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PROPOSED W1 STUDENT ACCOMMODATION

WESTERN DEVELOPMENT PLOT (DARLING DRIVE)

THE HAYMARKET

SYDNEY INTERNATIONAL CONVENTION, EXHIBITION AND ENTERTAINMENT PRECINCT

SSDA 12

STRUCTURAL & BUILDING SERVICES REPORT

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REVISION SCHEDULE

Date	Revision	Issue	Prepared By	Approved By
10/08/2015	1	DRAFT - FOR REVIEW ONLY	RH	
18/08/2015	2	REVISED DRAFT – FOR REVIEW ONLY	RH	
28/08/2015	A	FINAL ISSUE – FOR DEVELOPMENT APPLICATION	RH	
03/09/2015	B	RE-ISSUED FOR DEVELOPMENT APPLICATION	RH	
14/09/2015	C	RE-ISSUED FOR DEVELOPMENT APPLICATION	RH	

Prepared By: Rodhan Haughton		**Revision:** C
Approved By:		**Revision:**

PROJECT NAME: Urbanest Darling Harbour Stage 2

Structural Mechanical Civil Hydraulic Electrical Environmental Structural Mechanical Civil Hydraulic Electrical Environmental Structural Mechanical Civil Hydraulic Electrical Environmental Structural Mechanical Civil Hydraulic Electrical Environmental Structural Mechanical Civil Hydraulic Electrical Environmental Structural Mechanical Civil Hydraulic Electrical Environmental Structural Mechanical Civil Hydraulic Electrical Environmental

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INTRODUCTION

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Application (referred to as SSDA 12) follows the approval of a staged SSD DA (SSDA 2) in December 2013. SSDA 2 sets out a Concept Proposal for a new mixed use residential neighbourhood at Haymarket referred to as “Darling Square”, previously known as “The Haymarket”. Darling Square forms part of the Sydney International Convention, Exhibition and Entertainment precinct (SICEEP) Project, which will deliver Australia’s global city with new world class convention, exhibition and entertainment facilities and support the NSW Government’s goal to “make NSW number one again”.

More specifically this subsequent DA seeks approval for a residential building (student accommodation) within the Western development plot (Darling Drive) of Darling Square and associated public domain works. The DA has been prepared and structured to be consistent with the Concept Proposal DA.

Overview of Proposed Development

The proposal relates to a detailed (‘Stage 2’) DA for a residential building (student accommodation) in the Darling Drive Plot of Darling Square together with associated public domain works. The Darling Square Site is to be developed for a mix of residential and non-residential uses, including but not limited to residential buildings, commercial, retail, community and open space. The Darling Drive Plot is one of six development plots identified within the approved Concept Proposal.

More specifically, this SSD DA seeks approval for the following components of the development:

- Demolition of existing site improvements;
- Associated tree removal and planting;
- Construction and use of one residential building within the Darling Drive Plot, to be used for student accommodation purposes;
- Public domain improvements, including provision of a new urban courtyard space between student accommodation buildings W1 and W2; and
- Extension and augmentation of physical infrastructure / utilities as required.

Background

The NSW Government considers that a precinct-wide renewal and expansion of the existing convention, exhibition and entertainment centre facilities at Darling Harbour is required, and is committed to Sydney reclaiming its position on centre stage for hosting world-class events with the creation of SICEEP.

Following an extensive and rigorous Expressions of Interest and Request for Proposals process, a consortium comprising AEG Ogden, Lend Lease, Capella Capital and Spotless was announced by

the NSW Government in December 2012 as the preferred proponent to transform Darling Harbour and create SICEEP.

Key features of the Preferred Master Plan include:

- Delivering world-class convention, exhibition and entertainment facilities, including:
  - Up to 40,000m^2 exhibition space;
  - Over 8,000m^2 of meeting rooms space, across 40 rooms;
  - Overall convention space capacity for more than 12,000 people;
  - A ballroom capable of accommodating 2,000 people; and
  - A premium, red-carpet entertainment facility with a capacity of 8,000 persons.
- Providing a hotel complex at the northern end of the precinct.
- A vibrant and authentic new neighbourhood at the southern end of the precinct, now called 'Darling Square', including apartments, student accommodation, shops, cafes and restaurants.
- Renewed and upgraded public domain that has been increased by a hectare, including an outdoor event space for up to 27,000 people at an expanded Tumbalong Park; and
- Improved pedestrian connections linking to the proposed Ultimo Pedestrian Network drawing people between Central, Chinatown and Cockle Bay Wharf as well as east-west between Ultimo/Pyrmont and the City.

On 21 March 2013 a critical step in realising the NSW Government's vision for the SICEEP Project was made, with the lodgement of the first two SSD DAs with the (now) Department of Planning and Environment. The key components of these proposals are outlined below.

Public Private Partnership SSD DA (SSD 12_5752)

The Public-Private Partnership (PPP) SSD DA (SSDA 1) includes the core facilities of the SICEEP Project, comprising the new, integrated and world-class convention, exhibition and entertainment facilities along with ancillary commercial premises and public domain upgrades. SSDA1 was approved on 22 August 2013.

Concept Proposal (SSD 13_5878)

The Concept Proposal SSD DA (SSDA 2) establishes the vision and planning and development framework which will be the basis for the consent authority to assess detailed development proposals within the Darling Square Site. SSDA2 was approved on 5 December 2013. The Stage 1 Concept Proposal approved the following key components and development parameters:

- Indicative staging of demolition and development of future development plots;
- Land uses across the site including residential and non-residential uses;
- Street and laneway layouts and pedestrian routes;
- Open spaces and through-site links;
- Six separate development plots, development plot sizes and separation, building envelopes, building separation, building depths, building alignments, and benchmarks for natural ventilation and solar access provisions;
- A maximum total gross floor area (non-residential and residential GFA);

- Above ground car parking including public car parking;
- Residential car parking rates;
- Design Guidelines to guide future development and the public domain; and
- A remediation strategy.

In addition to the approval of SSDA2, the following approvals have been granted for various stages of the Darling Square site:

- Darling Drive (part) development plot (SSDA3) for the construction and use of a residential building/W2 (student accommodation) and the provision of associated public domain works approved on 7 May 2014;
- North-West development plot (SSDA4) for the construction and use of a mixed use commercial development and public car park building and associated public domain works approved on 7 May 2014; and
- South-West development plot (SSDA5) – construction and use of a mixed use residential development and associated public domain works approved on 21 May 2014.
- North-East development plot (SSDA7) – construction and use of a mixed use residential development and associated public domain works approved on 16 April 2014.

Approval was also granted on 15 June 2014 for SSDA6 which includes the construction and use of the International Convention Centre (ICC) Hotel and provision of public domain works.

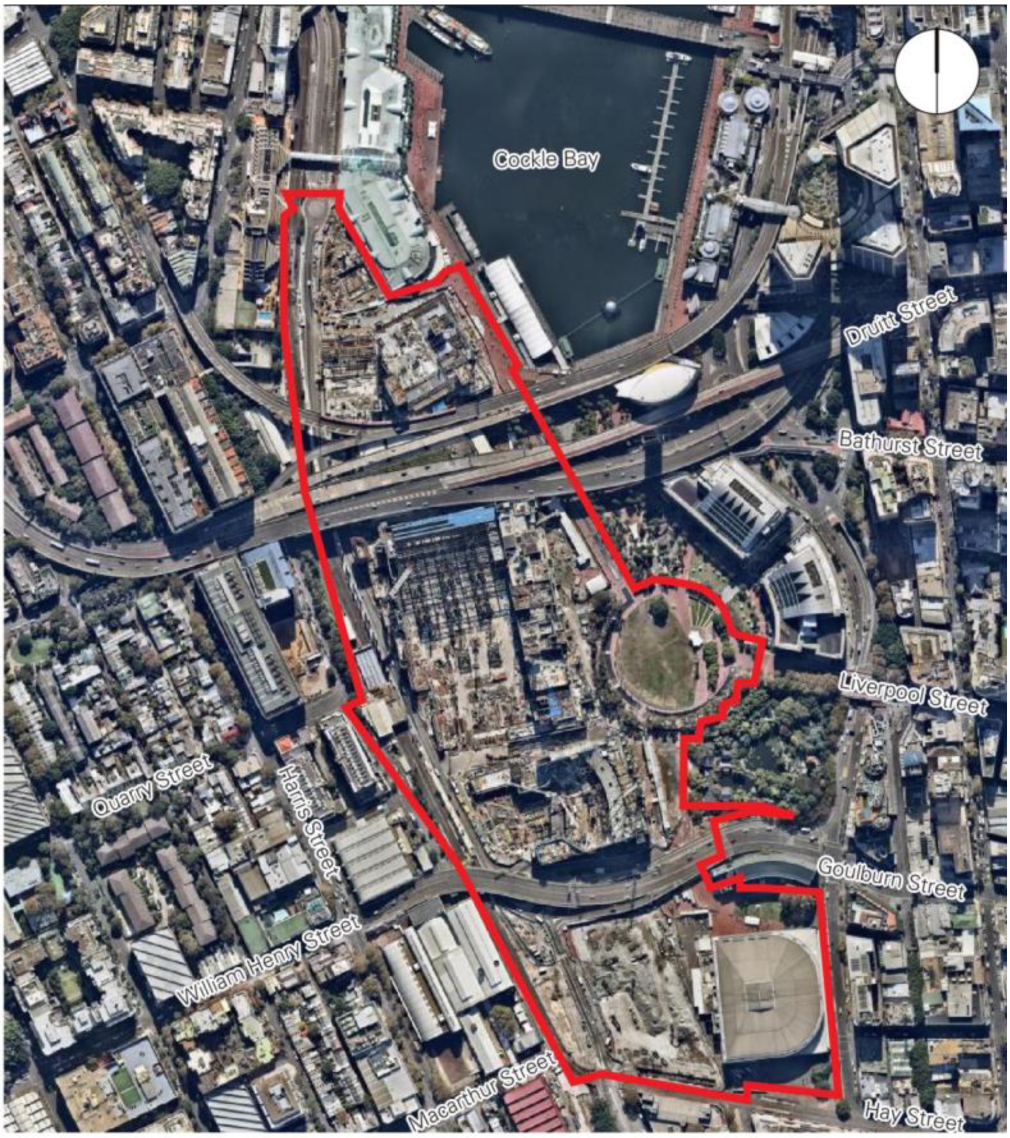
This report has been prepared to support a detailed Stage 2 SSD DA for a residential building/W1 (student accommodation) and associated public domain works within Darling Square (SSDA 12), consistent with the Concept Proposal (SSDA 2).

Site Description

The SICEEP Site is located within Darling Harbour. Darling Harbour is a 60 hectare waterfront precinct on the south-western edge of the Sydney Central Business District that provides a mix of functions including recreational, tourist, entertainment and business.

With an area of approximately 20 hectares, the SICEEP Site is generally bound by the light rail Line to the west, Harbourside shopping centre and Cockle Bay to the north, Darling Quarter, the Chinese Garden and Harbour Street to the east, and Hay Street to the south (refer to **Figure 1**). The Darling Square Site is:

- located in the south of the SICEEP Site, within the northern portion of the suburb of Haymarket;
- bounded by the Powerhouse Museum to the west, the Pier Street overpass and Little Pier Street to the north, Harbour Street to the east, and Hay Street to the south; and
- irregular in shape and occupies an area of approximately 43,807m^2.



SICEEP Site

Figure 1 – Aerial Photograph of the SICEEP Site

The Concept Proposal DA provides for six (6) separate development plots across the Darling Square Site (refer to **Figure 2**):

1. North Plot;
2. North East Plot;
3. South East Plot;
4. South West Plot;
5. North West Plot; and
6. Western Plot (Darling Drive).

The Application Site area relates to the northern portion of the Western Plot and surrounds as detailed within the architectural and landscape plans submitted in support of the DA.

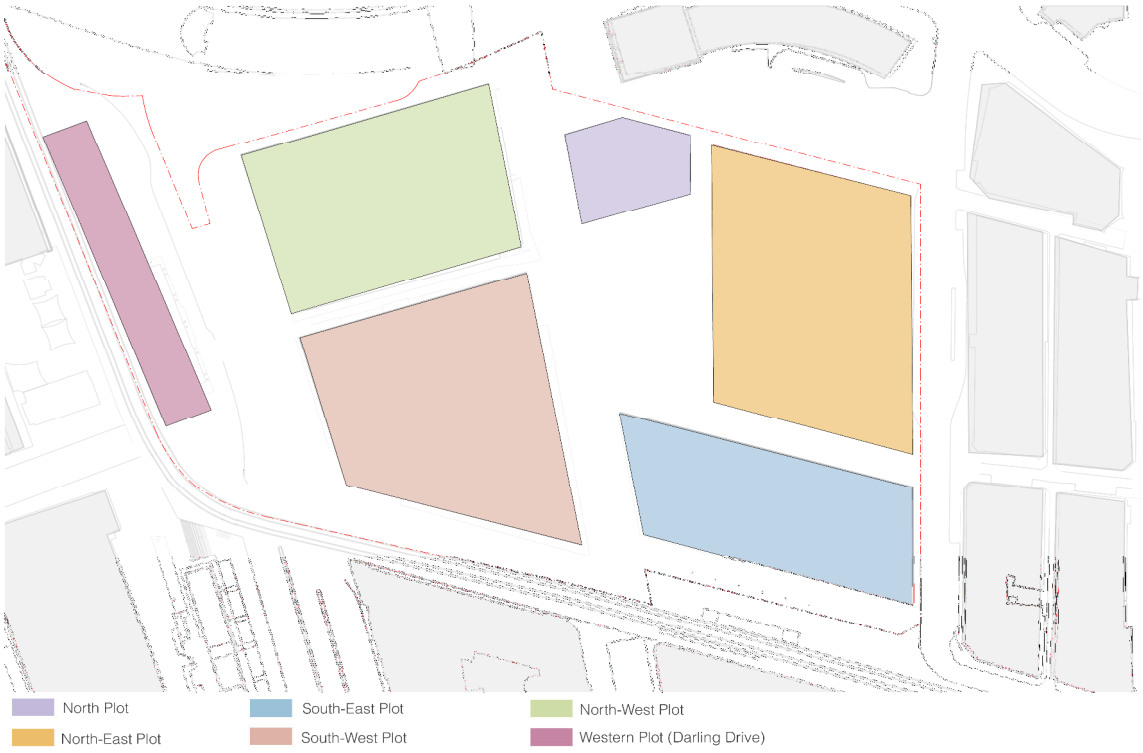


Figure 2 – Concept Proposal Development Plots

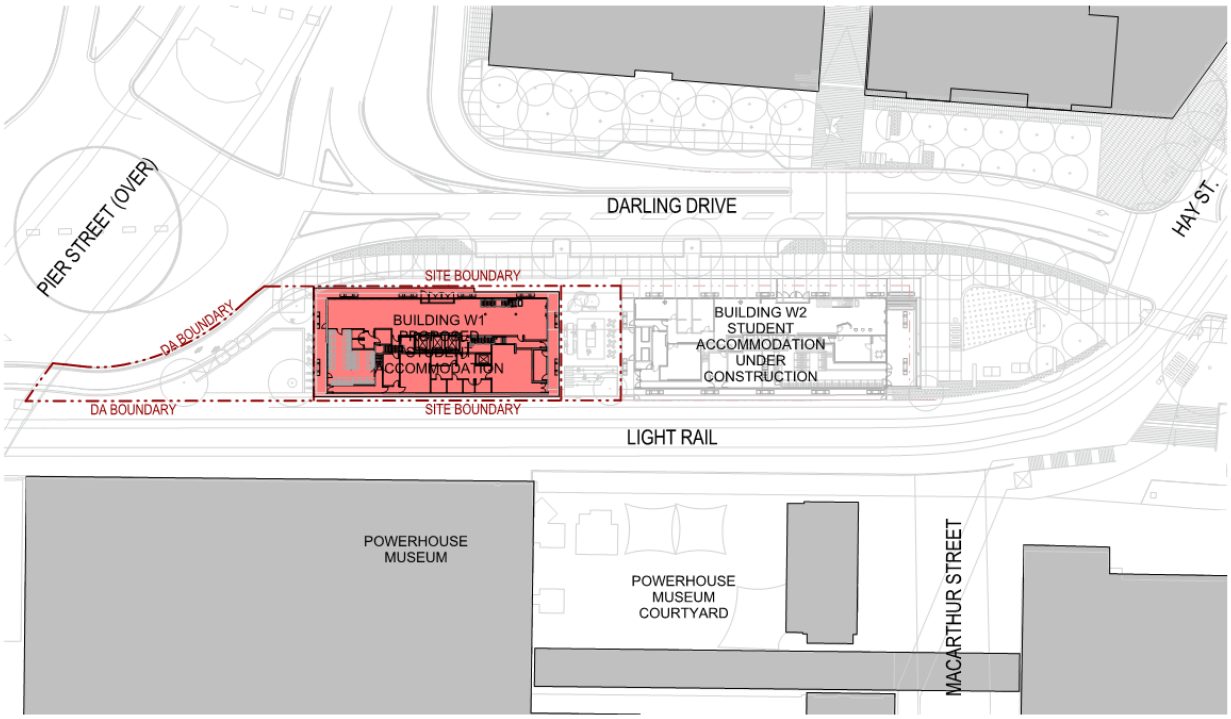


Figure 3 – Works Boundary for subject DA

STRUCTURE

Site Constraints

A Sydney Water sewer crosses the Application Site from North to South. This is a diversion of the Hay Lackey sewer and was constructed by open cut in about 1988. The sewer comprises a 1.0m diameter glass reinforced plastic liner cast in to a 1.6mx1.6m reinforced concrete block with depth to crown of approximately 5.0m to 7.5m.

A bored Energy Australia cable tunnel (City West Cable Tunnel) crosses the South East corner of Application Site at a depth of about 20m and overlain by approximately 13m of bedrock. The tunnel is of segmental precast concrete construction and is 3.45m in diameter and was constructed in 2008.

Geotechnical Conditions

A geotechnical assessment of the Haymarket Site within the SICEEP has been undertaken by Coffey Geotechnics (GEOTLCOV24303AV-AB, 13 September 2015).

The Application Site (Northern portion of the western plot) is not within the zone that may be affected by the Great Sydney Dyke or the GPO fault zone joint that traverse the Haymarket precinct and so conventional piled foundations taken to bedrock may be used to support the building.

The ground conditions below the Application Site can be described as comprising a variable thickness of fill and alluvial/estuarine soils above sandstone bedrock. The water table is relatively shallow, but is not expected to be encountered by the excavations other than the piling works. The construction will not impact on the water table.

Structural Description

The proposed development is a student accommodation building including associated amenities comprising of ground floor, 21 typical levels, and roof level with an effective height of over 50m. It is rectangular in shape on plan and contains no basement.

Typical floors of accommodation repeat from level 2 to 21. Between Ground and level 2, raked columns support the buildings perimeter. Perimeter column lines are transferred at level 2 at the top of the raked columns.

Typical floors are to be of post-tensioned concrete, flat plate construction, supported vertically by blade columns and lift and stair cores.

Ground floor will be suspended, constructed on-grade with ground beams and core bases supported on large diameter piled foundations socketed into sandstone bedrock.

All four elevations are to be of lightweight construction and supported by floor plates at each level.

Lateral stability is provided by a single concrete core located on the centreline of the building, allowing columns to be designed as braced elements.

Managing Site Constraints

Of primary concern are the sewer and cable tunnel below ground structures crossing the site.

- Sydney Water Corporation (SWC) trunk sewer tunnel
- Energy Australia City West Cable Tunnel (CWCT)

An assessment has been undertaken by Pells Sullivan Meynink (PSM), consulting Geotechnical Engineers to determine the impact of the development on these structures (PSM2796-002R, 11 September 2015)

Through 3D finite element analysis, PSM have developed a foundation strategy to limit the loads, settlements and deflections generated in these structures to an acceptable level.

In summary, the foundation strategy is as follows.

Sydney Water Corporation (SWC) trunk sewer tunnel

The SWC underlies the application site building footprint. As such, we propose to adopt the following PSM recommendations, and those referred to in Appendix A ‘Sydney Water BPS/Feasibility Letter’.

- Piles are to extend below the sewer invert level
- A suitable foundation transfer structure by way of either a partially cantilevered foundation or a bridging foundation will be employed over the SWC. Supporting piles to rock will maintain a minimum separation distance on 1.5m between the pile shaft and concrete sewer encasement

Energy Australia City West Cable Tunnel (CWCT)

The cable tunnel runs beneath the building, crossing the south-west corner.

We propose to adopt the following PSM recommendation

- Maintain 10m of rock cover to tunnel crown
- Limit foundation loads above the tunnel such that the impact on the tunnel structure is negligible (within agreed acceptance criteria).

We understand that further analysis will be undertaken by PSM during the detailed design stages to ensure compliance of the final solution. This will be undertaken in conjunction with the relevant utilities owners to obtain approval for the new works and acceptance criteria used in the final design. Refer to Appendix C ‘Ausgrid Letter from DS1’. We note prior approval has been received in relation to construction over the CWCT from Ausgrid in relation to the W2 student accommodation building. Refer to Appendix A - Sydney Water BPA / Feasibility Letter.

MECHANICAL

Ventilation Systems

All habitable rooms are to be naturally ventilated where possible in accordance with Section F4.6 of the NCC-2015. We note however, mechanical ventilation will be required in some habitable rooms in order to address acoustic requirements.

Mechanical services ventilation have been designed to comply with Section F4.5 of NCC-2015, AS 1668.1-1998, and AS 1668.2-2012. This includes the following systems:

- Habitable rooms where closing of windows is required in the acoustic consultant's report
- Habitable rooms which cannot be naturally ventilated e.g. internal rooms
- Toilets and ensuites
- Kitchen ventilation
- Laundry ventilation
- Garbage Rooms

Smoke Hazard Management

On receipt of a fire trip, all air handling systems greater than 1000 L/s plant installed are intended to automatically shut down in accordance with AS 1668.1-1998.

Provisions for stairwell pressurisation, and the associated relief air system, have been designed in accordance with AS 1668.1-1998.

Protection of Openings

It is intended that all openings in fire rated walls and in the fire rated shaft will be designed in accordance with Sections C3.12, C3.13, C3.15 of the NCC-2015, AS 1668.1-1998, and AS 1682.1 – 1990.

Energy Efficiency

Mechanical services air conditioning and ventilation systems have been designed to comply with energy efficiency requirements of Section J5 of the BCA.

Refer to Section J5 of the BCA.

Access for Maintenance

The mechanical plant design includes provision for access for maintenance conforming to the requirements of BCA Section A, Clause 2.1.

We, Northrop Consulting Engineers, being professional engineers, certify that the Mechanical Design has been designed in accordance with the above.

Proposed Air Conditioning Systems

The proposed air conditioning system will consist of a variable refrigerant volume air conditioning system. Provisions for these systems have been designed in accordance with AS 1677.2-1998.

Pursuant to the provision of **Clause A2.2 Building Code of Australia,** I hereby certify that I am an appropriately qualified engineer and the above design has been carried out in accordance with normal engineering practice and will meet the relevant requirements of the Building Code of Australia and relevant Australian Standards.

We confirm that in preparing the mechanical services for this development, we have exercised due diligence and care, in accordance with Standard practice. This Certificate however, does not relieve other parties from their responsibilities.

Full Name of Designer:	Jen Cardwell
Qualifications:	MSc, BEng (Hons)
Address of Designer:	Level 11, 345 George Street
	Sydney NSW 2000
Business Telephone No:	(02) 9241 4188 **Fax No:** (02) 9241 4324
Name of Employer:	Northrop Consulting Engineers P/L

Signature:

ELECTRICAL

Electrical Supply & Demand

The preliminary maximum demand calculations for the proposed development have been carried out by IGS Consulting. The calculations have been based on data gathered on similar Urbanest student accommodation buildings throughout Australia and have revealed loads in the order of 670.2 Amps per phase for the new student accommodation facility.

Currently, the development adjacent, which is also own by Urbanest will have a mini chamber substation to be installed on site and it is rated at 1000 kVA. The new facility will also be powered by the same substation.

Northrop has lodged an application for connection and the proposed load connection has been approved by Ausgrid.(refer to Appendix D).

The proposed maximum demand report can be found in the Appendices' at the rear of the documents.

Power Distribution System

The power distribution, including incoming supply, protection and cabling will be designed in accordance with AS/NZA 3000:2007, AS/NZS 3008.1.1:2009 and the NSW Service and Installation Rules.

Emergency and Exit Lighting

A system of self-contained, single point emergency and exit lighting will be designed in accordance with BCA Section E, Clauses E4.2, E4.4, E4.5, E4.6, and E4.8. and AS2293.1

Internal Lighting

Internal lighting will be designed in accordance with BCA Section F, Clause F4.4, and AS 1680.

External Lighting

External lighting will be designed in accordance AS 1158 and AS 4282.

Automatic Fire Detection

An automatic smoke detection system will be designed in accordance with NCC (BCA) Section E, Table 2.2a, NSW Table E2.2b and BCA Specification E2.2a. and AS1670.

Occupant Warning Systems

An occupant warning system will be designed in accordance with NCC (BCA), Section E and AS1670.

Energy Efficiency

Energy efficiency measures will be included in the design in accordance with Section J, Clauses J6.2 and J6.3

Voice/Data

The main IT room located at ground floor will feed the new building, there will be optical fibre/copper cabling installed to link the floor distribution cabinet. Cat 6 cabling is to be provided to all outlets.

Lift Services

The performance of the lift services will be specified in accordance with BCA Section E (E3.2, E3.3, E3.5) and AS1735 Parts 1,2 & 11.

Pursuant to the provision of **Clause A2.2 Building Code of Australia,** I hereby certify that I am an appropriately qualified engineer and the above design is in accordance with normal engineering practice and meets the requirements of the Building Code of Australia and relevant Australian Standards.

We confirm that in preparing the electrical services documentation for this development, we have exercised due diligence and care, in accordance with Standard practice. This Certificate however, does not relieve other parties from their responsibilities.

Full Name of Designer:	Yogesh Maharaj
Qualifications:	B Eng. MIE Aust
Address of Designer:	Level 1, Grafton Bond Store, 60 Hickson Road
	Sydney NSW 2000
Business Telephone No:	(02) 9241 4188 Fax No: (02) 9241 4324
Name of Employer:	Northrop Consulting Engineers P/L

Signature:

HYDRAULIC AND FIRE PROTECTION SERVICE

The proposed development is a student accommodation building including associated amenities comprising of ground floor, 21 typical levels, and roof level with an effective height of over 50m.

We understand the proposed development will be constructed in accordance with BCA 2015 and BCA building classifications as below:

Class 3 (residential accommodation)

This report has been prepared to describe:

- Brief overview of the required infrastructure (Sydney Water) services to service the building. It is noted that Northrop Engineers is not responsible for the infrastructure works. These works will be provided by others.
- Design objectives for the proposed development.
- Potential impact to existing services.
- Possible engineering strategies to enable development to occur at this site.
- Preliminary spatial design for the major site works and servicing components required to support the development.

Report Constraints

General site plans for the hydraulic services and partial set of building drawings have been provided for review. However, we note that the documents provided are at DA stage and are subject to change.

While every effort was made to accurately determine the existing hydraulic / fire services, Northrop recommends further site investigation to confirm certain elements including location, sizes, capacity and condition before a final design is adopted.

Existing Infrastructure

NOTE: All external infrastructure works and incoming services are being completed by others.

Northrop has allowed for connecting to the services provisions provided by others at the property boundary.

All works shall be subject to Sydney Water requirements under a Section 73 Certificate Application.

Based on recent telephone discussions with Sydney Water, we understand these requirements to be as follows:

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Building Plan Approval:

The proposed development is over an existing 1000mm GRP Sydney Water sewer. Sydney Water will impose a number of requirements as part of a Section 73 Application. These requirements will include but are not limited to the following:

- Detail Service Protection Report "Peg out"
- CCTV investigation on the existing 1000mm main before and after the development
- Excavation procedure will need to ensure no impact on the existing 1000mm main
- The works will need to bonded
- All new structural foundation to taken below the Zone of Influence of existing sewer.

Through a feasibility application we note that Sydney Water have approved with conditions the construction of the proposed development over the above mentioned sewer. Please refer to attachment Appendix A for conditional approval by Sydney Water.

Sewer:

- A sewer extension from the existing 450mm GRP near the corner of Darling Street & Pier Street will be nominated as the required sewer connection point to service this development (completed).
- A new 225mm sewer extension will be required to the Northern of the site (completed).

  Please refer to Sketch SK-H-01 for general details. Note this sketch has been amended to reflect the requirements outlined by Hyder Consulting.

Water:

Sydney Water requested the following to be provided:

- Existing 500mm water main traversing the site is to be diverted away from the buildings footprint (completed).
- New 200mm water main extension from the southern side of Hay Street is to be constructed to service the development (completed).
- Please refer to Sketch SK-H-01 for general details. Note this sketch has been amended to reflect the requirements outlined by Hyder Consulting.

Hydraulic Description

The building comprises of ground floor, 21 typical levels, and roof level on a rectangular plan. There are no basements proposed as part of the building.

Typical floors of residential accommodation repeat from level 2 to level 21.

Building over 50m high.

Individual Bathroom Pods will be used as part of the construction.

Northrop will complete the following services:

- Sanitary plumbing & sewer drainage

- Trade waste (Laundry & Kitchen)
- Water services (Cold Water, Hot water & Warm water reticulation)
- Rain water re-use
- Roofwater (downpipes, eaves/box gutter system)
- Fire hydrants
- Fire hose reels
- Fire sprinklers
- Gas service

Sanitary Plumbing and Drainage

The sanitary plumbing and drainage will be designed to AS3500.2 requirements.

A Section 73 Application will be necessary to be lodged with Sydney Water to comply with the Development Consent.

The system will collect effluent from the sanitary plumbing stacks and Ground Floor fixtures and be conveyed by gravity to the proposed sewer connections, complete with manholes, piping, fittings, etc.

Northrop anticipates 1 x sewer connections within our site.

- **Connection 1:** The sewer connection will be at the southern end of the site to the external sewer to be provided by others.

An overflow gully will be provided as part of these services. The gully will be external to the building at ground level to prevent any surcharge of sewerage, within the building, in the event of blockage.

Inspections openings in pipes and fittings will be fitted in accessible positions to facilitate maintenance procedures for each individual section of pipework.

Trade Waste

On-Site provisions are to be constructed to AS3500 requirements. The following on-site trade waste provisions are anticipated and initial assessment suggest:

- Lint pit for the Laundry.

  Note: Final Lint pit size shall be confirmed.

- 3000 litre inground Grease Interceptor Trap to Sydney Water's requirement.

  Note: Final Grease Interceptor Trap size & location shall be confirmed.

- Bucket trap floor wastes will be required at the ground floor garbage room

Stormwater Drainage

Refer to the civil engineers report / documents for details relating to the stormwater drainage. Downpipes and overflow from the rainwater harvesting tank will be connected to the external stormwater system. The stormwater system is expected to be available for connection within 1.0M of the downpipes.

Domestic Cold Water

Domestic cold water for the new building will be supplied via the ø100 property service provided by Lend Lease.

A dedicated water meter complete with a zone protection back flow in accordance with AS 3500 requirements is to be provided.. The system will reticulate to all points of usage and be complete with connection to water main, pumps, piping, fittings, valves, etc. Non domestic user points considered a back flow hazard will be fitted with protection within the recommendations of Australian Standard 3500.

Domestic Hot Water

A central gas instantaneous hot water system with heat recovery from the mechanical system is being considered. The hot water plant will be located on the top roof plant room.

The hot water system / designed will be documented to AS 3500.4 requirements and be in accordance with manufactures recommendations.

The pipework reticulation will be typical flow-return, with dual in line recirculation pumps to allow acceptable waiting time for hot water to be delivered at tap outlets.

Note. As part of the design development, a tri-generation hot water plant will be considered. If implemented, the tri-generation plant will need to be located at ground floor.

Warm Water

Warm water will be supplied via the tempering valves provided as part of the hydraulic services for the pods.

Thermostatic mixing valves, to all disabled ablution sanitary fixtures, which includes showers and basins within the facility.

Warm water is to comply with the requirements of AS 3500 requirements

Roof Drainage and Downpipes

New Syphonic roof drainage system will be provided by a number of strategically located rainwater water outlets (RWO) on the roof. Overflow provisions will be incorporated as part of the design.

RWO's and downpipes will be designed to an average storm recurrence interval (ARI) for the City area equal to:

1 in 20 year storm of 5 minutes for eaves gutter (ARI 155 mm/hr)

1 in 100 year storm of 5 minutes for box gutter (ARI 270 mm/hr)

Downpipes shall discharge via gravity to an above ground 30,000ltr for re-use.

Rainwater Re-use System

Our preliminary water balancing assessment indicates that an aboveground 30,000 litre rainwater harvesting tank would provide a reduction on the domestic water consumption for the building if used for toilet flushing and as a secondary water supply to the laundry. The rainwater tank overflow pipe shall discharge into stormwater system (refer to civil).

The rainwater harvesting tank shall be provided with a first flush device and overflow pipe. The First Flush devises shall be equal to 'Rain Harvesting Systems Pty Ltd'. The outlet pipe from the first flush-diverter system is then discharged into a downstream stormwater pit (refer to civil).

The rainwater harvesting system shall be complete with a booster pump assembly, filtration system, and all associated valves and pipework in accordance with Code and Australian Standards. The harvested water service shall be used for a toilet flushing purposes.

The rainwater harvesting system shall be provided with a potable cold water make-up supply complete with a three way valve, backflow prevention device and all other associated valves and equipment in accordance with Code and Australian Standards.

Gas Service

Natural gas for the new building will be supplied 1 x water connections to the gas supply supplied by others.

The natural gas service will be designed and reticulated in accordance with current AS 5601 requirements to supply the gas fired hot water units and mechanical plant if required.

The internal system of pipework will supply 2.75kPa gas to all points of usage and be complete with piping, fittings, valves etc unless noted otherwise

Sanitary Fixtures and Taps

Sanitary fixtures throughout the facility will form part of the services provided as part of the pods.

All other fixtures tapware shall be selected accordance with the Water Efficiency Labelling and Standards Scheme. Flow control will be considered and implemented as necessary.

Combined Fire Hydrant & Fire Sprinkler System

The combined fire hydrant & sprinkler system will be designed to the requirements of AS 2419.1 – 2005, AS 2118.1 – 1999, AS2118.6 – 2012 and the Building code of Australia.

The building shall be classified as light hazard throughout except for Ground & First level which will be classified as Ordinary Hazard Group 1.

System design requirements will be as follows:

Two hydrant operating simultaneously: 20L/s.

Ordinary Hazard Group 1: 5mm/min over 72 m2 (6L/s)

Light Hazard Group: 6 sprinklers at 48 L/min

Water supply will be classified as Grade 1 as required by the BCA consisting of a 50,000 Litre water storage tank located at roof level and an authority water main connection via the 2 x ø150 fire service provisions provided by Lend Lease.

Fire services booster pumps (Diesel / Electric) including brigade relay pumps will be located within the fire pump room at Ground Level. The pump demand will be 16 litres/sec at 800 kPa in accordance with AS 2419.1

A dual point Fire brigade Booster valve complete with block plan is required at ground level together with a fully flow fire brigade relay pump connected to the upper pressure zone as required by AS2419.1.

Sprinkler control valves for each level shall be located within one of the fire isolated stairs adjacent to the hydrant landing valve. Sprinkler heads shall be 10mm 68 degree fast response type sprinklers having a maximum coverage of 4.6m x 4.6m for light hazard and 4m x 3m for Ordinary Hazard. Fire hydrants will be located within both fire stairs on each level.

A Fire Service block plan shall be provided at the Fire Brigade Booster valve cupboard and in the pump room.

Pump run indications shall be connected to the Fire indicator Panel.

Automatic operation of the sprinkler system shall initiate a Fire Brigade Alarm via the Fire Indicator Panel and operate an external gong located at ground level.

Window Drenchers / Sprinklers

Window sprinklers maybe required to be provided to all windows on Darling Drive. If these sprinklers are required, an automatic self-closing system will need to be provided. All to AS2118 and BCA requirements.

Water supply will consist of a 50,000 litre water storage tank located at the top of the building and dual outlet Fire Brigade suction supply of the water main at ground level.

As the building is over 50 metres the system will contain 2 pressure zones, Upper pressure zone (level 8 to roof) and lower pressure zone (Ground to level 7). The maximum pressure zone height shall be 35metres.

The pressure and flow demand for the system is 20 litres/sec at 700 kPa at the highest hydrant (Level 20)

Fire Hose Reel

A fire hose reel system shall be designed in accordance with AS 2441 – 1988.

All fire hose reels shall be located within 4 meters of a required fire exit.

The water supply to fire hose reels will be connected to the potable metered water system on site.

All isolations valves between the FHR system and the water supply shall be padlocked opened in accordance with Australian standard.

In accordance with BCA 2015 fire hose reel's will be provided to Ground & First floor (non resi areas), residential levels will not be provided with fire hose reel supply.

Fire Extinguishers

Fire extinguishers will be selected in accordance with AS 2444 and Architects requirements. The final extinguishers location will be coordinated with the Architect.

Hydraulic Building Management System

BMS provisions will be provided to all major hydraulic plant including hot water plant, water, gas meters and pumps as required.

ESD Initiatives (refer to separate ESD report prepared by Northrop)

Appendix A Sydney Water BPA / Feasibility Letter

Appendix B IGS Demand Report

Appendix C Ausgrid Letter Regarding DS1

Appendix D Ausgrid Approval – Revised Assessment Response