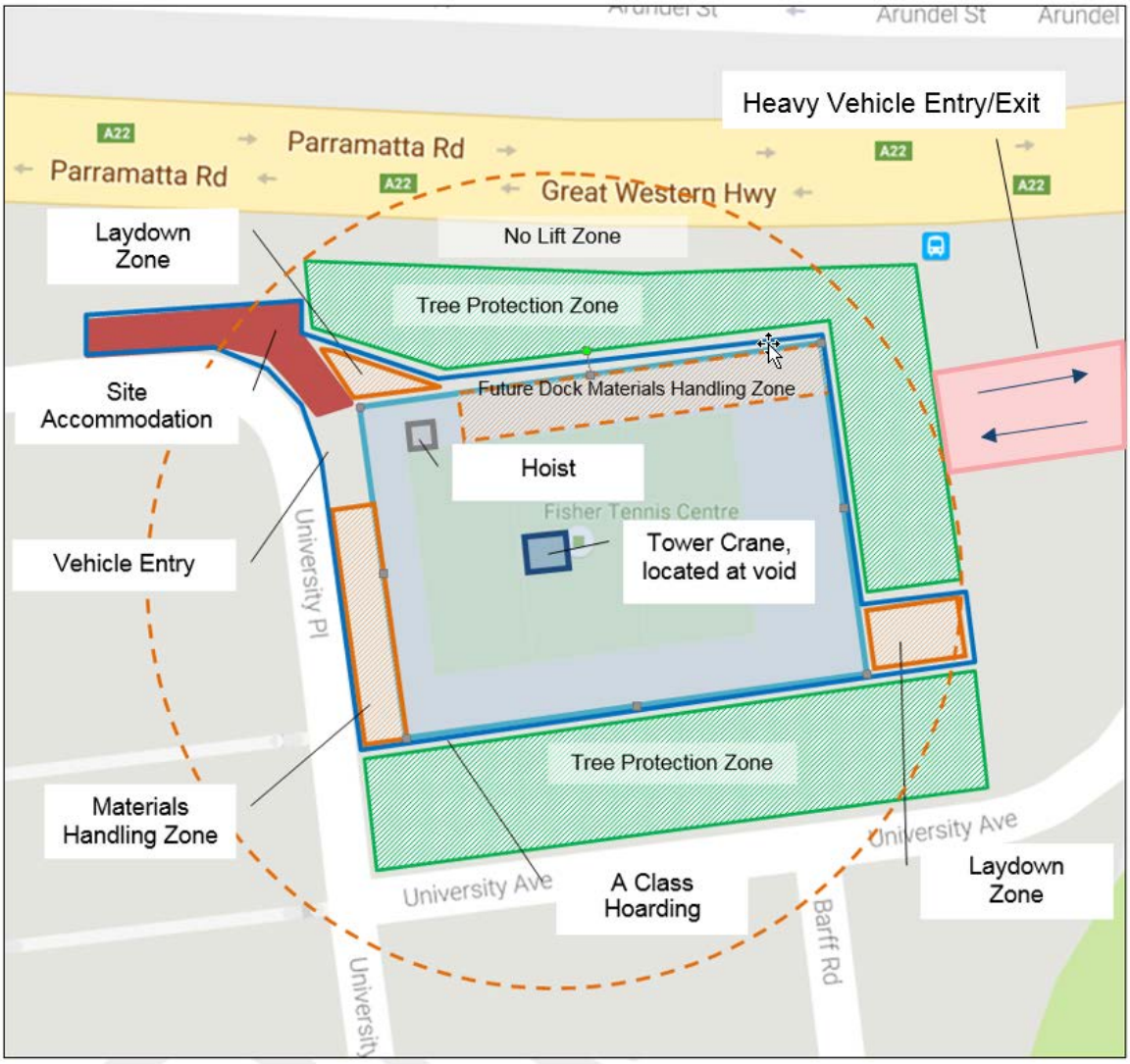

Figure 8 Site Establishment Plan

5.3 Materials Handling Strategy

5.3.1 Strategy

This strategy ensures that all site operations are contained behind the boundary hoardings to provide safe outcomes for both the construction workers and the university pedestrians. Activities such as crane lifting, concrete pours and unloading trucks will be all contained within the hoardings segregated from the public. No operations will impact areas beyond the northern boundary or Parramatta Road. A comprehensive material handling strategy will be developed by the successful Head Contractor on award. This document provides an overview of the likely methodologies.

5.3.2 Plant & Equipment

To facilitate construction of the Chau Chak Wing Museum Building within a constrained site, major plant and equipment are needed where by it will reduce horizontal movement.

An electric hammer head tower crane will be located centrally to the building through the void between the lower level to the roof level provide for vertical lifting of construction elements. A temporary penetration through the lower level and Roof concrete slabs would be necessary to facilitate the tower crane location. This tower crane will be heavily utilised during the structure and façade stages of the programme and be removed once the roof plant and equipment have been installed. The hammer head tower crane will have a 55 metre jib which will provide sufficient coverage for the building footprint.

The tower crane will be erected on completion of the bulk excavation. The crane erection setup will utilise the materials handling zone in the western area of the site on the University Avenue site frontage. This will be planned in further detail during the construction planning phase of the project. Dismantling of the crane would be from the same location.

A man and materials hoist will be used for vertical movement of personnel and materials. This will be located at the western elevation of the site in close proximity to the site accommodation and delivery area on University Avenue. Once the structure is erected and the building watertight, the hoist will be removed, and reliance will be on the permanent Loading Dock and internal lifts which will be fitted out as a Builders lift.

Loading Platforms will be utilised to facilitate formwork removal and the loading of fitout and façade materials to each floor. The platforms need to be strategically positioned to not be impeded by the roof overhang and to allow maximum time duration on site to allow materials to be pre-loaded onto the floors.

A forklift will be used through the materials handling zone to unload materials and manoeuvre around the building as required. Unloading of waste bins and like will be carried out with the forklift to reduce manual handling of workers. The forklift will be utilised predominantly for delivering and unloading materials into the basement via the permanent Loading Dock.

The pouring of concrete for the structure will be to utilise a concrete static pump and line system so as to reduce the need for mobile concrete pumps to be brought to the site for each pour. This provides greater efficiency and reduces the number of vehicular movements in and out of the site. The static line pump will accommodate for a two truck feed which will reduce the time for a typical concrete pour which is estimated at approximately 240m^3 per pour.

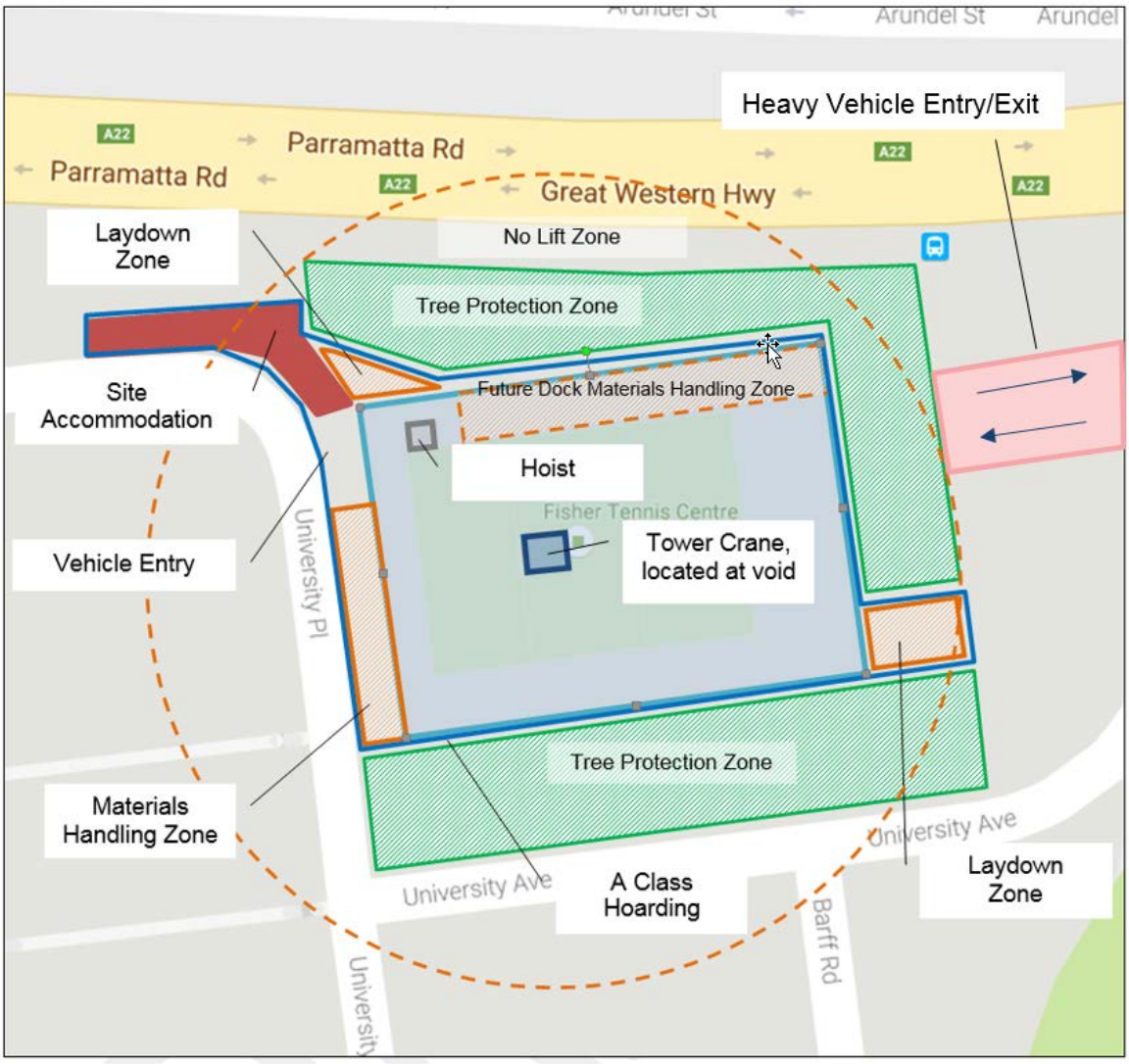

Figure 9 Plant & Equipment Plan

5.4 Project Staging

The staging of the works is identified in eight key stages. Each stage of works is being planned to ensure design and procurement are planned to meet the construction requirements. This includes authority approvals, University design sign off and subcontractor procurement. The below timelines identifies the key stages and their durations in accordance with the development programme.

The expected number of site resources has been calculated in accordance with the development programme and is summarised in the table below.

Chau Chak Wing Museum Schedule	2017			2018												2019						
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Earthworks	10	10	10	10	10																	
Inground Works					5	15																
Structure						30	50	50	50	30												
Façade										15	15	15										
Services										30	30	30	30	20	10							
Finishes													50	50	50	50	10					
Commissioning																	10	10				
Museum / Exhibition Fitout																			TBC	TBC	TBC	TBC

5.4 Enabling Works

The existing site contains services that require relocation and diversion. This includes but is not limited to minor irrigation, low voltage power and communications lines.

These services diversion works are critical to be planned and carried out prior to main construction works. It is anticipated that these works be completed prior to the main works construction commencement. Detailed planning and assessment of these works is currently being undertaken to ensure coordination with the building footprint.

5.5 Structure

Once the site is established, the basement excavation will commence by the installation of a perimeter piled shoring wall. The proposed configuration for this shoring wall is by continuous pile with infill shotcrete panels.

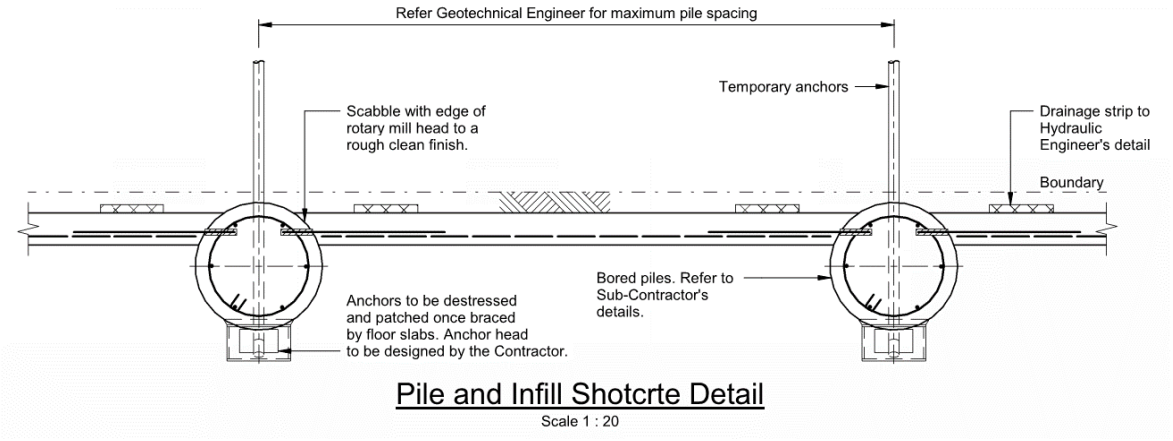

Figure 8 Plan on Contiguous Piled Shoring wall

This piling operation will involve a piling rig moving around the perimeter of the basement installing piles. Once piles are installed the basement excavation can begin with shotcrete infilling and temporary wall anchoring of the shoring piles undertaken as the excavation progresses. It is estimated that approximately 27,560m3 of material will excavated including residual fill and clay overlaying laminate rock. During the excavation the building footprint will be segregated with concrete jersey barriers to ensure the safety of workers whilst bogies enter and exit the site.

At completion of the excavation and detailed excavation works the superstructure work will commence. This will consist of the construction of pad foundations, columns and floor structure up to ground floor level. As these floor are constructed within the basement a sequence for removing of the temporary shoring wall anchors will occur.

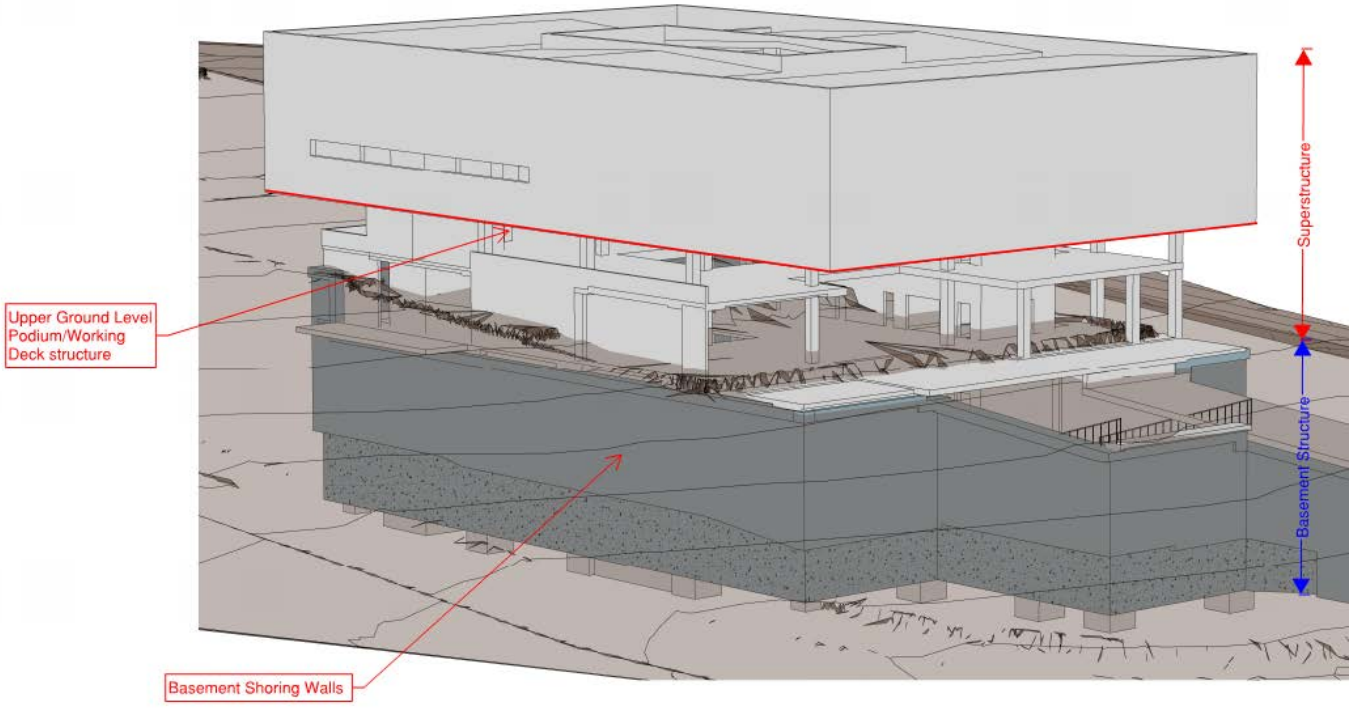

Figure 9 3 Dimensional Image of the structure

At ground floor level, perimeter scaffold will be erected ahead of the structure to provide perimeter protection. The scaffold will encapsulate the structure and will have shade cloth and mesh on the outside to control noise and dust. Extent of scaffold is indicated in the figure below.

The remainder of the superstructure above surface level will then be constructed. The upper ground level floor will act as a podium and working deck for constructing the floors and walls of the structure above. This floor will be temporarily propped to allow construction of the decks thereafter.

Sequentially when completing the concrete structure formwork is stripped and removed. Following the completion of the primary structure birdcage scaffolds can be constructed internally to interconnect interior elements to allow fixing of secondary elements including any secondary steelwork, glazing our services. These birdcage scaffolds are rated for 10kPa to allow installation works to continue safely below the birdcage.

Internal scaffold will be erected within the void to facilitate access to safely glaze the skylight, clad the stairs and complete the balustrading works to the void. Detailed planning of these works will be undertaken to prioritize the safety of workers in this area of work and that the quality of the works is not compromised as these finishes are important to the overall quality of the building.

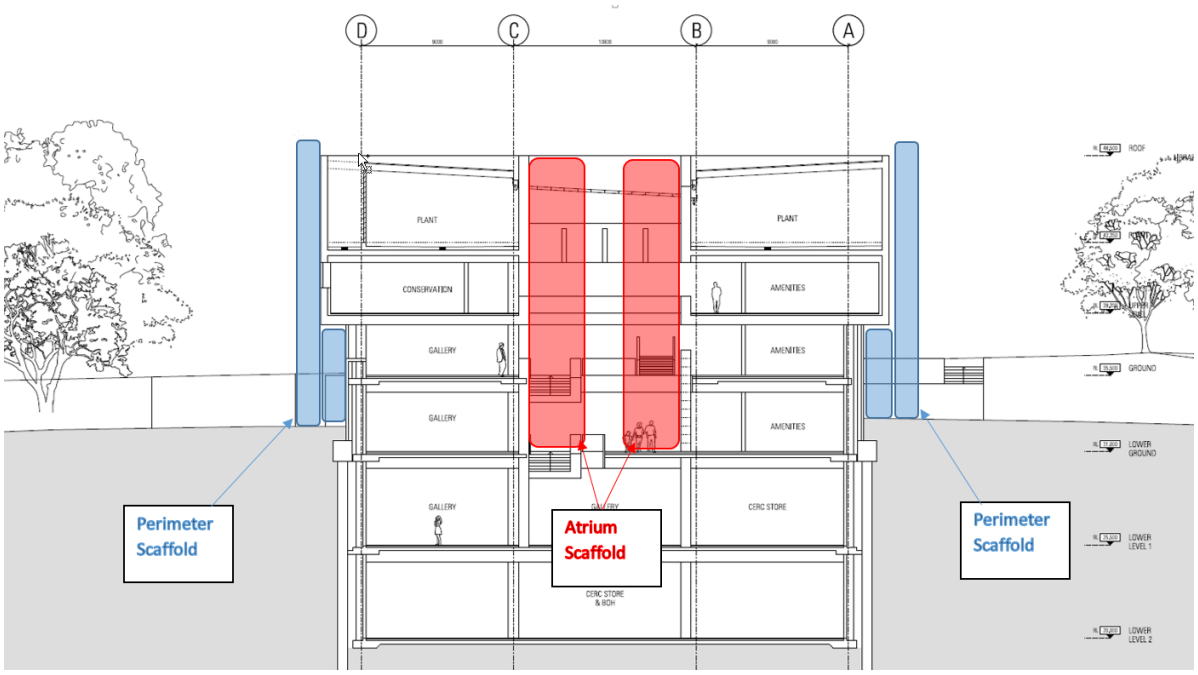

Figure 10 Scaffolding Diagram

5.6 Façade

The façade of the Chau Chak Wing Museum building compromises of elements which can be seen in the below image. The concrete profile continues throughout the levels of the building including the cantilever overhang which provides challenges for access to complete the pouring of the concrete structure and concrete façade.

The entrance level façade will be a combination of double glazed glass and sandstone elements which are the primary means of façade and which will be installed from within the building. These will be loaded into the building with the tower crane and the loading platforms for installation to commence once all the formwork materials are removed from each floor.

The upper level façade will be an off form Class 2 white concrete box structure with expressed and plugged tie bolt holes and expressed jointing at specified spacings. The concrete box forming the uppermost levels provides a sheltered space adjacent to the entrance.

The roof structure will be of concrete with a 3 degree fall and be a continuation of the building structure. The roof plant machinery will be loaded onto the top floor slab utilising the tower crane and will be assembled insitu.

Figure 11 Façade Finishes

5.7 Services

Services works will commence in earnest once the floor plates become free from the structure material. High level services rough in will be the initial activity followed by low level rough in in conjunction with the finishes trades.

Services major plant such as fire pumps, generators and chillers will be located in the basement levels, with localised AHU equipment floor by floor. The roof plantroom will compromise of gas boilers, cooling towers air handling units and other associated elements.

The Chau Chak Wing Museum electrical supply, for construction and commissioning, is dependent on the construction of the new kiosk substation and will be completed as part of these works commencing.

The commissioning process of the building will require early involvement of the UoS services departments, including ICT and Security. The communications rooms will be prioritised to provide access for ICT to reticulate the communications infrastructure and connect the Chau Chak Wing Museum building to the university network.

5.8 Fitout

The building has been designed from the inside out, to provide a range of spaces for display and research that are suited to the University's collections and objectives to generate more interaction and engagement between collections, visitors and research.

The Chau Chak Wing Museum building fitout will be delivered with exceptional quality. The selection of material will be chosen so that it's durable, compliant with university guidelines and aesthetic pleasing. Fitout will commence once the building is watertight to not compromise material quality. Off-site fabrication will be sought where possible for joinery elements and feature bulkheads. Protection of finishes will be applied as they are installed on site to minimise damage whilst trades coordinates their works on site which will require additional management focus to ensure this is delivered to expectations.

Key focus will be on sequencing the works in the void space. Installation of the glazed balustrades and interfacing with the steel stairs floor to floor will require detailed design and planning. These works will be carried out off scaffold which will be progressively dropped floor by floor as each level is completed

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5.9 External Works

The external civil and landscape works will commence in the later part of the programme once perimeter access equipment requirements such as scaffold and booms are no longer required. There is an extensive area of hard and soft scape to be carried out due to the footprint of the building and the existing surface conditions. Make good works to areas that have been effected by the scope such as incoming services provision will also be carried out at this time.

Decommissioning of the site accommodation will occur at the end of the project, and make good works associated in this area will be carried out at this time.

6. Quality

6.1 Introduction

A Quality Management Plan will be developed for the Chau Chak Wing Museum building prior to commencement by the Head Contractor, identifying how the Construction team will manage and deliver an exceptionally high quality building for the University.