The new Sydney Fish Market

Development Application – Structural, Civil and Maritime Design Report

26th September 2019

Infrastructure NSW

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Contents

Executive summary

Mott MacDonald with partners Arcadis and Royal Haskoning DHV are providing Structural, Civil and Maritime Engineering Design Services to support the development of the new Sydney Fish Markets. The vision for the new development is that of a world class facility designed to accommodate future growth and establish itself as an icon of the Bays District.

This report summarises the designs that have been developed during the concept phase to feed into the SSDA submission.

UrbanGrowth NSW Development Corporation (UrbanGrowth NSW) was abolished on 1 July 2019 with all functions transferred to Infrastructure NSW. Any reference to UrbanGrowth NSW throughout the report is interchangeable with Infrastructure NSW.

1 Introduction

1.1 Description of Project

Infrastructure NSW have engaged Mott MacDonald with partners Arcadis and Royal Haskoning DHV to provide structural, civil and maritime Engineering Design Services to support the development of the new Sydney Fish Markets. The vision for the new development is that of a world class facility designed to accommodate future growth and establish itself as an icon of the Bays District.

The new facility will be situated in Blackwattle Bay, adjacent to Pyrmont Bridge Road, adjacent to the existing Fish Markets site, as indicated in Figure 1-1 below.

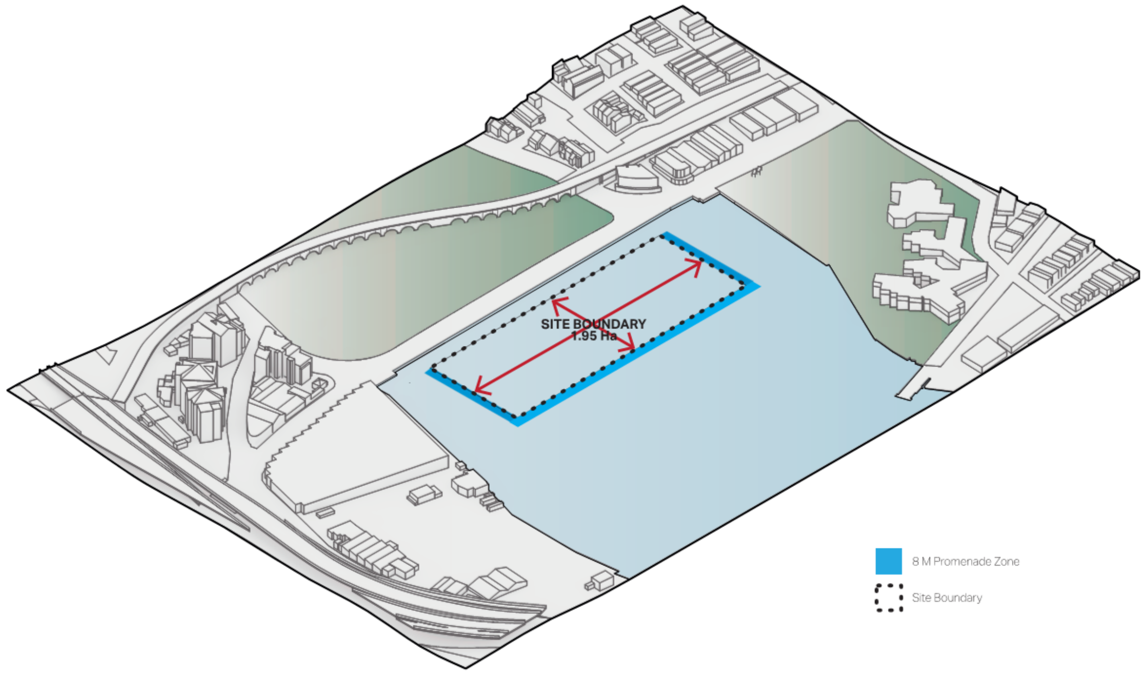


Figure 1-1 – Site Layout (3XN)

1.2 Scope of Report

This report covers the design philosophy, key design parameters and constraints and assumptions that have been made in developing the engineering scheme for the new facility.

Options explored during concept design phase have been rationalised into a single scheme that will be developed into a detailed design. The process of rationalisation has occurred through co-ordination with the design team, cost consultant, constructability considerations and operational requirements.

1.3 Project Team

Mott MacDonald are providing structural, civil and maritime engineering services, supported by Royal Haskoning DHV and Arcadis as sub-consultants. They supplement the team's capabilities with their proven expertise in delivering world class civil foreshore and maritime design.

1.4 Limitations of this Report

This report has been prepared to support the project DA submission. Therefore, there remain many unknowns regarding the functional and architectural requirements of the project that will be developed as the design progresses.

This report summarises the design decisions that have been made in forming a base scheme and preliminary cost estimate. Specific details of large areas of the design are yet to be developed.

2 Site Data & Constraints

A detailed list of constraints, developed as part of the constraints and opportunity register for the three parking options considered through the concept design phase, is included in Appendix A. The main issues are summarised below.

2.1 Geotechnical & Contamination conditions

2.1.1 Geotechnical

The new facility will be located in Blackwattle Bay, adjacent to Pyrmont Bridge Road, adjacent to the existing Fish Markets site.

The site was previously part of the Blackwattle Bay Cove or Blackwattle Swamp Cove and was reclaimed between 1835 and 1891 (exact date unknown).

There are a number of existing geotechnical reports that have been prepared as part of previous studies to the site that describe the geotechnical conditions.

- Coffey Geosciences Pty Ltd – Statement of Geotechnical Conditions (Ref: S20790/2 dated 28 May 2001)
- Golder Associates' Geotechnical Investigation and Assessment of Rozelle & Blackwattle Bay Wharves (Ref: 9862337/E dated March 1999)
- Douglas Partners' Report on Geotechnical Investigation – Wharf Repair, Blackwattle Bay (Ref: 29094 July 2000)

The subsurface conditions between Pyrmont Bridge Road as taken from the boreholes shown in Figure 2-2 are summarised in Figure 2-1 below.

Material	Description	Inferred Depth to Top of Unit (m)	
		Northern Building	Southern Building
Fill	SAND, clayey SAND, gravely SAND with sandstone cobbles and boulders, poorly compacted, moist to wet.	0	0
Marine Sediments	Clayey SILT or silty CLAY with layers of peaty SILT in places, soft to firm, overlying heterogeneous mix of SAND, silty SAND, clayey SAND and gravely SAND, loose to medium dense.	7 to 7.5	5 to 6
Alluvium	CLAY, medium to high plasticity.	8.8 to 9	8.2 to 8.6
Residual Soil	Clayey SAND and sandy CLAY, medium dense to very dense, stiff to very stiff (absent in places).	may not exist	16 to 21
Hawkesbury Sandstone	Extremely low strength to low strength (Class IV and V)* Hawkesbury Sandstone, grading to medium strength (Class III)* within about 0.3 to 3m of the top of the unit.	17 to 20	17 to 21

* Sydney Sandstone Rock Class according to Reference 1.

Figure 2-1 – Typical Subsurface Conditions

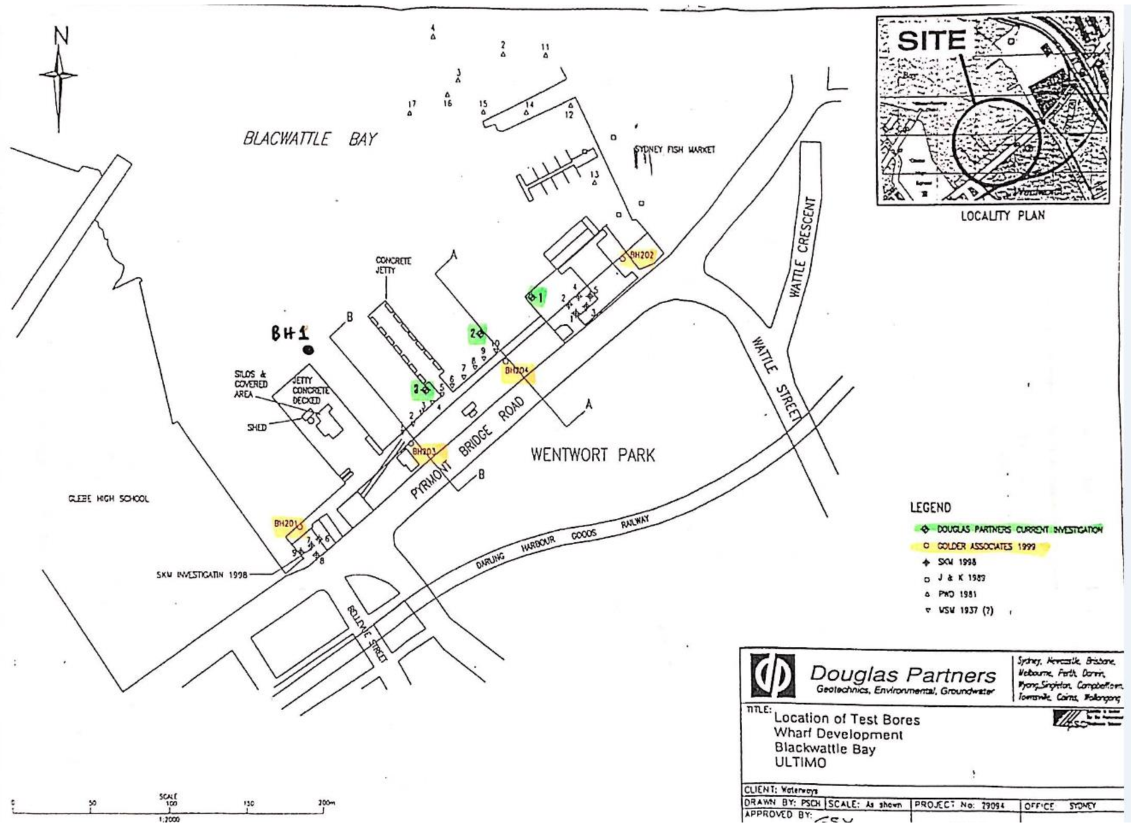


Figure 2-2 – Summary of Borehole Locations

There is therefore evidence of poorly compacted fill overlying soft marine sediment. Any works or support of structure located within the zone is recommended to be supported on piles driven to rock.

The top of rock level takes the form of a buried incised valley floor, with its axis running approximately SE to NW, with the deepest rock levels ~ 21m to 22m below existing ground level.

During the detailed design phase, further geotechnical investigations will be required to validate the design assumptions and confirm those investigations undertaken previously.

2.1.2 Contamination

Environmental Investigation Services undertook a contamination investigation (ref: E29245Klet_SP1 - April 2017). The investigation found the presence of heavy metals and PAHs (Polycyclic Aromatic Hydrocarbons) in the fill and natural sediment samples however noted this is not unusual given the legacy of a large number of former industries historically based on the water front. Reference should also be made to the JBS&G Acid Sulphate Soil Management Plan and a Remedial Action Plans. These reports give recommendations to how these contaminants should be treated once encountered.

The presence of such contamination has been a key consideration in the options explored, with the aim being to minimise the amount of disruption or removal.

2.2 Bathymetric Survey Information

A full bathymetric survey of the bay is available and has been used to understand sea bed levels relative to the underside of structure and the sea wall. The survey plot and typical section is shown in Figure 2-3. This has been combined with the site survey data of the existing wharfs and Pyrmont Bridge Rd to give a full understanding of the relative levels of each.

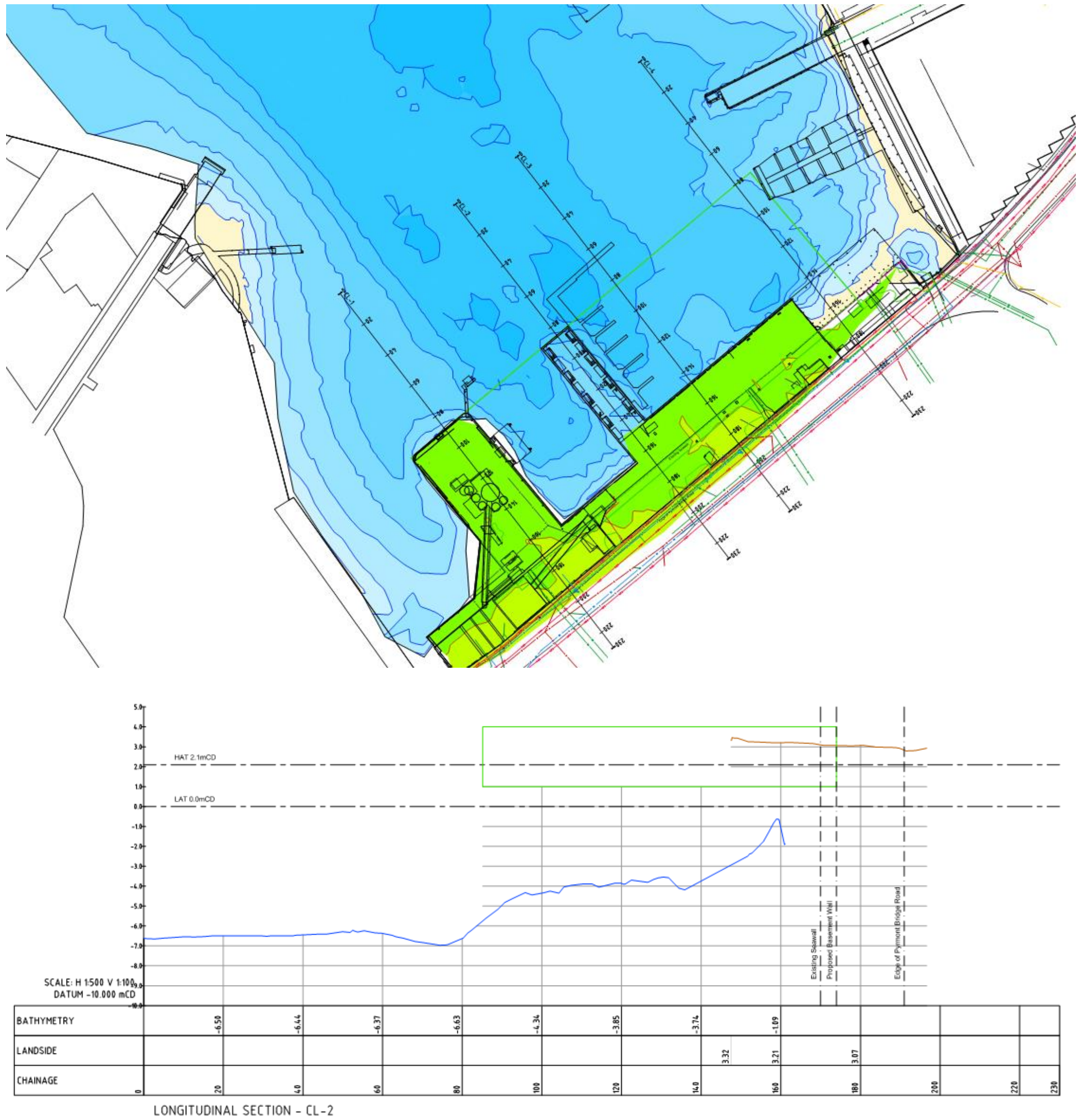


Figure 2-3 – Bathymetric Survey

2.3 Overland Flow & Stormwater

The proposed site has significant overland flow challenges, with Wentworth Park, Wentworth Park Road and Wattle St acting as conduits in the event of severe storms.

The catchment area is large, extending south to Central Station, east to the City and west towards Glebe. Since Wentworth Park is raised ~ 1m above the surrounding streets with a boundary wall around much of the perimeter, the adjacent Wentworth park Rd and Wattle St arteries carry significant volumes of water down to the bay, as indicated in Figure 2-4.

Currently there exists a series of walls and obstructions along the northern edge of Pyrmont Bridge Road that result in the greater depths as shown on the plot below.

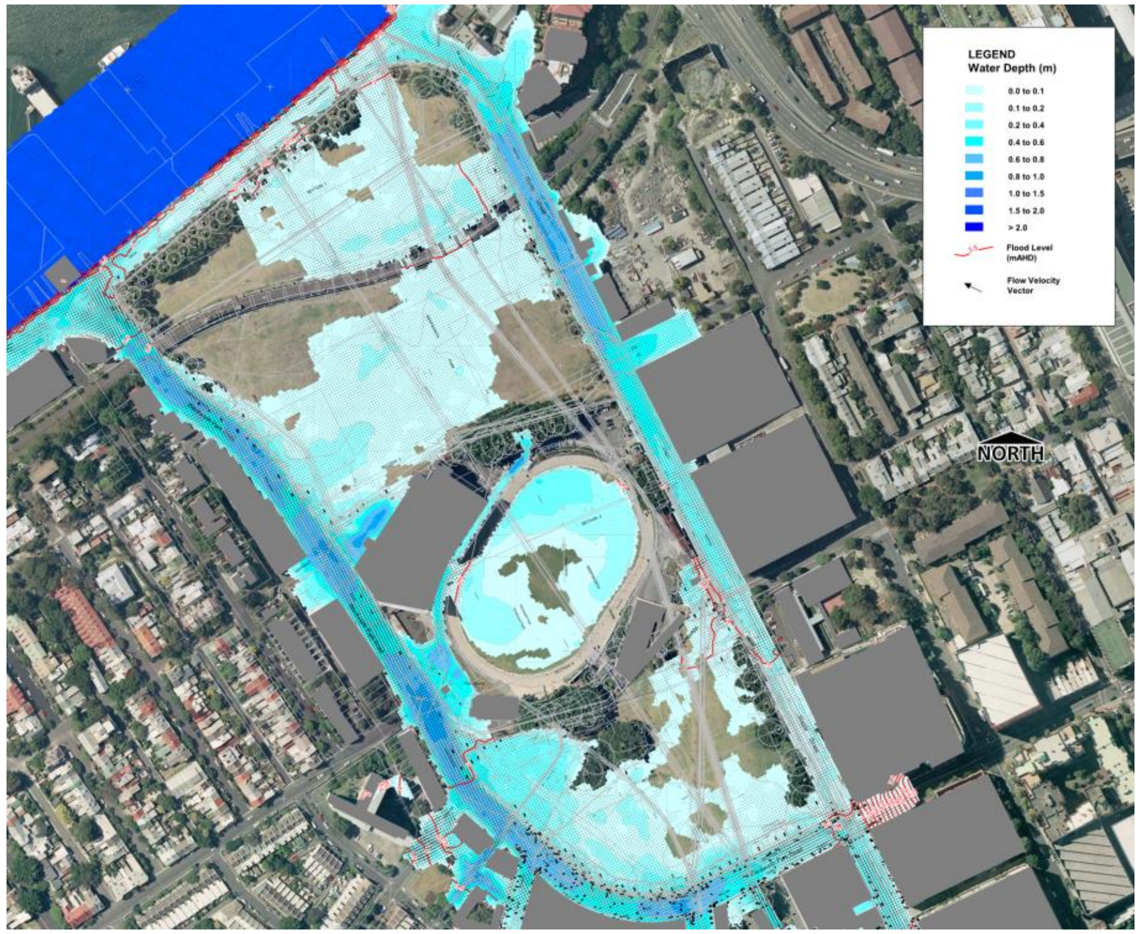


Figure 2-4 – Overland Flow Plot

There are several existing stormwater culverts that run under Wentworth Park, discharging into Blackwattle Bay, see Figure 2-5. Since the new facility will be placed directly in front of these outlets, the design must account for their location and not impact their operation. Treatment of the existing sea walls and their interaction with the culverts will require careful assessment, in consultation with Sydney Water.

At this stage, no allowance has been made in the project for amplification to the existing network. One of the culverts is heritage listed and will require the appropriate protection during construction. Baffles are proposed to capture detritous / material that flows out from the pipes under the facility. Access hatches will be provided to these baffles to allow for inspection and removal of material.

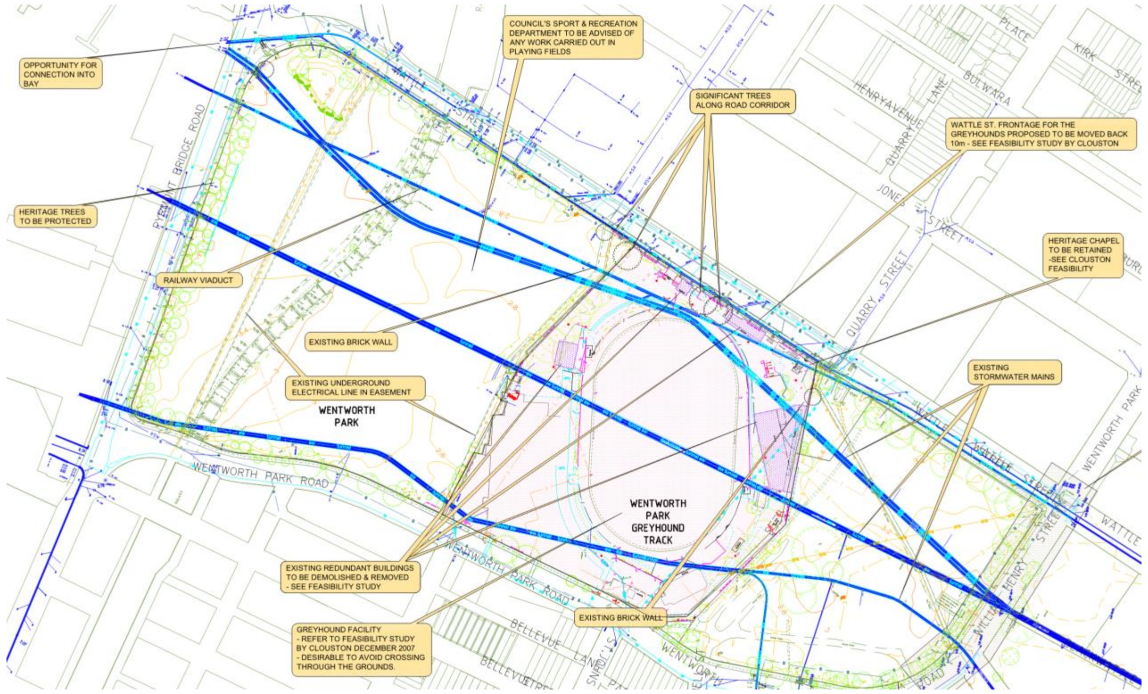


Figure 2-5 – Existing Stormwater Culverts

2.4 Existing services

The existing stormwater culverts, together with the other existing services indicated along Pyrmont Bridge Road will all need to be considered during the construction of the new facility.

The degree and extent of services diversions will depend on the scale of works to be undertaken along Pyrmont Bridge Road. As the results of the new Bridge Road, it is anticipated the existing electrical including street lighting, telecommunication and gas services located on the northern side of the road reserve will be require to be adjusted and/or relocated. The new Bridge Road generally will tie back to existing road layout at both the intersection. This may be limited adjustments of the existing intersections at Wentworth Park Road and Wattle St, or may include re-profiling of the road for overland flow considerations, or adjusting pavement and kerb lines for site entrances and exits and bus drop off zones.

Existing services adjacent to Pyrmont Bridge Road are sshown in Figure 8-1 in the Appendix of this report.

2.5 Existing Structures

2.5.1 Fig Trees

The large Fig Trees that line the northern edge of Wentworth Park Road are important Heritage items to the City of Sydney. The civil works associated with Bridge Road accounts for the presence of the fig tree roots, by limiting the height to which bridge road is raised to that of the adjacent masonry wall. The roots therefore remain unaffected.

Figure 2-6 – View of Heritage Listed Figs Trees from Heritage Listed Viaduct

2.6 Traffic

The proposed site sits adjacent to some of the main arteries of Sydney, with significant volumes of traffic accessing the Western distributer and Harbour Bridge from Wattle St and Pyrmont Bridge Road.

Traffic studies have been undertaken to assess the impact of changing the access point of the markets from Bank St to Pyrmont Bridge Road on the main intersections at Wattle St and Wentworth Park Road.

Reference should be made to the TIA undertaken by ARUP for a full description of the impacts of the facility on the local and wider reaching network.

3 Standards

The following engineering standards have been used in the design of the Sydney Fish Markets:

National Construction Code (NCC), previously the Building Code of Australia

AS/NZS1170.0 – 2002	Structural Design Actions Part 0: General principles
AS/NZS1170.1 – 2002	Structural design actions Part 1: Permanent, imposed and other actions
AS/NZS1170.2 – 2002	Structural design actions Part 2: Wind actions
AS/NZS1170.4 – 2002	Structural design actions Part 4: Earthquake actions in Australia
AS/NZS 2890 – 2014	Parking facilities
AS 1314 – 2003	Pre-stressing anchorages
AS 1379 – 2007	Specification and supply of concrete
AS 2159 – 1995	Piling - Design and installation
AS 4100 – 2005	Steel structures
AS 3600 – 2009	Design of Concrete Structures
AS 5100 – 2017	Design of Bridge Structures
AS 3735 – 2001	Concrete Structures for Retaining Liquids
AS 4654 – 2012	Waterproofing membrane systems for exterior use - Above ground level
AS 4997 – 2005	Guidelines for the design of maritime structures
AS 3962 – 2001	Guidelines on the Design of Marinas
BS EN 1992-1 – 2004	Eurocode 2 Design of Concrete structure

The following guides will also be used for reference:

Water-resisting basement construction – a guide – UK CIRIA Guide

ICE (Institute of Consulting Engineers) - Reducing the Risk of Leaking Substructure

– A Clients Guide

4 Performance Criteria

Reference should be made to the project specification for a full description of the project requirements.

4.1 Design Life

The design life of the new Sydney Fish Markets facility is stated within the functional brief as 50 years.

Table 6.1 of AS4997 Design Life of Structures states that a design life of 50 years is appropriate for normal commercial structures, category 3.

TABLE 6.1
DESIGN LIFE OF STRUCTURES

Facility category	Type of facility	Design life (years)
1	Temporary works	5 or less
2	Small craft facility	25
3	Normal commercial structure	50
4	Special structure/residential	100

Table 4-1 – Design Life of Structures - AS4997.

4.2 Durability

4.2.1 Concrete Cover

The Sydney Fish Market (SFM) is designed considering the marine environment within which it is situated. Exposure and classification environments for each area are as per Table 4-2 below These are based on the requirements stated in AS3600 and AS4997.

Location	Surface & Exposure environment	Exposure Classification	Concrete strength (MPa)	Cover (mm)
Precast basement beams, slabs & walls (to AS3600)	Surfaces of maritime structures in water – In tidal splash zone	C2	50	60
In-situ basement slab and walls (to AS3600)	Surfaces of members in interior environments. Industrial buildings subject to repeat wetting and drying	B1	40	30
Above ground in-situ slabs (to AS3600)	Surfaces of members in above-ground exterior environments - Coastal and any climatic zone: Surfaces of members in interior environments. Industrial buildings subject to repeat wetting and drying Surfaces of members in interior environments. Fully enclosed, non residential	B2 B1 A2	40 40 40	45 30 20

Table 4-2 – Exposure and cover classification

4.2.2 Allowable Crack Widths

The crack widths nominated are to prevent water ingress in the basement structure. This will be augmented with the use of high performance membranes and potentially admixtures such as Xypex. In addition, the scheme will provide falls, localised sumps and drains in the event leakages through the basement waterproofing systems do occur.

Crack widths will be controlled by limiting the stress within the reinforcement under serviceability conditions in accordance with AS3735 - Concrete structures for retaining liquids.

The nominal limiting stress in steel reinforcement to limit cracking is 130 MPa assuming N20 bar is adopted in the concrete structure. A minimum reinforcement ratio of 0.8% is adopted to both precast and In-situ concrete structures to control cracking with the use of N20 steel bar, refer to Table 4-4.

Whilst Australian standards do not have a mechanism for calculating crack widths, the design of water retaining elements will also be undertaken in accordance with BS EN 1992-1 – 2004 Eurocode 2 Design of Concrete structure, that allows the maximum crack widths to be estimated.

Table 4-3 – Allowable crack widths indicates the maximum crack widths each area of the proposed facility will be designed to.

Location	Design Max. crack width (mm)
Water retaining structures – Precast & in-situ basement slabs & walls	0.2
In-situ slab – external & Auction Hall & areas subject to repeated wetting and drying	0.2
In-situ slab – internal	0.3

Table 4-3 – Allowable crack widths

Bar diameter (mm)	8-12	16	20	24	28
Stress limit (MPa)	150	140	130	120	110
Minimum reinforcement ratio	0.48	0.64	0.80	0.96	1.12

Table 4-4 – Bar stress limits & reinforcement ratios

4.3 Material Properties

Basic material properties for the most commonly used materials are provided below, which are used as the basis for derived material properties as required in appropriate design standards.

For concrete, the specific mix design of each section will be investigated further during detailed design phase, for example, the use of low shrinkage mixes for the hydrostatic slabs.

Material	Density in kg/m^3
Concrete (mass, reinforcement < 1.5%)	2400
Concrete (reinforcement ≥ 1.5%)	2480
Cementitious Structural Grout	2100
Steel	7850
Concrete Block	2400
Timber - GL17 Glulam	650

Table 4-5 – Material Densities

Material	Strength (MPa)
Concrete (f'c) – precast elements	50
Concrete (f'c) – internal structural elements	32
Concrete (f'c) – exposed concrete elements / columns	40
Concrete (f'c) – interior/secondary elements	32
Concrete (f'c) – foundations	32
Concrete (f'c) – blinding concrete	15
Reinforcement (fsy) – plain to AS/NZS 4671 (250N)	250
Reinforcement (fsy) – deformed	500
Reinforcement (fsy) – wire fabric to AS/NZS 4671 (500L)	450
Prestressing (fp) – 12.7 mm, 7 wire super strand to AS 1311	1840
Prestressing (fp) – 15.2 mm, 7 wire super strand to AS 1311	1750
Timber - GL17 Glulam	33

Table 4-6 – Material Strengths

Material	Modulus of Elasticity (MPa)
Concrete – 50 MPa	34,800
Concrete – 40 MPa	32,800
Concrete – 32 MPa	30,100
Concrete – 15 MPa	19,580
Reinforcement	200,000
Pre-stressing	195,000
Structural Steel	200,000
Timber - GL17 Glulam	16,700

Table 4-7 – Material Modulus of Elasticity

Material	Poisson's Ratio
Concrete	0.2
Steel	0.25

Table 4-8 – Material Poisson's Ratio

Material	Coefficient of Thermal Expansion ($x\ 10^{-6}$ / ^oC)
Concrete	11.0
Reinforcement	12.0
Structural Steel	11.7
Timber - GL17 Glulam	5.0

Table 4-9 – Material Coefficient of Thermal Expansion

4.3.1 Concrete

Concrete shall comply with the requirements of AS1379. The average compressive strength at the completion of curing of not less than 75% of the specified concrete strength. Other material requirements shall comply with AS3735 Clause 4.3.

4.3.2 Reinforced Steel

Reinforced steel bar shall comply with the requirement of AS3600 concrete structure Clause 3.2. Yield strength of 500 MPa for reinforcement is adopted in the design.

Where galvanised reinforcement is adopted, galvanizing shall be as per AS3735 Cl 5.3.

4.3.3 Structural Steel

A variety of steel grades and section types will be used in the design of the new facility. A summary of standards and grades for each type is shown in Table 4-10 – Typical Steel Grades.

Type of steel	Australian Standard	Grade
Universal beams & columns, parallel flange channels & large angles	AS/NZS 3679.1	300
Welded sections	AS/NZS 3679.2	300
Hot milled plates, flats, floor plates, Small angles and slabs	AS/NZS 3678	250
Hollow sections - square & rectangular	AS 1163	C350 or C450 according to Section designation
Circular hollow sections	AS 1163	C350 or C250 according to Section designation
Cold formed purlins and girts	AS 1397	G450 Z350

Table 4-10 – Typical Steel Grades

All workmanship and material shall be in accordance with AS4100. Fabrication shall be carried out in accordance with section 15 of AS4100. All welding shall comply with AS 1554.

4.3.4 Stainless Steel

Stainless steel cast in angles are proposed for the basement precast structure to provide a watertight barrier prior to laying the membrane and in-situ slab.

Marine grade SS Grade 316 (L) is proposed for these angles as this grade is suitable for heavy gauge welding. It should be noted it is critical that the welding material should match the base grade.

It should also be noted that any granules or powder of carbon steel should not contaminate the stainless steel as it can be a corrosion initiator. The use of non-carbon reinforcing tying the precast to the in-situ slab can help to mitigate this risk. Composite reinforcing systems such as V-Rod are being investigated.

The use of lean duplex (LDX) stainless steel is also being investigated for the basement slabs to achieve the required design life.

4.4 Movements & Tolerances

4.4.1 Vertical Deflection Limits

Deflections under serviceability loads will be limited with due regard to the type of structure under consideration and the impact these deflections will have on supported elements, line of sight, finishes (brittle and non-brittle) and perceptible movement.

The deflection limits proposed in AS/NZS1170.0 Table C1 have been adopted for design as a guideline.

Tolerances for construction inaccuracies and vertical deflections on clearance heights will be accounted for in the design, specifically in areas of constrained clearances such as the basement car park and loading dock.

4.4.2 Horizontal Deflection Limits

Lateral movements under a service wind will be typically limited to H/500.

Inter storey drifts under earthquake loads will be in accordance with AS1170.4.

The structure and associated connections supporting facades and moveable partitions will take account of lateral movements under wind and earthquake.

The interaction between adjacent structures, such as the wharf structures and the main facility will be investigated under lateral actions, with due account taken for differential movements with articulation provided as required.

4.5 Differential Settlement

All structures will be designed so that settlement and heave during all stages of construction and throughout the design life of the structure are kept to within acceptable limits.

4.6 Thermal Movements

Movements due to changes in temperature will be considered during the detailed design phase using the thermal coefficients stated in Tale 4-9.

The sensitivity of each area of the structure to changes in temperature and their impact on adjoining elements will be considered in turn.

4.7 Joints

The use and location of temporary and permanent joints will be investigated during detailed design phase. It is expected that temporary pour strips will be provided in the in-situ basement and RL3.1 slab to allow it to shrink unrestrained and minimise the risk of early age cracking.

Permanent joints in the RL9.0 slab are likely to be provided with the joints running through into the finishes and facades.

Joints within the roof structure will be determined as the design progresses dependant on the materials adopted and the movements expected.

4.8 Fire Resistance

The fire resistance levels for structural elements will be governed by the requirements of the certifying authority and any fire engineered solutions. Reference should be made to the DLA BCA Report.

For concrete elements, fire resistance will typically be achieved by providing the required cover to reinforcement. For steel elements, either protection measures such as fire board, intumescent paint or sprinklers will be assessed. For timber elements, either the inherent fire capacity or systems such as sprinklers will be used following consultation with the BCA Consultant and the fire brigade.

4.9 Progressive Collapse

The structures will be designed to ensure that the failure of a single element will not cause a catastrophic and continued collapse. This will typically be addressed by ensuring the tie requirements specified within the relevant codes are met, with reinforcement or steel connections detailed accordingly.

5 Loadings

5.1 Gravity Loading

5.1.1 Dead Loads

Self-weights have been accounted for in the design by adopting the material densities as shown in Table 4-5.

Where falls within concrete slabs are formed as part of the cast in-situ slab, the additional weight has been accounted for in the slab thickness. Where falls are created via an in-situ topping, the weight has been accounted for in the superimposed dead loads.

5.1.2 Construction loads

An estimation of the expected construction loads will be made and compared to the design live loads. Crane locations, storage of materials, construction traffic vehicles will be considered.

5.2 Barriers and Handrails

Barriers and handrails will be designed for the loads as specified in Table 3.3 of AS1170.1. Table 5-4 summarises the various areas and barrier types that are expected to be required for Sydney Fish Markets.

Area	Design Loading	Top Edge Horizontal Load (kN/m)
Areas subject to overcrowding – (Inc. feature stairs)	C5	3.0
Areas with tables or fixed seating adjacent balustrades	C1/C2	1.5
Areas not subject to overcrowding	C3	0.75
Pedestrian zones in car park	F/G	1.5

Table 5-1 – Barrier Loads

5.3 Water Pressures

5.3.1 Current Sea Level Pressures

Water pressure for 2017 design is based on the current mean sea level plus high tide and high wave. Water levels are taken from the IPCC Sea Level Rise Scenarios Chart for Sydney, which is detailed in appendix 1, Figure 8-2 – (values assume full reflection).

- Current sea level – 0.000 AHD
- Mean High Water Springs (High Tide) – 0.620 AHD
- Highest Astronomical Tide (HAT) - 1.100 AHD
- Lowest Astronomical Tide (LAT) - -0.900 AHD
- Highest recorded Tide Sydney 1.500 AHD
- Expected peak wave action in Bay - 0.600m
- Design addition of half the wave height 0.300m
- Peak transient highwater level 2017 - 1.220 AHD
- Peak design water level 2017 1.800 AHD

Water pressures for 2017 design scenario will therefore be calculated based on the relative depth of water from 1.220 AHD to the soffit of the structure.

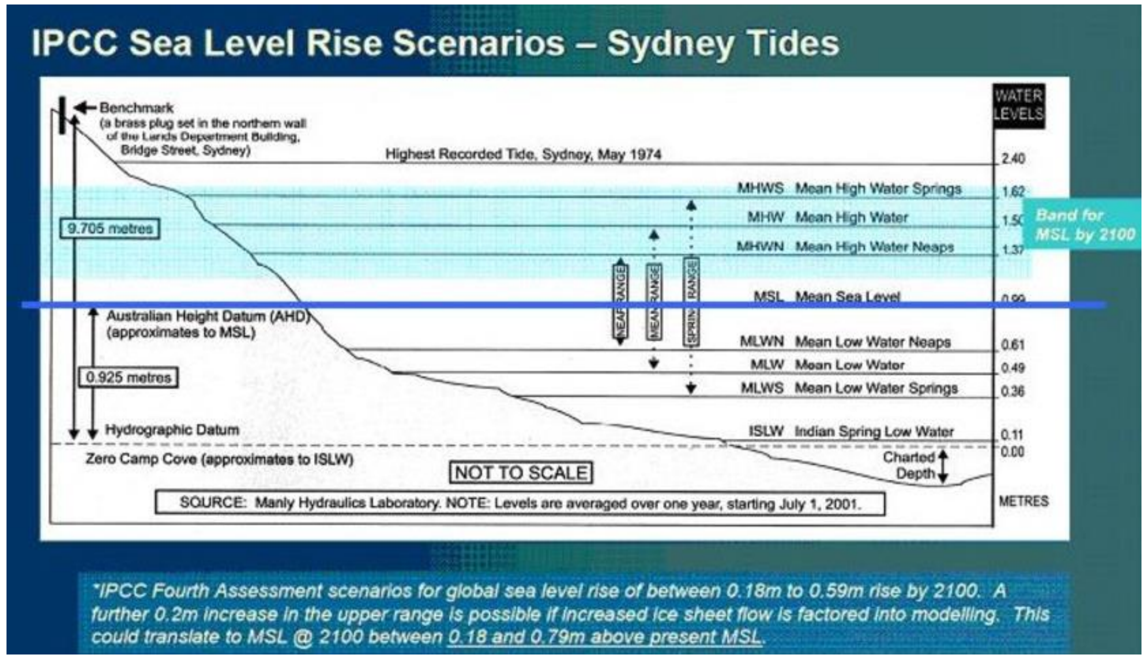


Figure 5-1 – IPCC Sea Level Rise Scenarios – Sydney Tides

5.3.2 Future Sea Level Pressures

Water pressure for the full 50 year design is based on the current mean sea level plus expected sea level rise, plus high tide and high wave, (values assumes full reflection). The initial value presented is for the serviceability design. This is based on a 50 year sea level rise being applied the maximum recorded tide in Sydney:

- Highest recorded Tide Sydney 1.500 AHD
- 50 year sea level rise 0.400m
- Expected peak wave action in Bay - 0.600m
- Design addition of half the wave height 0.300m
- Peak 50 year design highwater level 2.200 AHD

For the ultimate design case, the scenario the structure is designed to resist is based on the relative level of the surrounding flood plains.

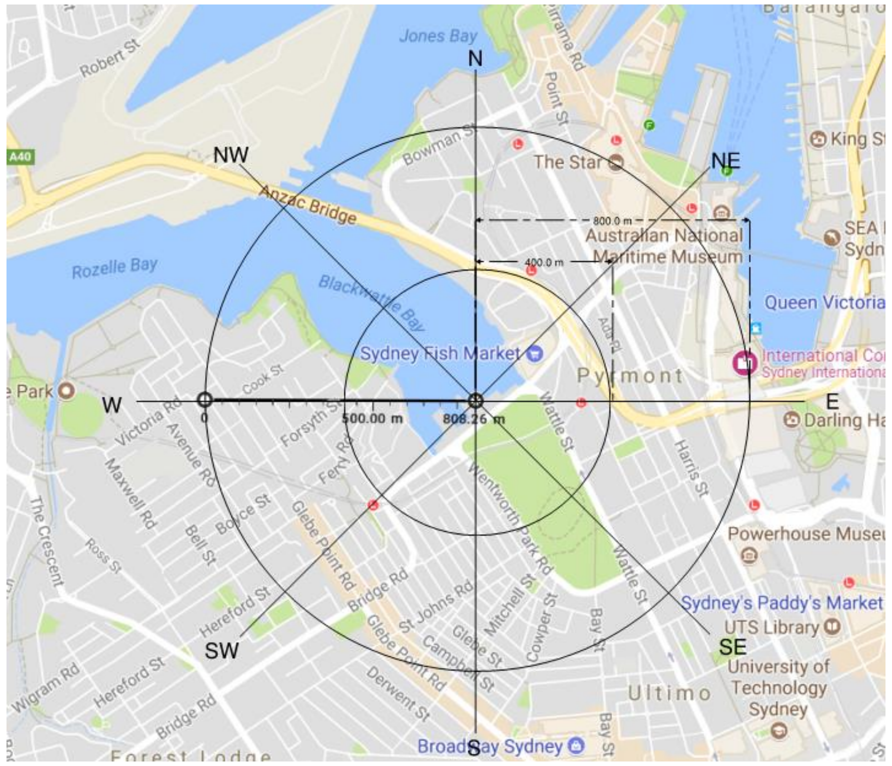
- Level of flood plain 2.200 AHD
- Depth of floodwater 0.300m
- Top of floodwater level 2.500 AHD
- Design ultimate load factor 1.2

Therefore, for serviceability design, a level of 2.200mAHD has been utilised. For the ultimate limit state design, it is assumed the surrounding land has been overtopped and thus this level of 2.500m AHD is assumed with an ultimate load factor of 1.2.

5.4 Wind Loads

Terrain categories vary from the site depending on wind direction. Open water and parkland are present from the NW and SE directions, however, given the height of the development, ~ 20m, and the presence of TC3 and TC4 within the terrain development length and in all other directions, a terrain category of 2.5 has been adopted for all directions at this stage.

This will be refined during detailed design phase for the design of the overall stability and individual elements such as the façade support structure and roof.



Region	A2
Structural Importance Level - BCA – part B1	3
$V_{r,Ult}$	46 m/s
$V_{r,Serv}$	37 m/s
Terrain Category (20m building height)	2.5
Terrain height multiplier Mz Cat	1.01
Shielding Multiplier Ms	1
Direction Multiplier Md	1
Topographic Multiplier Mt	1
Hill Shape Multiplier Mh	1
q (uls) (kPa)	1.30
q (sls) (kPa)	0.84

Table 5-2 – Wind Loads

5.5 Seismic Loads

The structure sits within the bay on steel piles driven into the rock layer. Water depths are approximately 2-10m deep. As per Figure 2-1 – Typical Subsurface Conditions, immediately below the water is a layer of fill over marine sediments and clay over sand over rock. The structure has been designed as a braced frame with raking piles socketed in the rock taking the lateral load. Given the nature of the fill over the rock, for the purposes of seismic design the fill is ignored and the structure designed with the piles modelled as columns socketed into sandstone. For this reason, a site soil sub class of B_e has been chosen.

Although AS1170.4 designates an EDC of II, a full dynamic analysis of the structure will be undertaken at detailed design stage in accordance with EDC III.

Structural Importance Level - BCA – part B1	3
Probability Factor kp	1.3
Hazard Factor Z	0.08
Site sub-soil class	B_e
kpZ	<0.17
Structure Height	<50m (relative to rock level)
Earthquake Design Category	II

Table 5-3 – Seismic Loads

5.6 Earth Pressure

There is nominal interaction from earth pressures from the existing sea wall that may eventually bear against the side of basement structure following failure of the sea wall over the design life of the facility. The lower ground floor slab typically spans over the top of the existing sea wall, therefore nominal surcharge loads will be applied, refer to Figure 6-5 – Typical section through proposed & existing sea wall.

The magnitude of these loads are not significant compared to the seismic and wind lateral loads imposed on the structure.

5.7 Thermal Loads

Thermal loads will be considered as part of the detailed design phase. Appropriate reinforcement will be provided in the concrete elements together with the necessary allowance for movement and tolerance within the steel connetions.

6 Structural Scheme

6.1 Introduction

The following section outlines the proposed scheme for the construction of the foundations, basement, sea wall, superstructure, lateral stability system and roof.

A single story basement is positioned between mean to low tide level to balance operational requirements including number of car parks & accessibility, site constraints including the maximum height of the facility in relation to adjacent heritage classified fig trees and structural constraints such as buoyancy. Over the basement sits the ground level operational zone, with the retail area at the level above. Discrete areas of mezzanine are provided over that retail zone, with a roof canopy covering the entire floor plate. A typical section is shown in Figure 6-1.

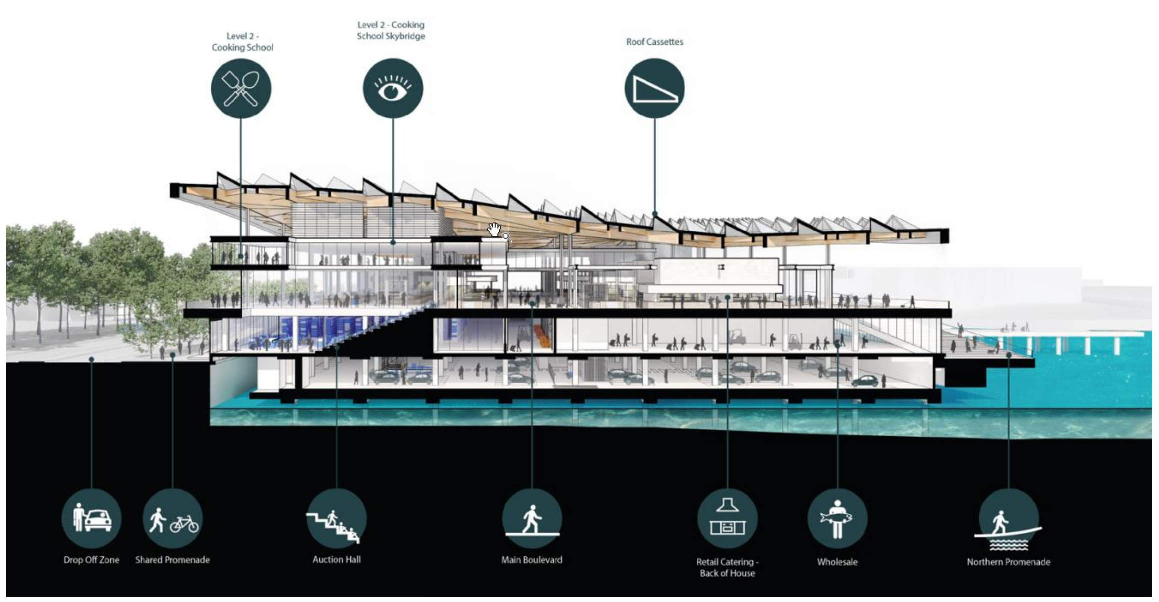


Figure 6-1 – Typical cross sectionional perspective through facility

6.2 Temporary Sheet Piled Wall

A temporary steel sheet pile wall is to be constructed to allow the construction of the basement to proceed unimpeded by water levels. The installation of the sheet pile wall can be done in conjunction with the installation of the main building piles.

The reference design of the sheet pile wall is indicated in Figure 6.2. Sheet piles are driven to rock to achieve cut off before props and wailer beams are installed to provide the required lateral resistance. A number of construction methods for the sheet pile wall have been investigated, including the use of a Giken silent piling technology. The exact method to be adopted will be driven by the marine contractor and their method to achieve cut off to allow dewatering of the coffer dam once complete.

A combination of raking and cantilevered props have been adopted based on the underlying soil profile.

Where both the overburden and rock is shallow, large diameter steel piles bored into the rock cantilever to provide restraint. Where the rock and overburden is deep, raking props are adopted, with the corresponding tension force developed in the sheet pile wall resisted by the friction between the sheet piles and the overburden and rock.

To the southern boundary, the sheet piles are driven from land behind the existing sea wall as required to achieve the necessary cut off.

Once the sheet pile wall is complete, the site is dewatered to a level of -2.3 AHD to allow the building steel piles to be cut to the required height and the precast installed.

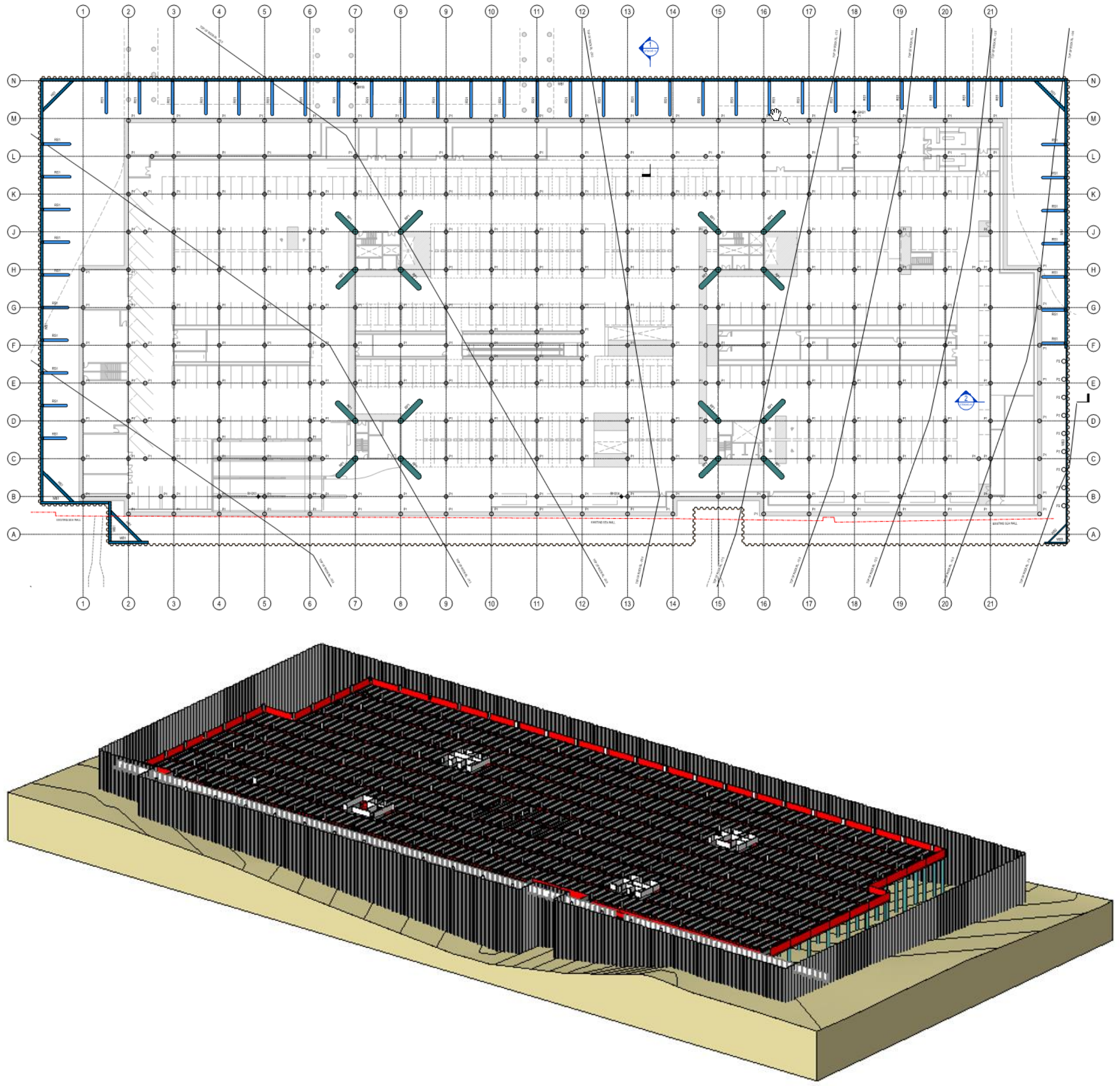


Figure 6-2 – Plan & 3D view showing extent of sheet pile wall

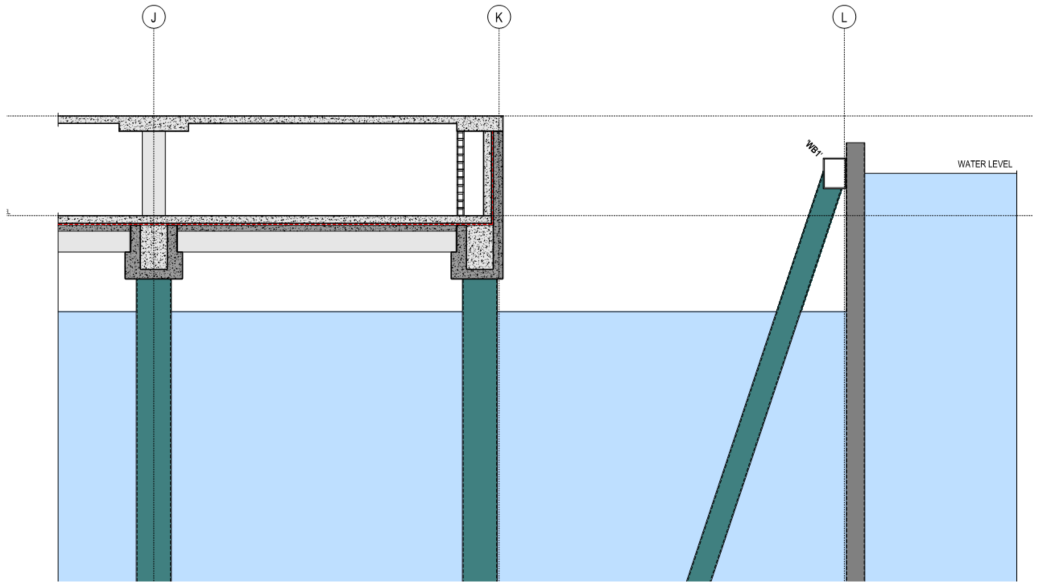


Figure 6-3 –Typical section of sheet pile wall

Disturbance to the sea bed will be minimised during removal of the sheet pile wall and the piles associated with the existing wharf. A methodology and mitigation strategy will be developed during the detailed design phase.

6.3 Foundations

The facility is located within Blackwattle Bay. The geotechnical conditions of the site from the existing boreholes are fill, over marine sediments, over clays and sandstone, with the sandstone located between 5 and 20m below 0.0 AHD, refer to Figure 2-1 – Typical Subsurface Conditions.

6.3.1 Piles

The lowest basement level is just below mean sea level. Uplift pressures are therefore driven by rise in sea level caused by a combination of tides, wave action and future sea level rise. As discussed in section 5.3 Water Pressures, it is anticipated this would be approximately 2.8m, equivalent to 28kPa of uplift approximately equivalent to the self-weight of the basement, ground and retail structure.

Given this represents an ultimate condition, and with the additional weight from the upper mezzanine levels and roof, there will not be any residual uplift on the structure in the permanent serviceability case, with the exception of columns with transfers over.

In the temporary case, the hydrostatic uplift pressure will be greater than the self-weight of the precast structure. Whilst the piles have a tension capacity, it would be uneconomical to design the piles for the full uplift pressure, and thus it is assumed that basement and ground in-situ slabs will be installed prior to the stopping of dewatering works.

The foundations will comprise steel CHS piles driven to a specified set and minimum penetration into Class III sandstone. The initial piles together with a sample would be tested with CAPWAP to check end bearing and skin friction capacity.

Following dewatering of the coffer dam, the piles will be cut to the correct level, with a capping plate fixed to accept the precast beams that may be fixed into place via a cast in plate welded to the top of the pile.

Raking piles are proposed to transmit the lateral forces from wind and earthquake actions to the rock. These are located discretely under the building cores and against the temporary cofferdam to provide the necessary lateral resistance. Tension loads may be experienced in the ultimate earthquake case, the magnitude of these loads will be determined during detailed design phase, with the pile size and embedment adjusted as necessary.

All steel piles will require a protective coating against corrosion, with a 1000-micron dry film thickness epoxy finish currently envisaged along the full length of the pile. Cathodic protection in the form of zinc anodes clamped to the piles would also be provided together with a denso tape type wrapping applied above and below the water line in the tidal and splash zone.

6.3.2 Typical piles and pile caps

Figure 6-4 – Typical pile cap detail shows the typical primary beam to pile connection. It is formed with the introduction of a fabricated pile cap that bears onto the pile that has been cut to the correct level. The pile cap ensures the precast element has adequate bearing on the pile and allows for sufficient tolerance in the pile and precast beam installation.

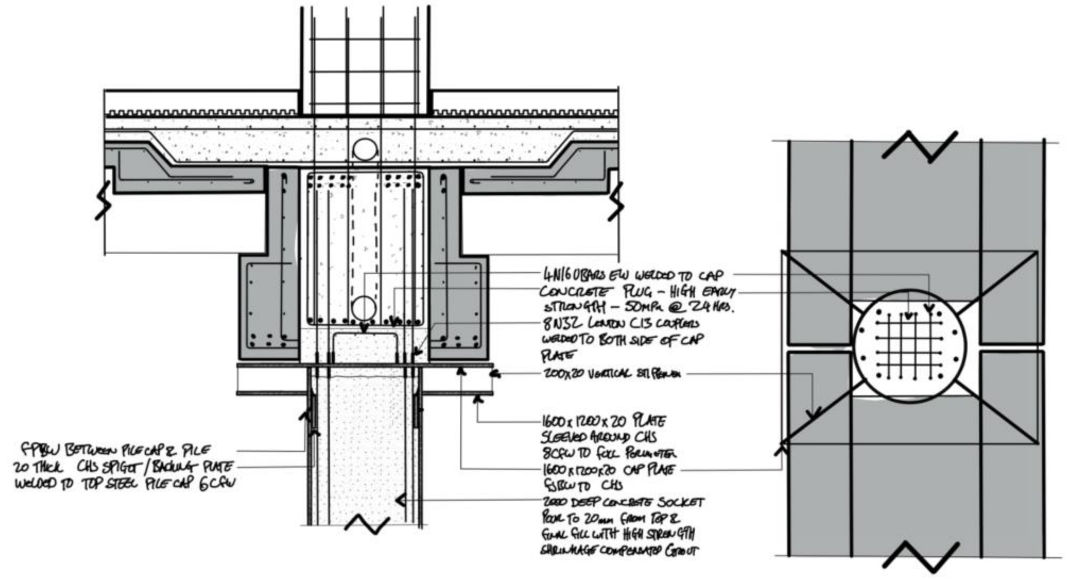


Figure 6-4 – Typical pile cap detail

6.4 Sea wall

An existing sea wall runs along the boundary between Pyrmont bridge road and Blackwattle Bay as shown in Figure 8-3 in the Appendix of this report.

Several options for the construction of a new sea wall were explored during concept phase, considering a new wall either in-front, behind or in line with the existing.

Key constraints considered during the design process included

- Existing structure type and method of retention
- Implications of failure of existing wall on adjacent structures
- Ability of existing and proposed wall to resist vertical and lateral loads
- Residual design life of existing structure
- Cost to retain or replace existing wall
- In ground obstructions (dead man anchors)
- Location of known and unknown existing services
- Geotechnical conditions
- Contaminated land
- Relative water levels current and future
- Vermin nuisance

It was concluded that:

- The existing wall is unlikely to have significant residual capacity and should not be relied upon to provide ongoing support for the life of the facility.
- The new wall should be separated from the new facility and not be required to resist lateral and vertical loads as this would require it to be piled due to the poor ground conditions.
- Lateral movements of the wall should only be sensitive to the soil it is retaining
- Any rock revetment should finish at max 0.0 AHD to mitigate the risk of vermin feeding on food scraps lodged within the rocks
- The amount of soil removal and associated contaminated land treatment should be minimised
- The wall should be designed for a full head of water in conjunction with low tide.
- The wall should be kept clear of in ground obstruction and services where possible
- The wall and design should take due account of the existing stormwater culverts.

In June 2018, a condition assessment of the existing sea wall was undertaken by Royal Haskoning DHV and detailed within report PA1518M&AR001F01. Reference should be made to that report for a more detailed understanding of the form and existing condition of the wall. In summary the report highlighted that the majority of the wall is of a Monier type construction, i.e. precast L-shaped gravity wall sitting on a rock revetment. The condition of the wall is poor and not considered adequate for a further 50 year design life.

Proposed Sea Wall remediation

The intent is to place the new facility directly infront of the existing sea wall to minimise the amount of remediation works required, wall as shown in Figure 6-5. To prevent undermining of the existing retaining wall revetment, a shallow precast beam section is proposed along this perimeter.

Where the existing sea wall is not covered by the new facility, it is proposed a new rock revetment wall be placed infront with the stormwater culvert extended as necessary, as indicated by Royal Haskoning DHV in the document PA1518-MA-Revetment Concept_20180718, included in Appendix D.

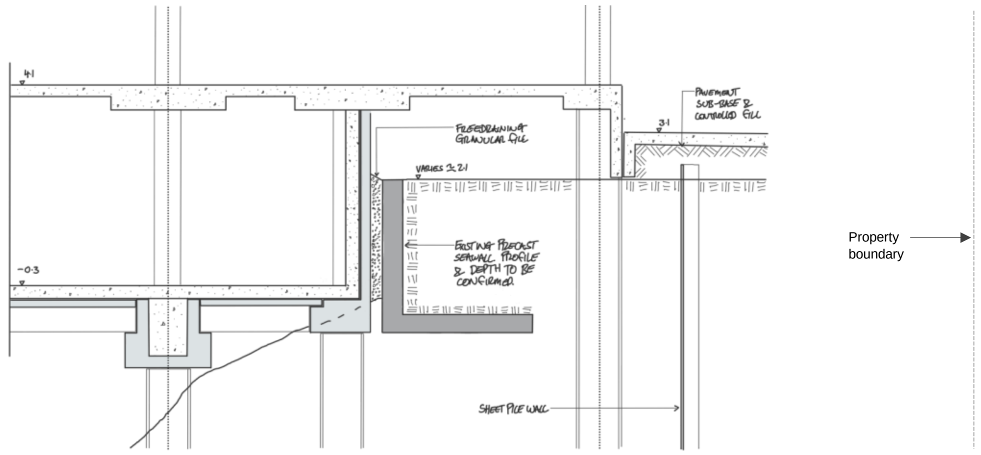


Figure 6-5 – Typical section through proposed & existing sea wall

The existing stormwater culverts will be locally given sufficient space to discharge into the bay (see Figure 6-6) and the new basement wall can be constructed hard up against the existing sea wall, effectively becoming the new sea wall. A baffle will be provided infront of the stormwater pipe to collect any discharge from the pipe. An access panel to this baffle will be provided from groud level via a removeable preast section. The gap between the two can be filled up with gravel infill, with the precast swing slab that supports ground floor entrance area spanning between a precast corbel on the basement wall and a ground beam (potentially supported off piles pending geotechnical information).

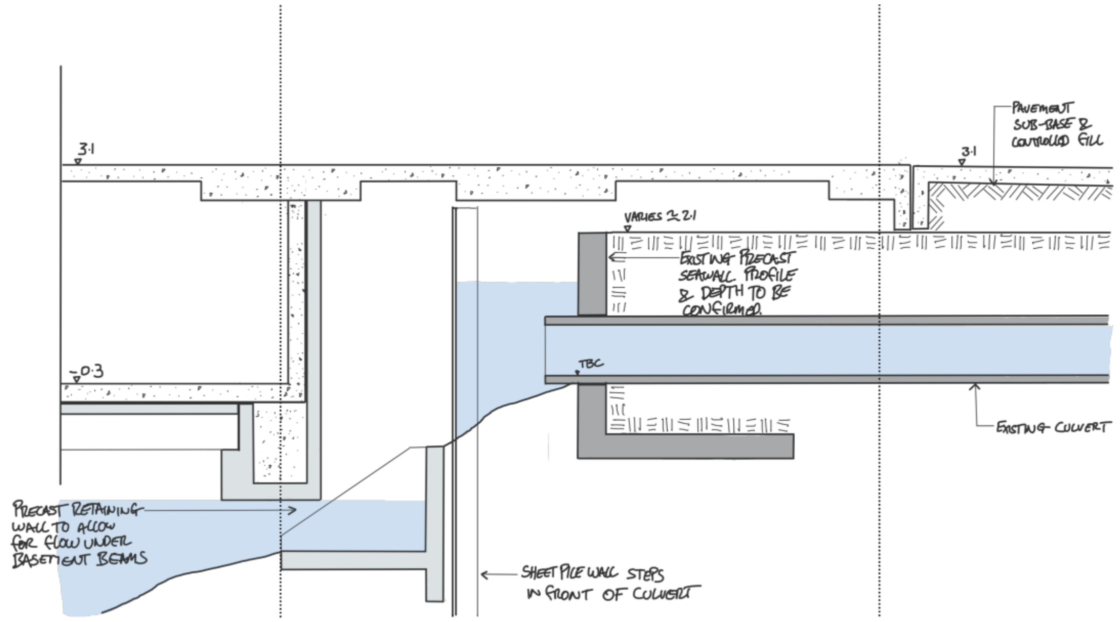


Figure 6-6 – Typical Section Through Culvert that discharges centrally into the facility

6.5 Sediment Adjustment

Two sources of information have been used to assess the volume of silt/fill that is required to be adjusted in order to install the basement precast structure and prevent disturbance of flow at stormwater outlets. The first of which is a hydrographic survey that gives a 3D plot of the seabed surface. However, the reliability of this hydrographic survey is questionable in some areas as it indicates very low levels at the base of the Monier Trestle wall. These potential errors may be due to the difficulties in performing the survey beneath the existing wharf structure. The second source is a historical detail of a rock revetment, see Figure 6-7. For the purpose of this analysis the sea bed level has been taken as the maximum of the hydrographic survey and the level of the rock revetment. The regions identified in the hydrographic survey that are above the designated rock revetment level are assumed to be a build of up silt.

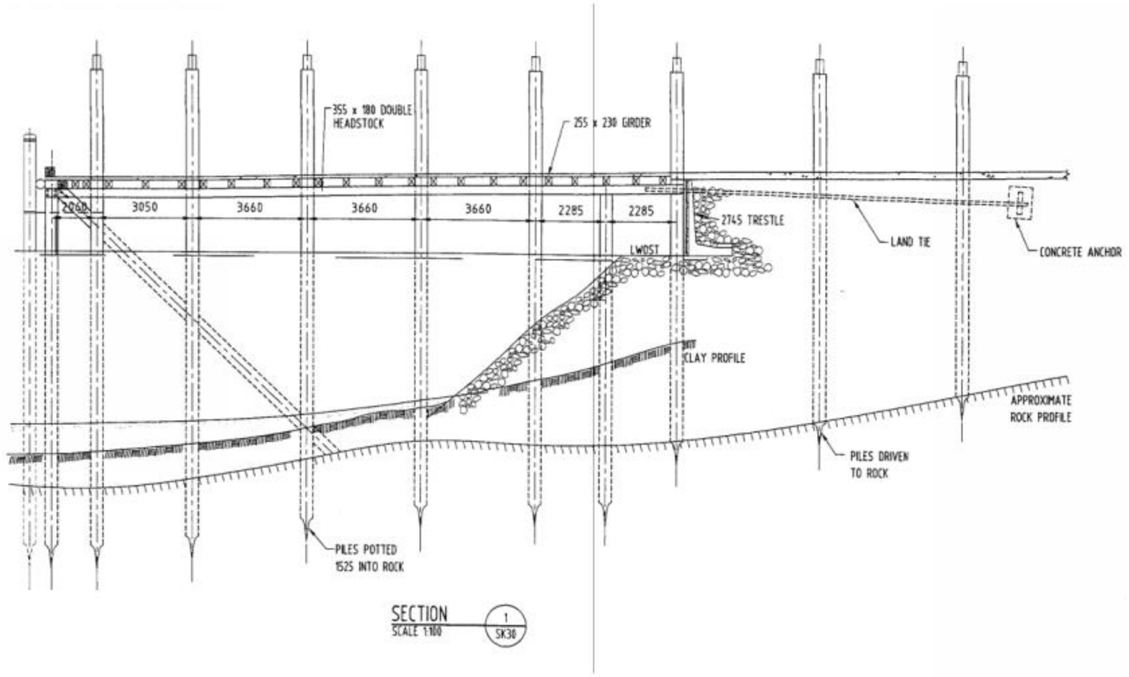


Figure 6-7 – Historic Rock revetment detail

A gap of at least 1m will be provided under the structure to allow the hydraulic performance of the stormwater culvert to remain unaffected. A detailed investigation of the hydraulic performance of the culvert with this revised arrangement has been undertaken by Cardno.

To provide this 1m clearance, approximately 55m³ of silt and 335m³ of rock revetment requires removal / relocating, see Figure 6-8. Along the remaining length a buffer zone of 500mm will be required to ensure the basement precast can be installed. This equates to the relocation of 135m³ of rock revetment. Therefore the total volume of silt to be adjusted is 55m³ and the total volume of rock is 470m³.

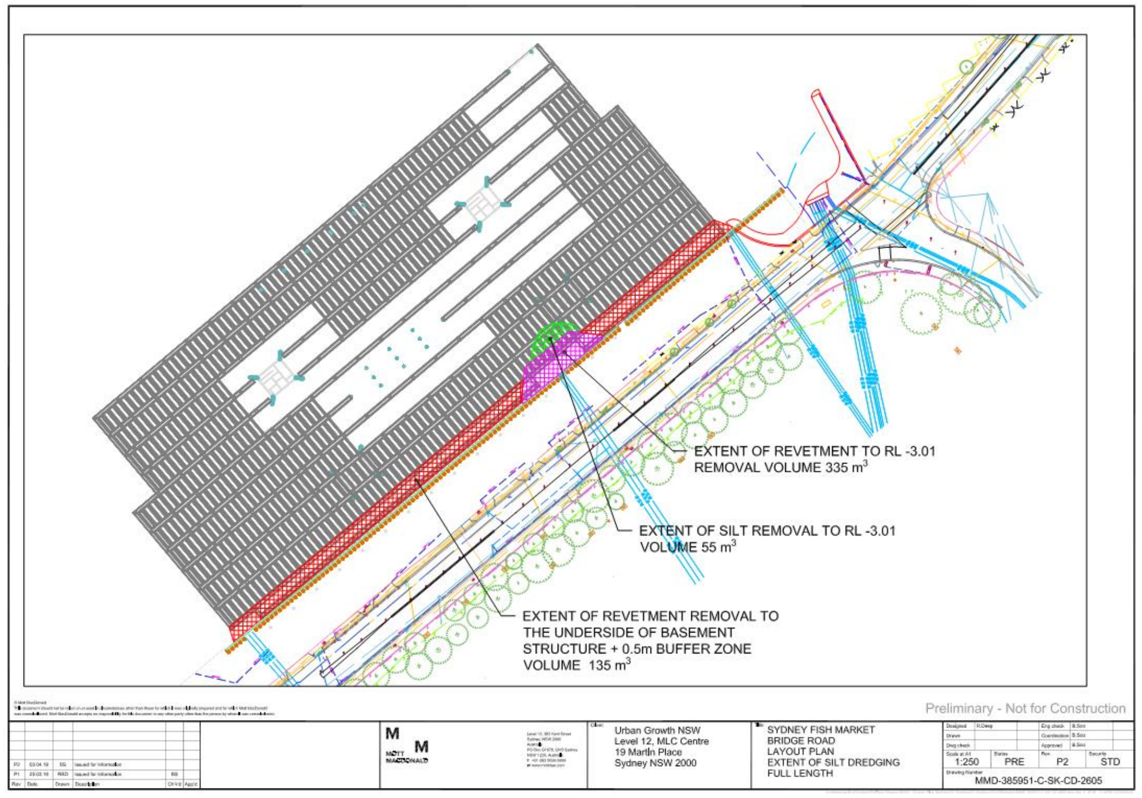


Figure 6-8 – Approximate extent of silt dredging and revetment adjustment

The likely construction methodology would be the use of a long armed excavator mounted on a barge, scraping the material along the sea bed to an adjacent area. The use of a sediment curtain would be a minimum requirement to control the turbidity, together with some water quality modelling outside of the curtain to ensure it is provide the required control.

Again, the uncertainty surrounding the material being adjusted must be considered in any future analysis. It is recommended to perform a revised survey to confirm these volumes following demolition of the wharf structure above.

6.6 Basement

The basement level structure is typically fully submerged below the water line. The SSL of the basement is -0.3AHD, with low & high tides typically ranging from -0.5 to +0.5 AHD.

The basement structure is formed using highly repetitive precast elements comprising of primary u-shaped culvert beams that span between the piles and secondary T-beams that span onto the primaries. **Figure 6-9 – Basement precast types** gives an indication of the degree of repition.

An insitu topping is then cast directly onto the precast, (precast is formed with a rough broomed finish), this in conjunction with the precast forms the primary basement waterproofing layer. At the precast joints, hydrophilic strips will be provided to mitigate the risk of water tracking along the joint between precast and insitu.

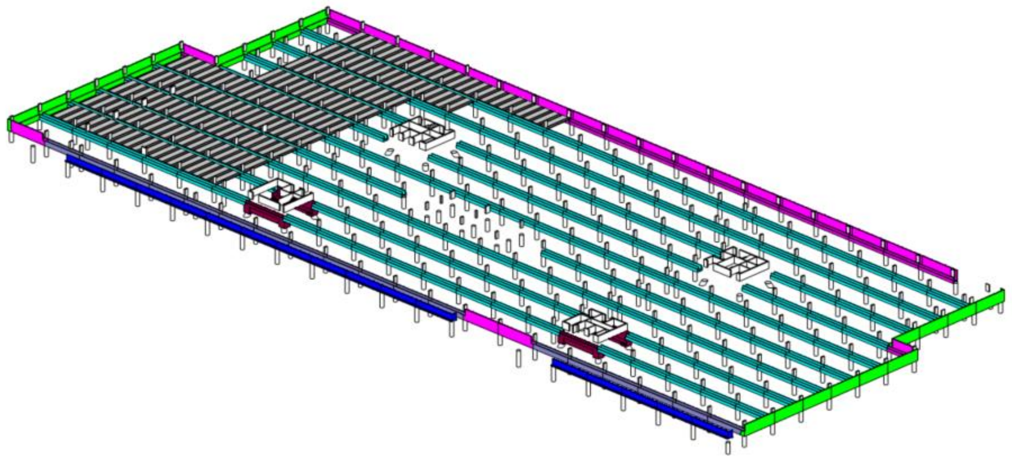


Figure 6-9 – Basement precast types

Above the insitu layer, a 20mm cavidrain system with a wearing slab is laid to prevent any leakage that may occur over time becoming visible. Figure 6-10 shows a typical section through the primary and secondary beams.

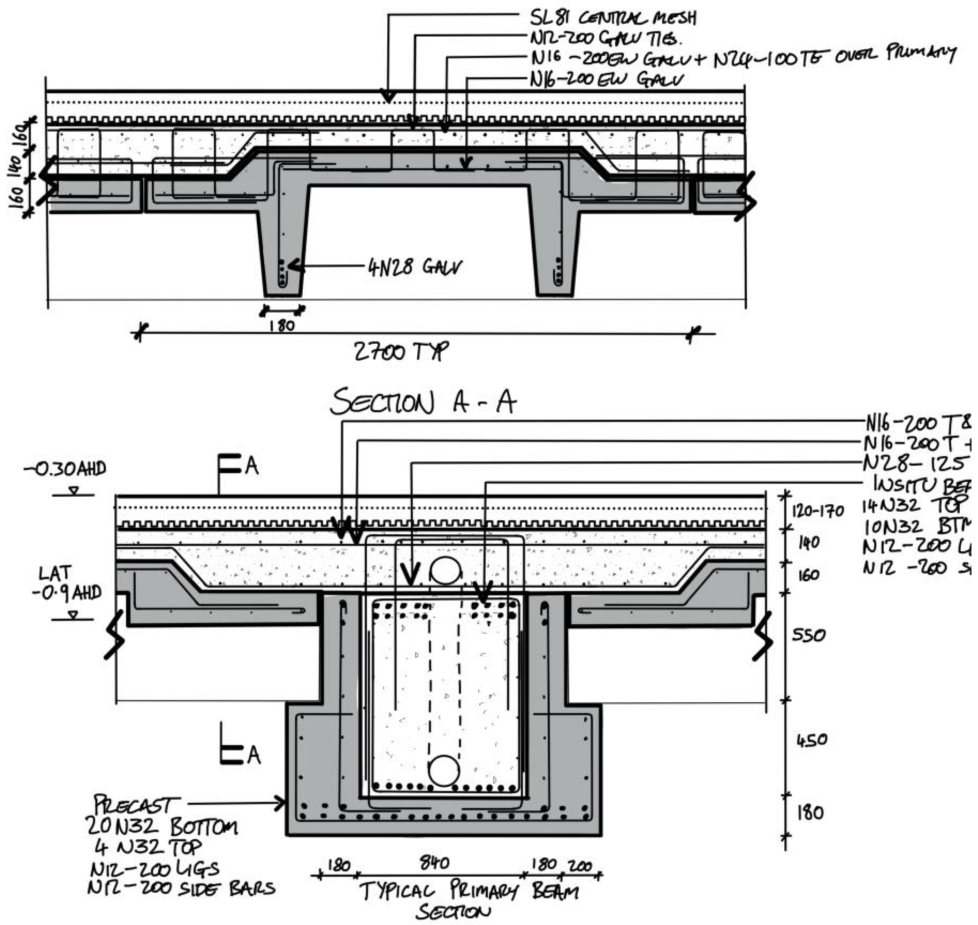


Figure 6-10 – Basement precast details

6.6.1 Basement pits

A large number of pits are present in the basement structure in which various pumps, sumps, lift pits and other plant is situtated as required for a facility of this type. Due to the nature of the basement construction, each of the pits require an alternate method of support rather than just an additional excavation that would be typical of most buildings.

Whereever possible, lift pits, pits and hoists have been located in the four main building cores since the basement level has been reduced over the entire grid in these locations. This helps to minimise the number of additional local reductions and associated complexity. Elsewhere, the pit types have been standardised wherever possible to limit the number of bespoke precast elements. Figure 6-12 - Bespoke precast pit shows one of these precast pits.

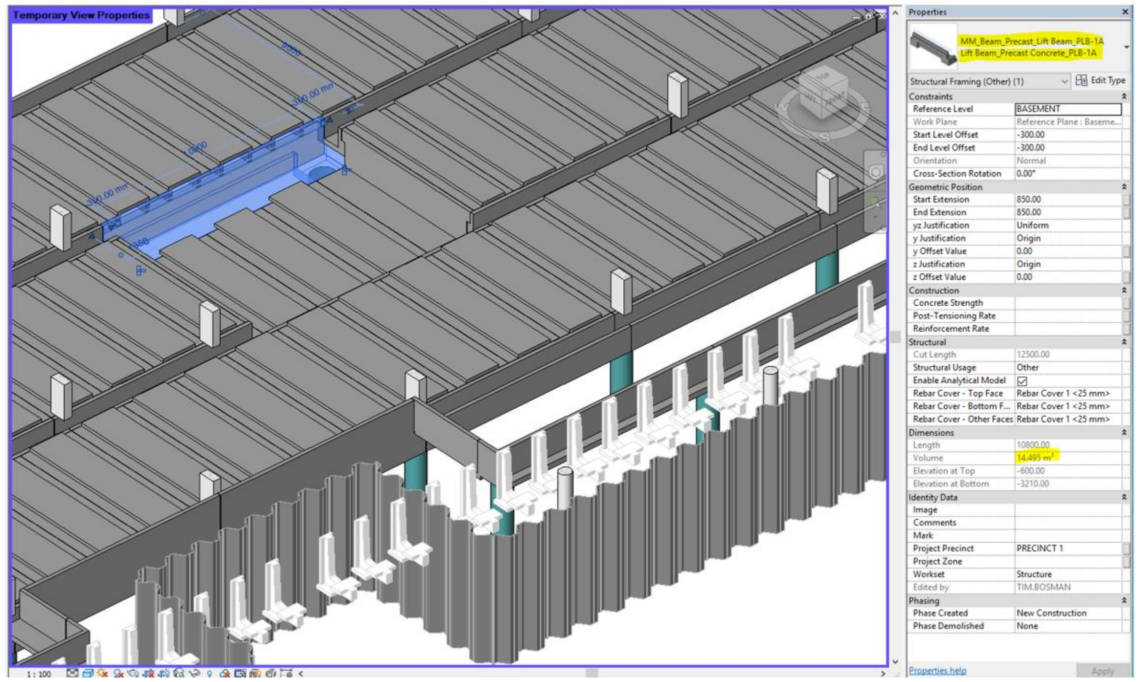


Figure 6-11 – Bespoke precast pit

6.7 Lower & Upper Ground

The lower and upper ground floor structures are comprised of post tensioned banded slabs. Bands are typically 2400mm wide ranging from ~500-600mm in dept and the slabs typically 200mm.

Transfer structures have been limited wherever possible to maximise the efficiency of the structure. They are present only above the loading dock to allow sufficient clearance for truck turning paths and in discrete areas where mezzanine columns do not align.

Column sizes have been standardised to simplify formwork and maximise construction efficiency. Columns are typically square within the operational zone and circular where exposed to view.

6.8 Feature stairs

The feature stairs to the north, south, east and west provide a key architectural feature to the facility as well as vertical access and egress to the main retail level at upper ground. A number of options for the support structure were developed during the design phase, with a significant focus on constructability whilst maintaining the architectural intent. The design is currently for a Steel and bondek system on the North, West and East stairs, and a precast concrete system on the South stairs.

All stairs require a degree of precambering of the steel elements to keep dead and superimposed deflections within allowable limits. The ability to shim and raise specific beams has also been factored into the design to allow for construction tolerances and ensure targt RL's can be achieved.

A consistent feature of the stairs is the spandrel that runs continuously around the perimeter of the building. Structure depths and details have therefore been carefully controlled in this area to maintain this approach.

Due to their nature, a dynamic footfall analysis will been undertaken for each stair to ensure it complies with the limits. Fire protection will be provided in accordance with the fire rating requirements.

6.9 Mezzanine

The mezzanine structure comprises composite metal decking slab on steel beams. This has been driven by the irregular nature of the slab outline and the associated lack of continuity, refer to Figure 6-12 & Figure 6-13 – Mezzaine steel . Studs are shot fired to the top of the beams after the metal decking is laid.

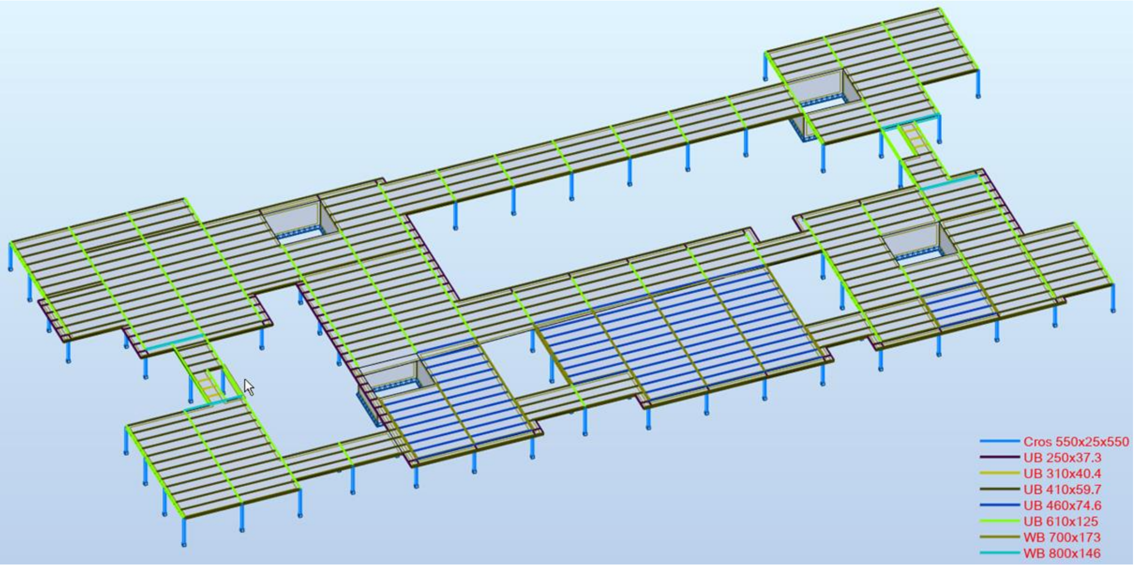


Figure 6-12 – Mezzaine steel layout

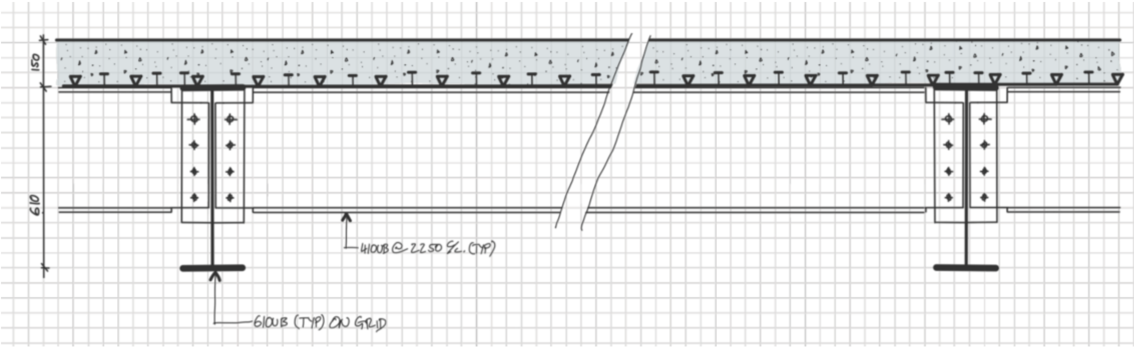


Figure 6-13 – Mezzaine steel typical section

6.10 Stability system

Lateral stability to the facility is provided by the four concrete cores that extend up to the roof which are in turn supported on raking piles, highlighted in Figure 6-14 – Building Stability Cores. Significant tie forces are developed in the raking pile to lift core connection. The detailing in this area together with finalising the magnitude of the tension forces within the piles will be developed during detailed design phase.

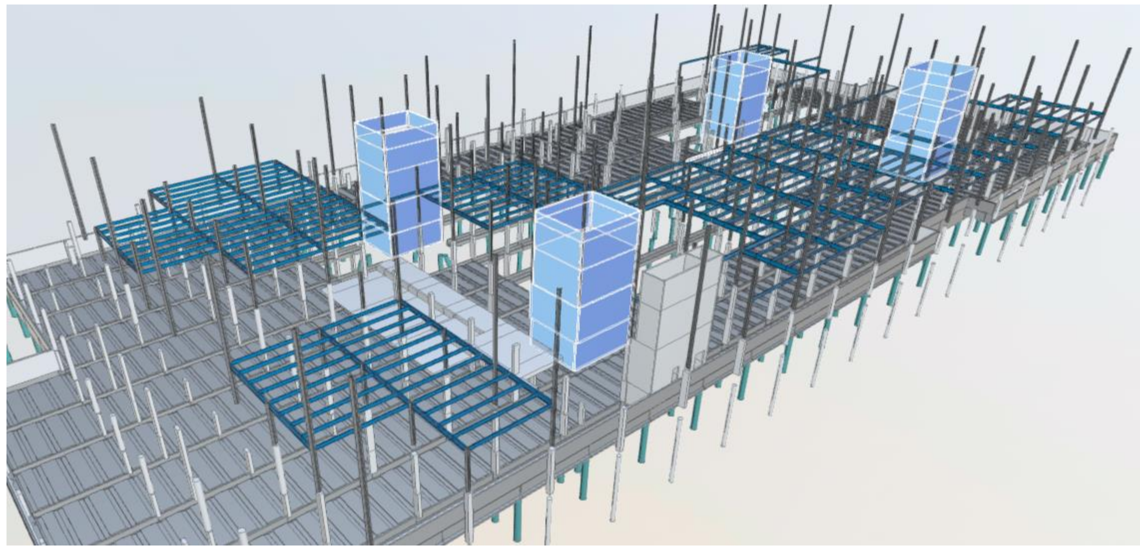


Figure 6-14 – Building Stability Cores

6.11 Roof Structure

A number of options were investigated for the primary roof structure during the design process. Long span glulam timber beams have been adopted as they aligned with the architectural intent and provided advantages from a corrosion perspective.

The current prefered option comprises timber beams arranged in a defined primary and secondary arrangement. Discussions with timber suppliers and manufacturers are ongoing to determine the schemes feasibility, with a focus on fabrication, erection and joints.

Columns are provided on every second grid, with the structure depth governed by a combination of the longer main spans and the longest cantilever.

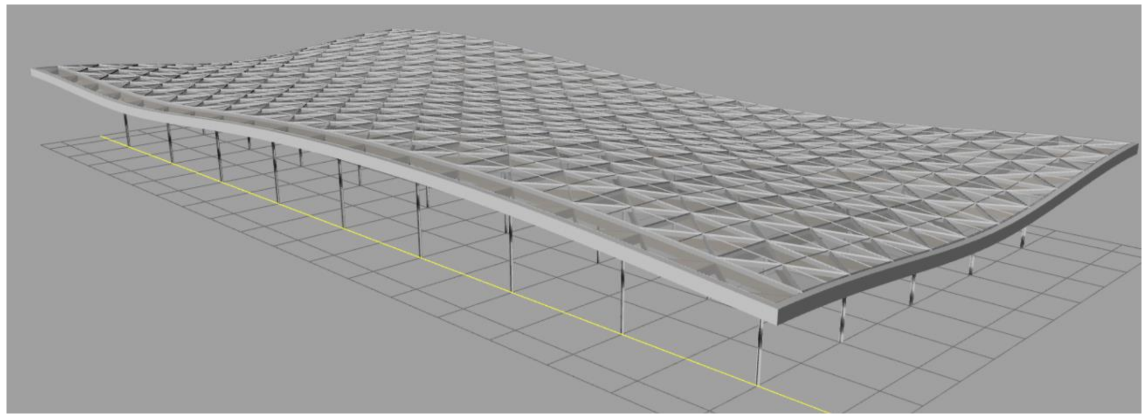


Figure 6-15 – Roof concept (3XN)

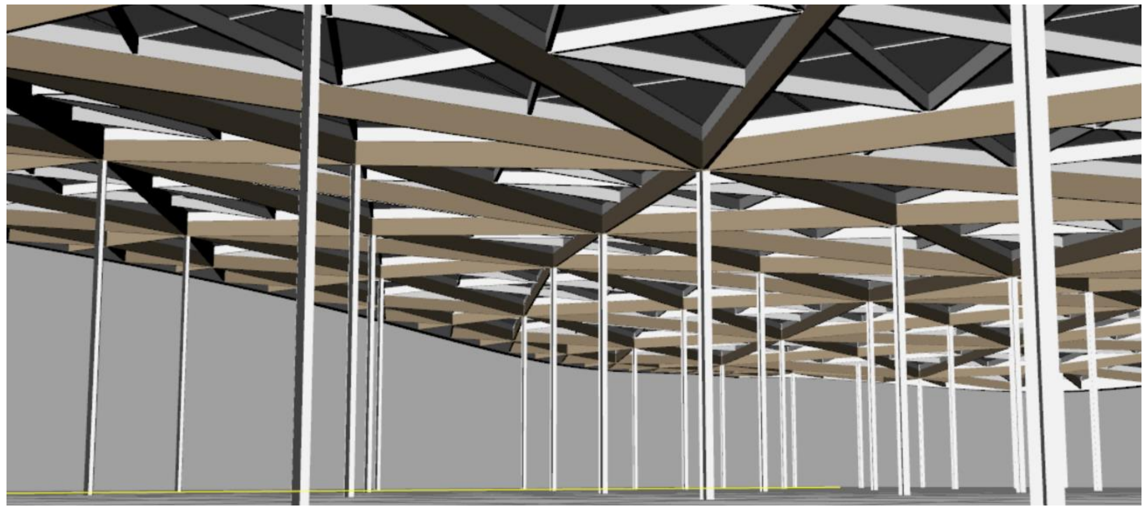


Figure 6-16 – Roof concept (3XN)

Due to the form of the roof, there are few locations available for the inclusion of rainwater overflows. The sensitivity of the long spanning roof however makes it uneconomical to allow for the pooling of large amounts of water on the roof. As a result, various options are being explored to dissipate the water using bunding, secondary siphonic systems and possibly large sumps over the lift cores.

Where possible, elements of the roof are prefabricated or constructed on ground then lifted into place to limit the amount of work performed on site and/or at height. All timber members are prefabricated with steel plates that either bolt to other members and columns or receive roof pods. Roof pods have been modularised to 4 variations of diamond shapes and designed for the temporary case of crane lifting, again with only bolted connections at height to the timber. The variation in size of pods and oversized bolt holes at connections caters for manufacture and installation tolerances.

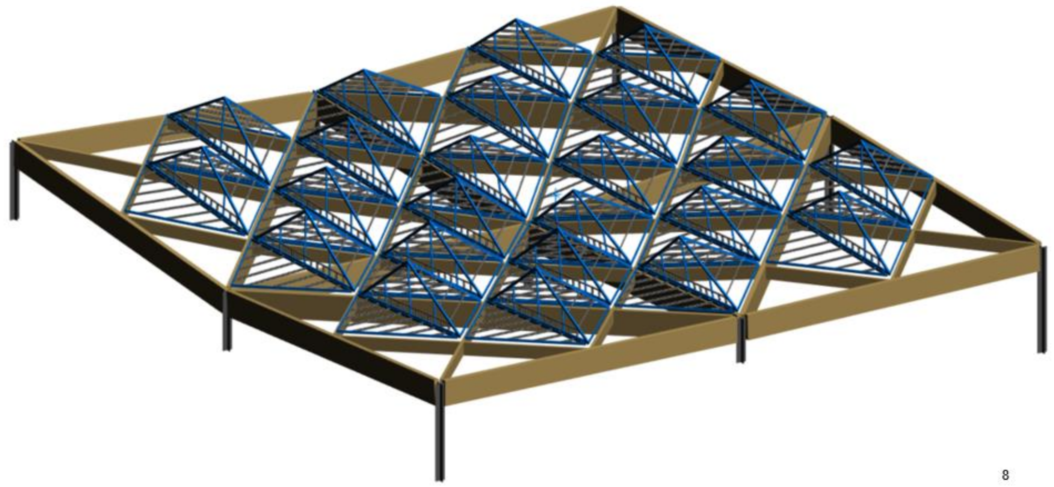


Figure 6-17 – Roof concept (3XN)

6.12 Promenade structure

The promenade structure will be independent to the main building, with permenant joints. The promenade structure is braced using raking piles. The approximate extent can be seen in **Figure 6-18**.

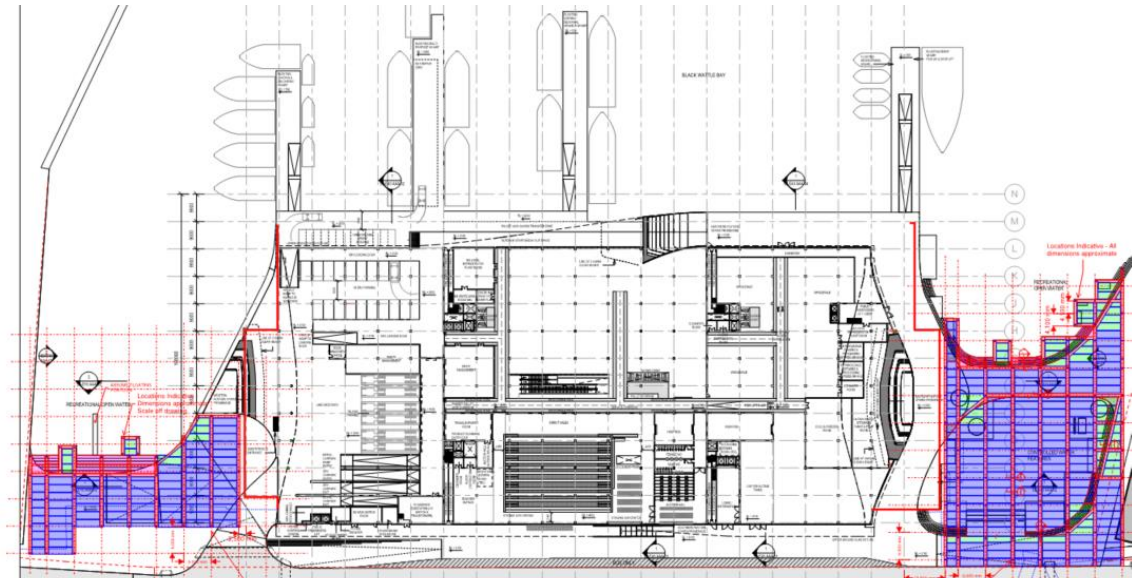


Figure 6-18 – Promenade structure extent

The structure comprises precast beams and double T-slabs with an insitu topping. Steps in the precast level is achieved by bearing primary precast beams on top of one another over a common pile.

6.13 Wharf Structures

Wharf structures will be required to facilitate a number of functions including fishing operations, public and private vessels, charter boats and ferries as indicated in Figure 6-19 – Preliminary wharf berthing plan (3XN). Currently the wharfs are envisaged to be proprietary systems like those provided by a supplier such as Bellingham or Superior Jetties.

The specific wharf type adopted will be developed during the design process as the functional brief better informs the design.

The wharf piles will likely be similar in nature to those of the main facility, i.e. steel hollow section driven to rock. The piles and the wharf structure will be designed for the relevant lateral loads imposed by tide, wave, and impact from various marine vessels via energy absorption of either the vessels, deck, or fenders.

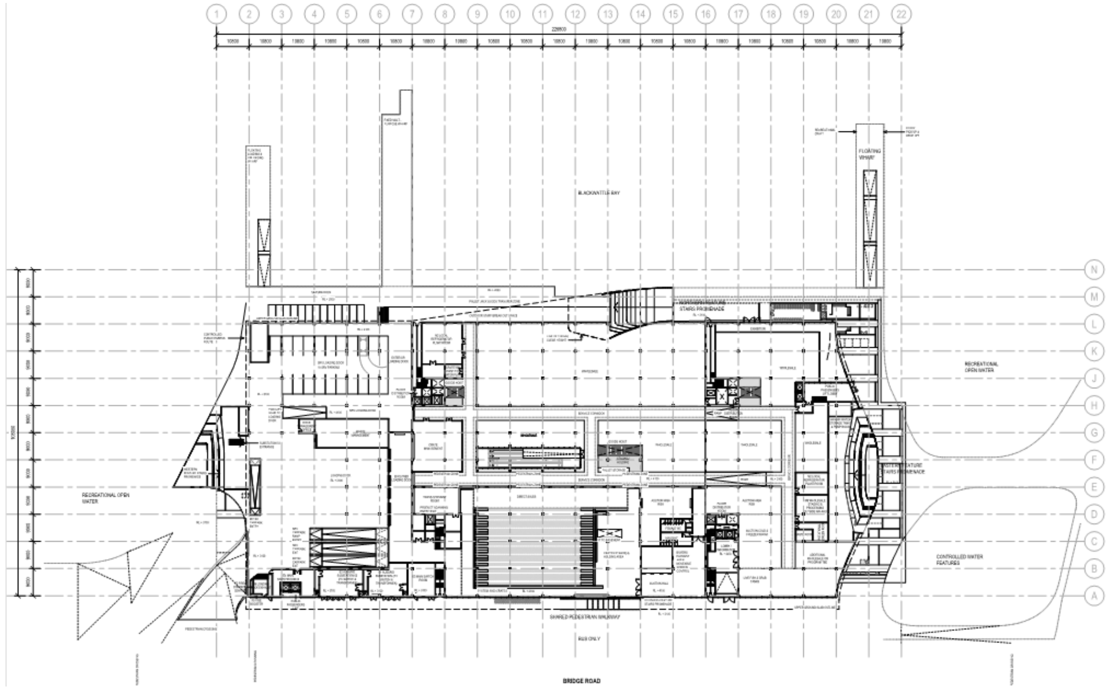


Figure 6-19 – Preliminary wharf berthing plan (3XN)

7 Civil Design

The civil design has focused on four key areas of the project:

- Bridge Road
- Overland Flow
- Site stormwater
- Rock Revetment

7.1 Bridge Road

Initial traffic studies undertaken by Mott MacDonald, followed by a detailed TIA by ARUP have informed the traffic demands of the new facility on the surrounding road network and the associated intersections at Wattle St and Wentworth Park Road. Reference should be made to the Traffic Impact Assessment undertaken by ARUP for a broader understanding of the facilities impact on the surrounding road network.

The existing lane widths on PBR are non-compliant with current RMS standards. Since the road is being reconfigured for the new facility, and being brought up in level, there is a requirement to bring it up to current standard. The new lanes widths inform the pedestrian concourse and available space for drop off zones, bike paths etc.

The proposed layout is indicated below in Figure 7-1. A central reservation has been provided to maintain straight sections of road and consistent lane widths. The final layout has been developed in conjunction with RMS following several interactive sessions, comments and design revisions.

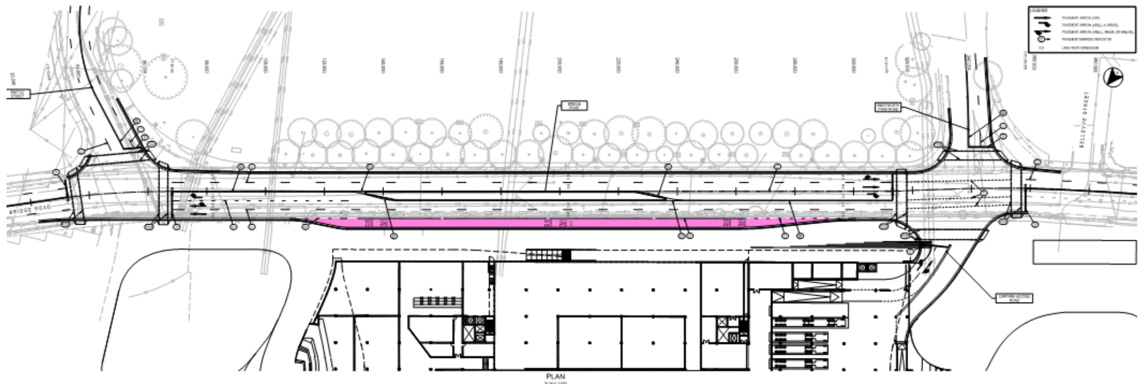


Figure 7-1 – Bridge Road Layout

The strategic concept design drawings and design report have been issued to RMS for initial commentary with the intent to receive RMS in-principal agreement of the concept design layout and extent of proposed works. For more detailed information relating to the Bridge Road design refer the Bridge Road design report (separate to this report).

7.2 Overland Flow

Flood modelling for the precinct has been undertaken by Cardno. Mott MacDonald have provided Cardno with the civil levels against which the modelling is undertaken. The geometry of Bridge road and the two intersections have been modified to allow the upstream catchment overland flow into the bay without adversely affecting the new facility and the surrounding developments. In order to avoid any adverse impact to the surrounding areas, the western and eastern plaza have been designed to ensure an overland flow route is formed as part of the public domain design.

The full flooding assessment including the overland flow route has been documented in Cardno's flood report.

7.3 Site stormwater

The site has been separated to two catchment areas, the roof and the external hardstands such as water front promenade, plaza's and Bridge Road promenande.

7.3.1 Roof water

The rainwater from the roof will be harvested in a tank inside the building for re-use. The external building drainage system has been designed to allow connection to roof downpipes and overflow pipes. The flow from this drainage system is generally clean roof water which will discharge directly into the bay.

7.3.2 Promenade and Plaza

The runoff from the external areas such as the waterfront promenade and the eastern and western plazas will be captured by the site stormwater drainage system which comprises pits and trench drains. The captured stormwater from these areas is piped to a localised stormwater quality treatment device placed within the site and treated prior to discharging into the harbour. Some of the areas in the western and eastern plaza will flow into an on-grade biofiltration swale where the surface runoff is treated prior to discharging into the harbour.

7.3.3 Lower Ground Floor

Any surface runoff from the loading dock will be captured by a separate building hydraulic system which will be piped to the localised quality treatment devices to remove/reduce hydrocarbons in the runoff prior to discharging into the trade waste system. A section of the lower ground floor area adjacent to the loading dock and wharves is located beyond the roofline as illustrated in Figure 7-2. Trench drains will be provided along the edge of this area to intercept and capture any surface flow.

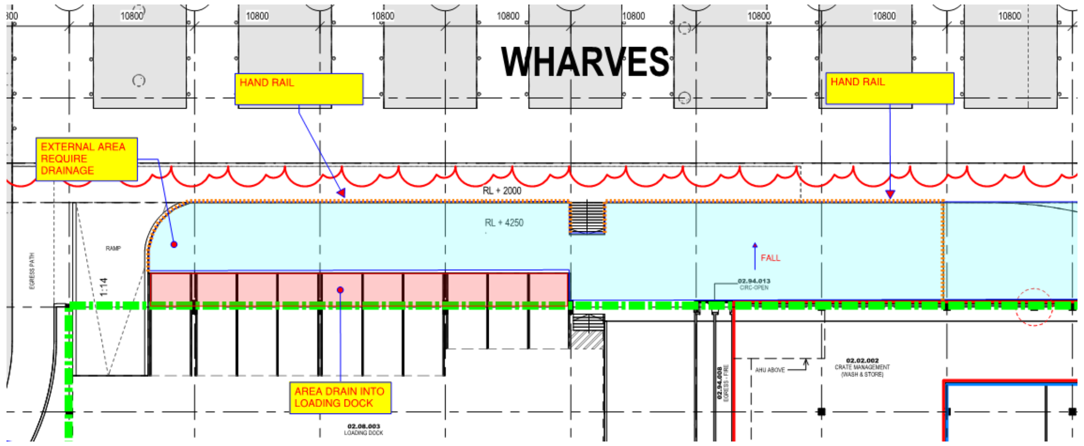


Figure 7-2 – Lower Ground Floor

7.3.4 External Stairs

Analysis has been undertaken to identify any drainage requirements for the external stairs. Australia Rainfall and Runoff have specific requirements regarding hazardous flow for pedestrians. The standard requirement is for D (depth of flow) multiplied by V (velocity) to be less than 0.4. There are four (4) external stairs located around the building connecting upper ground floor to the Western Plaza, Eastern Plaza, Waterfront promenade and Bridge Road promenade.

DRAINS models have found the DV values at all the four stairs to be below 0.4. Therefore, there is no requirement to provide drainage to capture surface runoff in between landings and only a trench drain at the bottom of the stairs will be provided.

7.4 Water Quality Modelling

A detailed water quality assessment has been undertaken by Cardno using MUSIC software and the results of the assessment are documented in the Water Quality, Soils and Contamination report prepared by Cardno.

7.5 Rock Revetment

A sea wall condition assessment has been undertaken by Royal Haskoning DHV. The assessment identified two (2) sections of the the existing sea wall to have deteriotiate beyond repair and require replacement (See Figure 7-3 for locations).

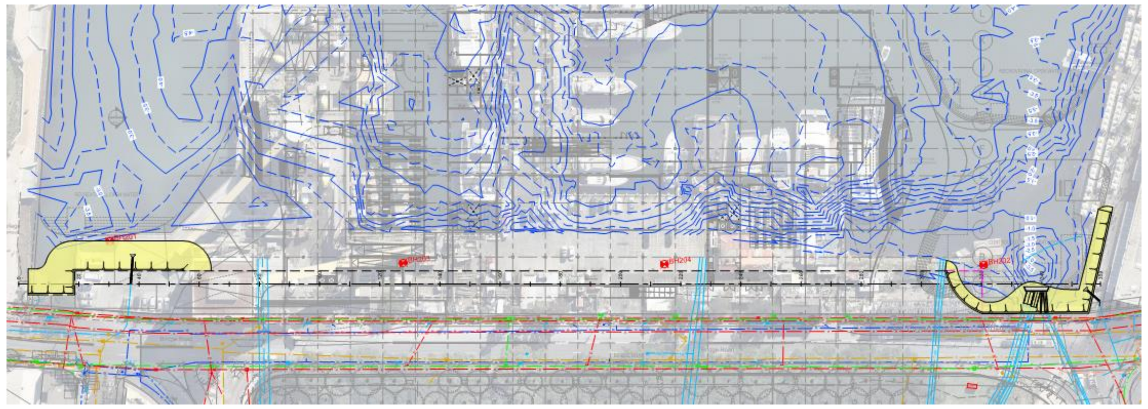


Figure 7-3 – Location of New Sea Wall

The new sea wall will be formed using rock revetment. Figure 7-4 shows a typical section detail of the rock revetment and Figure 7-5 shows a typical section with drainage outlet.

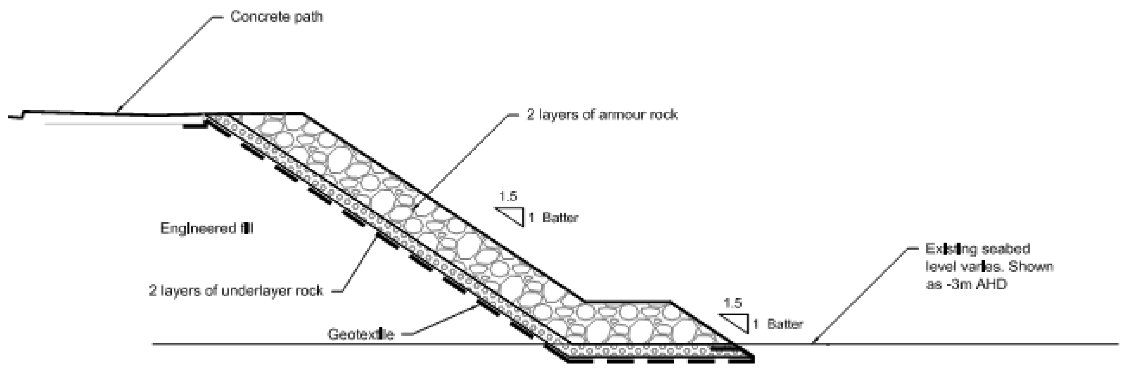


Figure 7-4 – Typical Section

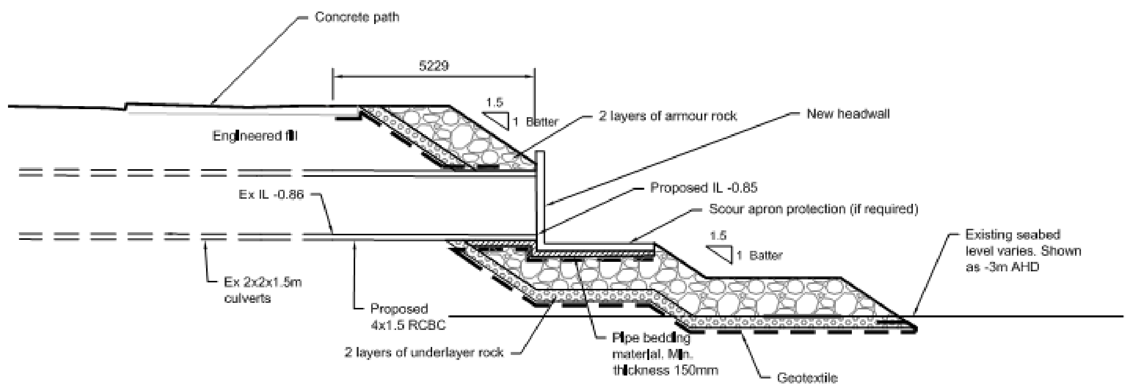


Figure 7-5 – Typical Section With Drainage Outlet

8 Appendices

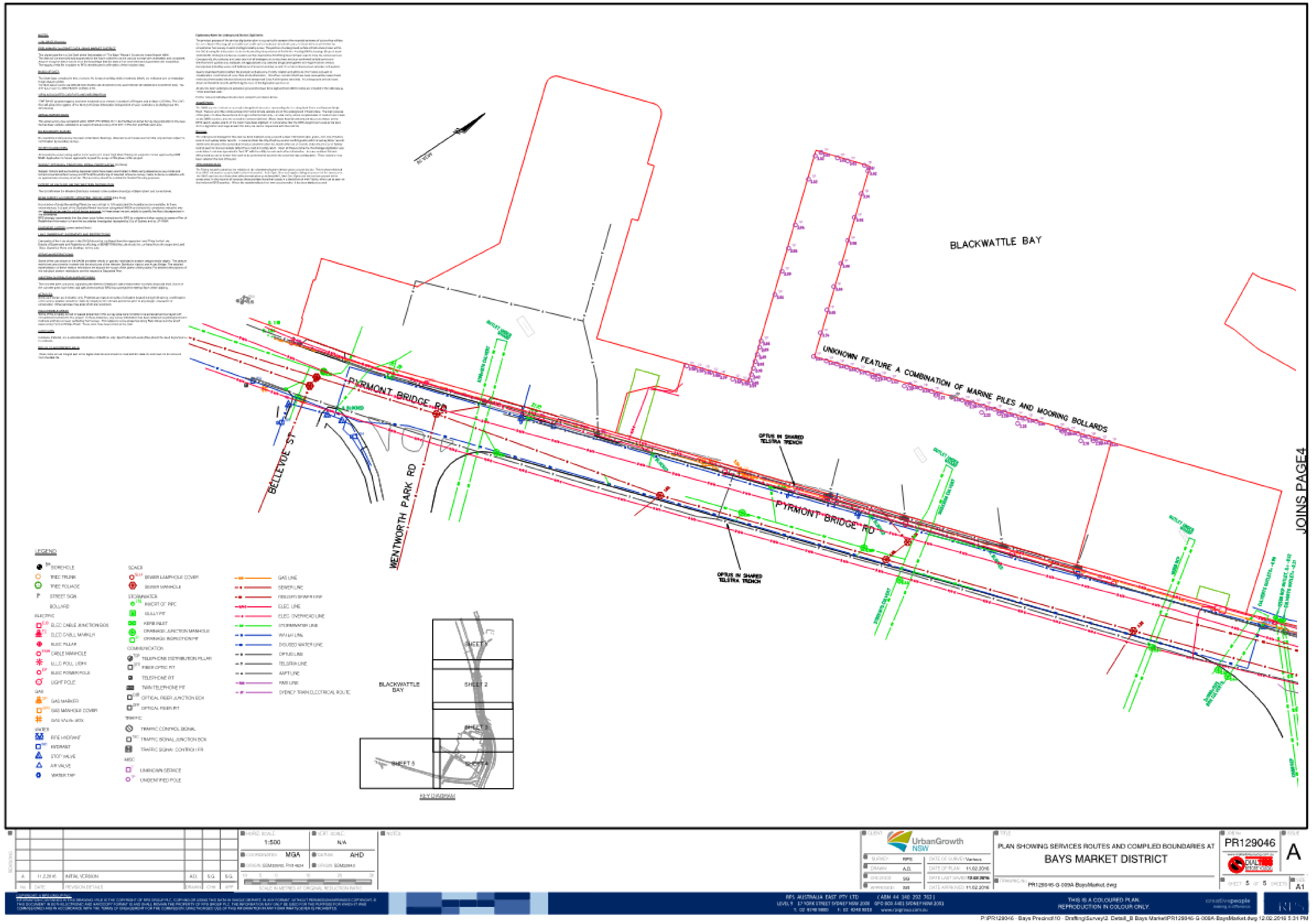


Figure 8-1 – Existing Service adjacent Pyrmont Bridge Road

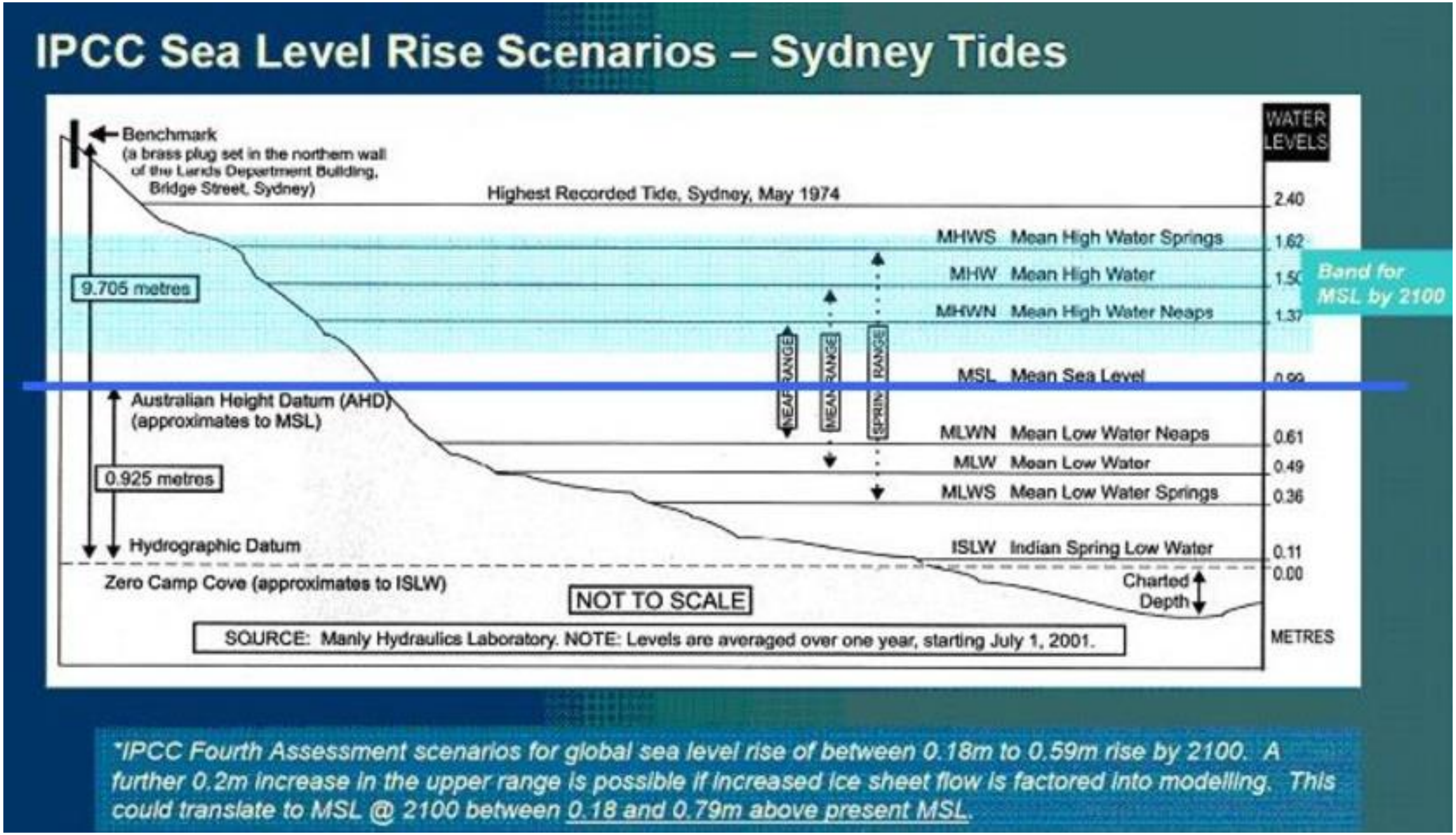


Figure 8-2 – IPCC Sea Level Rise Scenarios – Sydney Tides

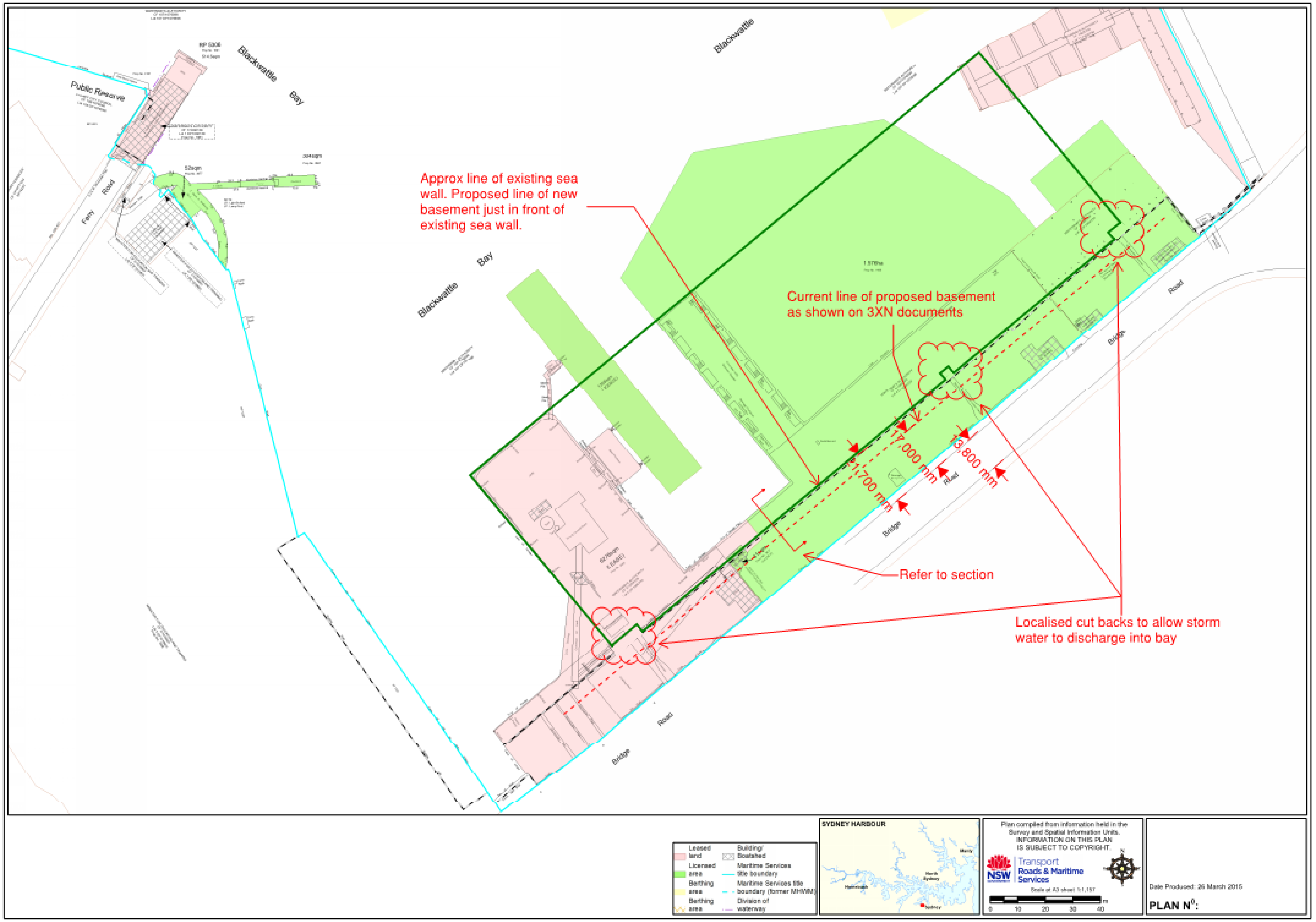


Figure 8-3 – Plan showing location of existing sea wall

A. Safety in Design - Designers Hazard Elimination and Management Record

Safety in Design - Designers' Hazard Elimination and Management Record

MOTT MACDONALD

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1	Demolition of existing structure	Collapse of structure during demolition, including any parts to be retained	Demolition	A	2	L	Prior to undertaking demolition works, Contractor to understand loading capacity of existing structure. This is currently a combination of the Hanson concrete factory and the Blackwattle Marina. Since concrete trucks currently regularly use the Hanson site. It can be assumed this area has adequate capacity to continue to support construction vehicles. It is likely the Blackwattle Marina will have the same capacity however this may need to be verified. Any failure would likely be in the form of localised cracking of the wearing surface and therefore not represent a significant risk.	A	2	L	Y	N/A	Contractor	Active
2	Demolition of existing marine structure	Drowning, injury during demolition	Demolition	B	4	H	Demolition of marine structures is a specialist skill that should be undertaken by a compentant contractor with significant, proven experience in this area. Selection of appropriate contractor should account for a proven track record of the safe demolition of marine structures. Demolition plan to be provided.	A	4	M	Y	N/A	Owner	Active
3	Basement excavations - Deep excavations	Collapse of excavations	Construction	B	4	H	Temporary works designs to be supplied by the contractor. Temoprary propping of retaining walls to consider adjacent in-ground services which may be affected by wall deflections and subsequent ground settlement. Currently, deep excavations are not expected to form part of the design of the facility since it is constructed primarily over water. There may be excavations associated with in ground detention pits, in this case the above should apply.	A	4	M	Y	D and R	Contractor	Active
4	Excavation / ground works	Exposure to contaminated ground	Construction	C	2	H	Ground investigation highlighted presence of contaminated ground. Contractor to prepare safe work method statement for work to and for safe treatment and disposal of contaminated ground.	B	2	M	Y	D and R	Contractor	Active
5	Excavation / ground works	Contact with existing services, electrocution	Construction	C	4	S	Existing services survey has been undertaken and will be provided to the contractor. Contractor to undertake detailed review of existing in-ground services, and follow proper procedure in exposing and removing/moving existing services, informing all construction persons of existing services locations.	B	4	H	Y	D and R	Contractor	Active
6	Construction - Worker Safety	Injury from contact with equipment casued by congested and busy areas. Fatality on wharf apron due to collision with operations vehicles and construciton vehicles	Construction	C	4	S	Contractor to determine and incorporate the required work area and safe access procedures with operator Contractor to ensure all site personal and those visiting site have had the required inductions and are wearing the correct PPE. Contractor to ensure correct storage of materials. Consultants to consider staged design such that different elements are incorporated at different times so as not to cause congested areas.	B	4	H	Y	D and R	Contractor	Active

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7	Construction - Worker Safety	Diver fatality from collision with vessels at berth	Construction	B	5	S	Liaise with operator and harbourmaster to determine safe work arrangements at berth locations and avoid clashes with the potential to form an exclusion zone around the site perimeter. Operator to liaise with Contractor and harbour master to confirm berth arrangement to avoid clashes Document requirement for liaison between operator and Contractor in technical speification	A	5	L	Y	N/A	Contractor	Active
8	Temporary Works	Collapse or failure of structural system or integrity of temporary supports.	Construction	B	4	H	Design will consider temporary construction loads in the permanent design of the structure where appropriate.	B	4	H	Y	N/A	Contractor	Active
9	Temporary Works	Collapse or failure of structural system or integrity of temporary supports.	Construction	B	4	H	Contractor to appoint temporary works engineers to ensure all temp works are safely and properly designed to standard requirements, ensuring all load bearing requirements are met.	B	4	H	Y	N/A	Contractor	Active
10	Design - Hydrostatic pressure	Tidal lag unknown	Construction	C	3	H	Design to consider future water levels due to sea level rise. This will be based of IPCC data. Initial design to consider impact of wave height in conjunction with high tides for extreme peak uplifts. Sea wall structures will be designed for a full head of water.	A	3	L	N	D	Designer	Active
11	Basement construction	Flooding of underground basement(s) due to leak(s) in structure. Potential to cause significant structural damage / failure which may lead to injury and loss of life.	Construction	B	4	H	Avoid designing structure extending below the water table. If structure is designed for under-water basement, water-retaining structure must be designed suitably for the hydrostatic pressure imposed by sub-marine location. Use of a membrane to ensure water does not leak through walls, also walls are to be designed to contain reinforcement sufficient to act as a water retaining structure. Current prefered design results in structure located at or below water level. Three lines of protection are currently proposed. Precast concrete design as water retaining structure with pour strips between panels + membrane + Insitu concrete slab and walls design as water retaining structure. Contractor and designer to ensure any alternate solutions provide adequate / equivalent protection. Contractor to ensure all stainless steel is kept free from non stainless corrosion inducing contaminants to prevent failure of first line of defence. Contractor to ensure all membranes are installed in accordance with manfacturers recommendations and have the relevant warranties following installation.	A	4	M	Y	R and F	Contractor	Active

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12	Basement construction	Failure of the pumps causing hydrostatic uplift in excess of design cases on the piles prior to installation of ground floor	Construction	B	4	H	The design has been undertaken such that the piles have an uplift capacity in them; this is sufficient for most cases, with the exception being the exteme king tide and storm surge. The contractor is to ensure they have multiple duty and standby pumps with several lines of redundancy to cater for pump failures. The contractor should ensure there are sufficient back up power generation methods on site to cater for a grid black out. Pumps are to have continuous network linked monitors to send warning text messages to contractors should an out of hours failure occur.	A	4	M	Y	R and F	Contractor	Active
13	Basement construction	Failure of cofferdam causing flooding of site during construction	Construction	B	5	H	Cofferdam to be designed and installed by specialist subcontractor in accordance with australian standards. Design to be reviewed and approved by clients maritme engineer to confirm adequate. Installation to be inspected by clients maritime engineer. The contractor is to develop an adequate evactuation strategy as the last line of defence, ensuring there are multiple exit points.	A	5	M	Y	F	Contractor	Active

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14	Stormwater design	Ground water flow running into new structure causing flooding which may cause drowning.	Construction	A	4	M	Mitigate direction of over-ground flow and design accordingly a system by which this water is diverted elsewhere (such as a grated walkway into new structure such that runoff water flows through and down into existing marine body.	A	4	M	N	N/A	Contractor	Active
15	Operation - Durability of structure	Premature corrosion of structural elements leading to inadequate structural capacity in future	Operation	C	3	H	Implement measures at design stage which allow the structure to meet durability requirements. Including selection of materials and design of individual components. This may include cathodic protection of steel elements that may require ongoing maintenance.	A	3	L	N	D	Designer	Active
16	Use of facility	Workers or pedestrians falling into water from new structure.	Operation	B	3	M	Design and construct appropriate railings around the perimeter of the structure above water. Architect to consider signage warning people not to stay too close to the perimeter of the structure.	B	3	M	N	N/A	Designer	Active
17	Construction of basement	General construction risks associated with a marine environment	Construction	C	3	H	Use best marine contractors to minimise risk to workers and public. Marine works as far as possible should be from the water to avoid having to transport large piles or precast elements along busy city arteries. That is, all piles etc barged to site. Minimising traffic hazard and risk. All lifts to be with single floating crane. Multiple crane lifts on floating gear is uninsurable risk. Need large crane. Piling installation wherever possible to be early morning 5 to 7 am, ie before Harbour traffic to avoid disturbance to floating gear. Maximise elevation of concrete work and steel fabrication to avoid tidal delays and risks.	B	3	M	Y	D and R	Contractor	Active

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18	Construction of basement	Crushing of limbs during installation of precast. Slips trips and falls, drowning, electrocution due to water inflow from bay during construction of basement.	Construction	C	3	H	Contractor to ensure all works associated with the construction of the basement whilst it is not in a water tight condition are undertaken by team members specifically trained in working in that environment. The design has been developed on the ability to construct the majority of lowest basement structure whilst the tide is out such that the water level is below the top of precast beams & slab. The piles after being driven into the sandstone will ned to be cut to the correct level to accept the precast beams. Contractor to ensure cutting of piles is undertaken by specialist divers with all appropriate safety measures and support staff in place. The precast beams can be placed directly onto the piles before being grouted into position. Contractor to ensure this is undertaken in a controlled manner, with staff supervising precast lift from barges with adequate protection. The precast slabs have been designed such that they can be lifted and fixed into place with minimal labour, i.e. stainless steel anchors are provided to fix planks to beams so that they can remain in place temporarily until fixed permanently via welding. All welding of stainless steel is to be undertaken by specifally trained contractors that have a proven track record of undertaking thius work in a marine environment. Contractor to ensure all measures are put in place to ensure the safety of thier staff during this and all other operations. If contractor employs temporary measures to maintain a level of water tightness to allow the waterproofing works to commnce early, this will be under the agreement of all parties responsible for ensuring the water tightness.	B	3	M	Y	D and R	Contractor	Active
19	Storage of construction materials	Overloading the structure with materials and machinery	Construction	B	2	M	Ensure that the construction load does not exceed the design load. Consult design engineer prior to placing machinery on the structure. Provide temporary propping as required.	B	2	M	N	N/A	Contractor	Active

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20	Steel Erection	Handling of steel/timber structure and connections - fallilng from height	Construction	D	3	S	Design to maximise use of prefabrication simplification of connections to minimise manual handling at height. Timber elements to have steel plates embeded offsite where possible to allow simple steel to steel connections on site. Pods to be modularised as far as possible to minimise working at height. lifting lugs on pods could be retained and utilised as fall restraint. Contractor to provide scaffolding and appropriate fall arrest systems as required.	B	3	M	N	N/A	Contractor	Active
21	Structural elements fixed via anchors	Failure of machanical and chemical anchors. Injury as a result of anchor installation.	Construction	C	4	S	Design to be in accordance with manfucaturers recommendations. Follow installation specification by anchor manufacturer.	A	4	M	N	N/A	Contractor	Active
22	Excavation	Undermine adjacent structures.	Construction	C	2	H	Shoring engineer to ensure the shoring design includes the loading effect from adjacent structures. Surveys of existing structures to understand latent conditions to be undertaken. Contractor to follow construction sequence and requirements on shoring documentation.	B	2	M	N	N/A	Contractor	Active
23	Movement of people and materials	Large moving crowds (particularly in an emergency event) can cause a crush, resulting in injury or even death.	Operation	C	4	S	Barriers in emergency escape pathways and as designated by the BCA consultant to be designed for crowd loading.	A	4	M	N	N/A	Designer	Active
24	Movement of people and materials	Vehicular impact with new structure both accidental and deliberate, can cause structural failure and thus injury and death.	Operation	A	4	M	Structure to consider vehicle impact loading as appropriate to the functional space and vehicle type. Loading docks may require large impact loading compared to standard car park structure. Risk of IED explosive or vehicle explosive to be addressed in design with appropriate mitigation strategies employed. Vehicle barriers or structural strengthening.	A	1	L	N	N/A	Designer	Active
25	Movement of people and materials	Vehicular impact with pedestrians, can cause injury or death.	Operation	C	4	S	Separation of pedestrian and vehicular accessible areas, correct signage to indicate passenger/vehicle directions, implement speed limits for vehicles. Design to ensure as far as reasonably practicable that fish market vehicles (forklifts, delivery trucks, etc) have their own delivery bay with exclusive access to fish market sales floors.	B	4	H	Y	D	Designer	Active

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				Probability	Severity	Risk Level		Probability	Severity	Risk Level				
26	Movement of people and materials	Vehicular (boat) impact with new structure	Operation	D	3	S	Signage to be provided around fish market marine area, enforcing a speed limit for vessels, implementing tie-up/docking areas for boats. Wharf structures to be designed for impact loads from marine equipment as would normally be required for a facility of this type.	B	3	M	Y	R and F	Contractor	Active
27	Installation/maintenance/replacement of building services plant and equipment	Injury sustained from manual handling/lifting of plant and equipment to plantroom.	Maintenance	C	3	H	Allowances for access hatches to be provided in design for lifting/lowering plant equipment, and clear horizontal routes provided to plantrooms.	A	3	L	N	N/A	Contractor	Active
28	Installation/maintenance of plant equipment on roof	Falling from height	Maintenance	B	4	H	Parapet or fence to be provided around all roof level plant, stair access to be provided for all rooftop plantroom areas. Lifting eyelets for modular roof could potentially be utilised for static lines.	A	4	M	N	N/A	Contractor	Active
29	Plant maintenance	Injury resulting from replacement of equipment in tight/confined/difficult to access spaces	Maintenance	C	2	H	Plantroom layouts to allow for sufficient space for maintenance and replacement of plant.	A	2	L	N	N/A	Designer	Active

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				Probability	Severity	Risk Level		Probability	Severity	Risk Level				

Checked and approved by (see note 4):

Name: Graham Babcock Signature: Date: 26/07/2018

Notes

1 Use Hazard Quantification Tables

2 Significant risks are not necessarily those that involve the greatest risks, but those, including health risks that are: (a) not likely to be obvious to a competent contractor or other designers; (b) unusual; or (c) likely to be difficult to manage effectively.'

3 Information codes: D = Information detailed on drawings (add drawing nos); R = Information for Safety in Design Report; F = Information for Health and Safety File

4 Project Manager (or Design Team Leader, as appropriate) to check and approve Record unless the design work has been carried out directly by the Project Manager (or Design Team Leader) in which case the Record is to be checked and approved by the Project Director (or Sub-Project Director, as appropriate).

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				Probability	Severity	Risk Level		Probability	Severity	Risk Level				

Likelihood	
Probability of Occurrence	Probability Index
So unlikely that probability is close to zero	A
Unlikely to occur, though conceivable	B
Likely to occur sometime	C
Occurrence not surprising. May occur more than once	D
Occurrence inevitable. May occur many times	E

Severity	
Potential Maximum Consequence (Hazard Severity)	Hazard Severity Index
Minor injury/illness resulting in lost time of 3 days or less	1
Injury/illness causing lost time more than 3 days	2
Major illness/injury to one or more persons not causing permanent disability	3
Single fatality or single/multiple permanent disability	4
Multiple fatality	5

Risk Level					
Hazard Severity Index	Probability Index				
	A	B	C	D	E
1	L	L	M	H	H
2	L	M	H	H	H
3	L	M	H	S	S
4	M	H	S	S	S
5	M	H	S	S	S

Risk Level Action		
Risk Level	Description	Action by Designer
L	Low	Check that risks cannot be further reduced by simple design changes
M	Medium	
H	High	Amend design to reduce risk, or seek alternative option. Only accept option if justifiable on other grounds.
S	Severe	

B. Civil Design Documentation

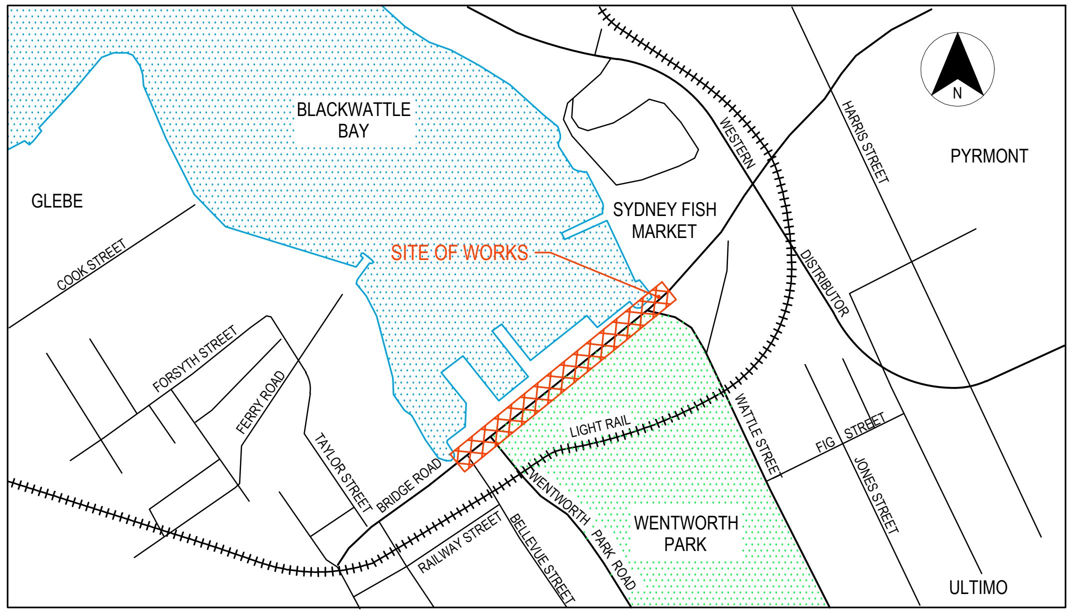
UrbanGrowth **NSW**
Development Corporation

CITY OF SYDNEY

MR 00000 - BRIDGE ROAD

SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD

CONCEPT DESIGN



LOCALITY SKETCH
NOT TO SCALE

PART INDEX

PART NUMBER	SHEET CODE	NAME
PART 1	GE	GENERAL
	RD	ROAD ALIGNMENT AND DETAIL
	UT	PUBLIC UTILITIES
	PV	PAVEMENT DESIGN

MM DRAWING NUMBER	SHEET NUMBER	SHEET TITLE
GENERAL		
CI-GE0-A00 GE-0001	GE-0001	COVER SHEET AND INDEX SHEET
GENERAL ARRANGEMENT AND ROAD DESIGN (RD)		
CI-RD1-D10 RD-0011	RD-0011	TYPICAL CROSS SECTIONS
CI-RD3-B20 RD-0301	RD-0301	ROADWORKS PLAN SHEET 1 OF 3
CI-RD3-B20 RD-0302	RD-0302	ROADWORKS PLAN SHEET 2 OF 3
CI-RD3-B20 RD-0303	RD-0303	ROADWORKS PLAN SHEET 3 OF 3
CI-RD3-D20 RD-0401	RD-0401	ROADWORKS LONGITUDINAL SECTIONS SHEET 1 OF 3
CI-RD3-D20 RD-0402	RD-0402	ROADWORKS LONGITUDINAL SECTIONS SHEET 2 OF 3
CI-RD3-D20 RD-0403	RD-0403	ROADWORKS LONGITUDINAL SECTIONS SHEET 3 OF 3
UTILITIES (UT)		
CI-UT1-B00 UT-0011	UT-0011	EXISTING UTILITIES LEGEND
CI-UT1-B20 UT-0301	UT-0301	DRAINAGE AND PUBLIC UTILITIES PLAN SHEET 1 OF 3
CI-UT1-B20 UT-0302	UT-0302	DRAINAGE AND PUBLIC UTILITIES PLAN SHEET 2 OF 3
CI-UT1-B20 UT-0303	UT-0303	DRAINAGE AND PUBLIC UTILITIES PLAN SHEET 3 OF 3
PAVEMENT (PV)		
CI-PV1-B20 PV-0301	PV-0301	PAVEMENT PLAN SHEET 1 OF 3
CI-PV1-B20 PV-0302	PV-0302	PAVEMENT PLAN SHEET 2 OF 3
CI-PV1-B20 PV-0303	PV-0303	PAVEMENT PLAN SHEET 3 OF 3

NOT FOR CONSTRUCTION

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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
\\mottmac\project\Sydney\Projects\38xxxx\385951 Sydney Fish Markets\04 Working\01 Drafting\Civil\Drawings\CI-GE0-A00 GE-0001.dwg

LINEAR REFERENCING
START: END:

PLOT DATE / TIME: 9/25/2019 5:22:45 PM
PLOT BY: JED64037

CLIENT: UrbanGrowth NSW Development Corporation

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE STREET
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
COVER SHEET

A3

PREPARED BY
MOTT MACDONALD
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NSW 1230, Australia
T +61 (0)2 9098 6800
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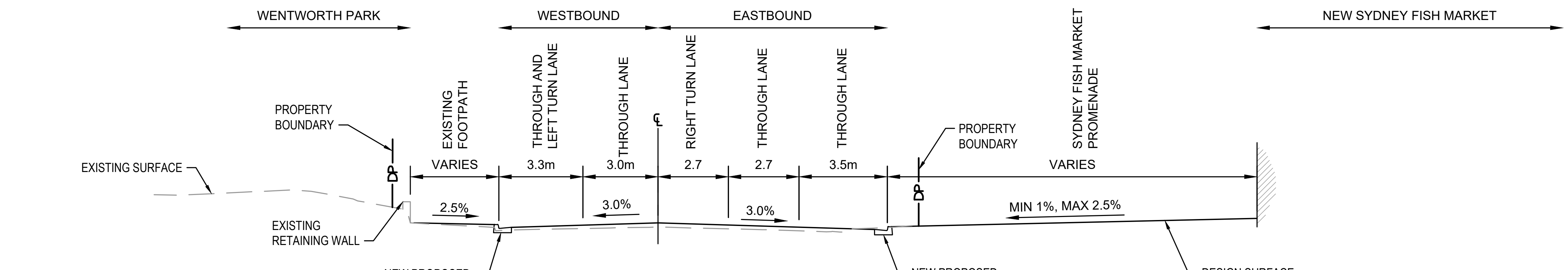
DESIGNED	REVIEWED	VERIFIED	RMS PROJECT MANAGER
SIGNED -	SIGNED -	SIGNED -	NAME -
NAME MATTHEW JEDNIUK	NAME ANDREW LEE	NAME BOON SOO	TITLE -
TITLE PROJECT DESIGNER	TITLE PRINCIPAL HIGHWAY DESIGNER	TITLE CIVIL DISCIPLINE LEAD	VALIDATION AND ACCEPTANCE OF THESE DRAWINGS AND THE DESIGN SHOWN THEREON IS TO BE CARRIED OUT UNDER SEPARATE PROCESS
DATE 13.02.2018	DATE 14.02.2018	DATE 15.02.2018	

MM DRAWING NUMBER: CI-GE0-A00 GE-0001

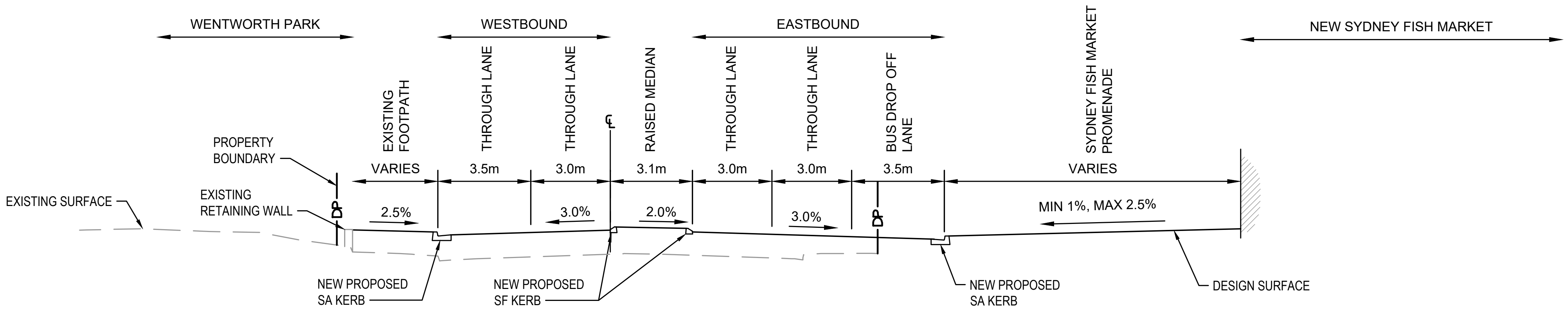
PREPARED FOR: URBAN GROWTH

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01
ISSUE STATUS: CONCEPT DESIGN
EDMS No.:
SHEET No.: GE-0001
ISSUE: 1



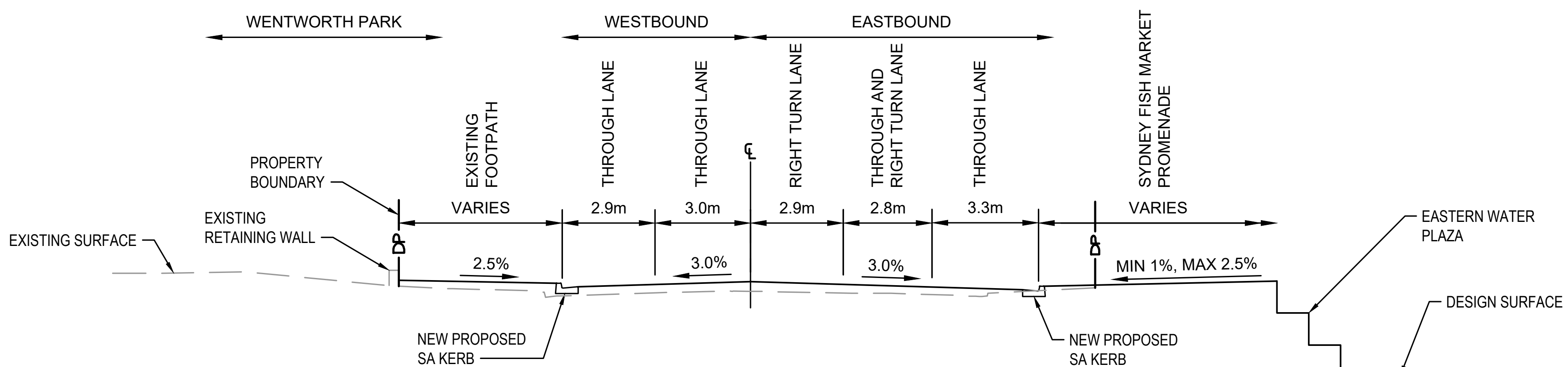
TYPICAL SECTION

BRIDGE ROAD - APPROX. CH300



TYPICAL SECTION

BRIDGE ROAD - APPROX. CH200



TYPICAL SECTION

BRIDGE ROAD - APPROX. CH80

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50mm ON A3 SIZE ORIGINAL

0 5 10 15 20 25 30 35 40 45

DRAWING FILE LOCATION / NAME
\\mottmac\project\Sydney\Projects\38xxxx\385951 Sydney Fish Markets\04 Working\01 Drafting\Civil\Drawings\CI-RD1-D10 RD-0011.dwg

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
	1	25.09.2019	RE-ISSUED FOR CONCEPT DESIGN		B.SOO

SCALES ON A3 SIZE DRAWING
0 2.5 5 7.5
PLAN 1:200

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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MM DRAWING NUMBER: CI-RD1-D10 RD-0011

PLOT DATE / TIME: 25/9/2019 5:30:10 PM
PLOT BY: PAC82679

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

CLIENT
NSW GOVERNMENT | UrbanGrowth NSW Development Corporation

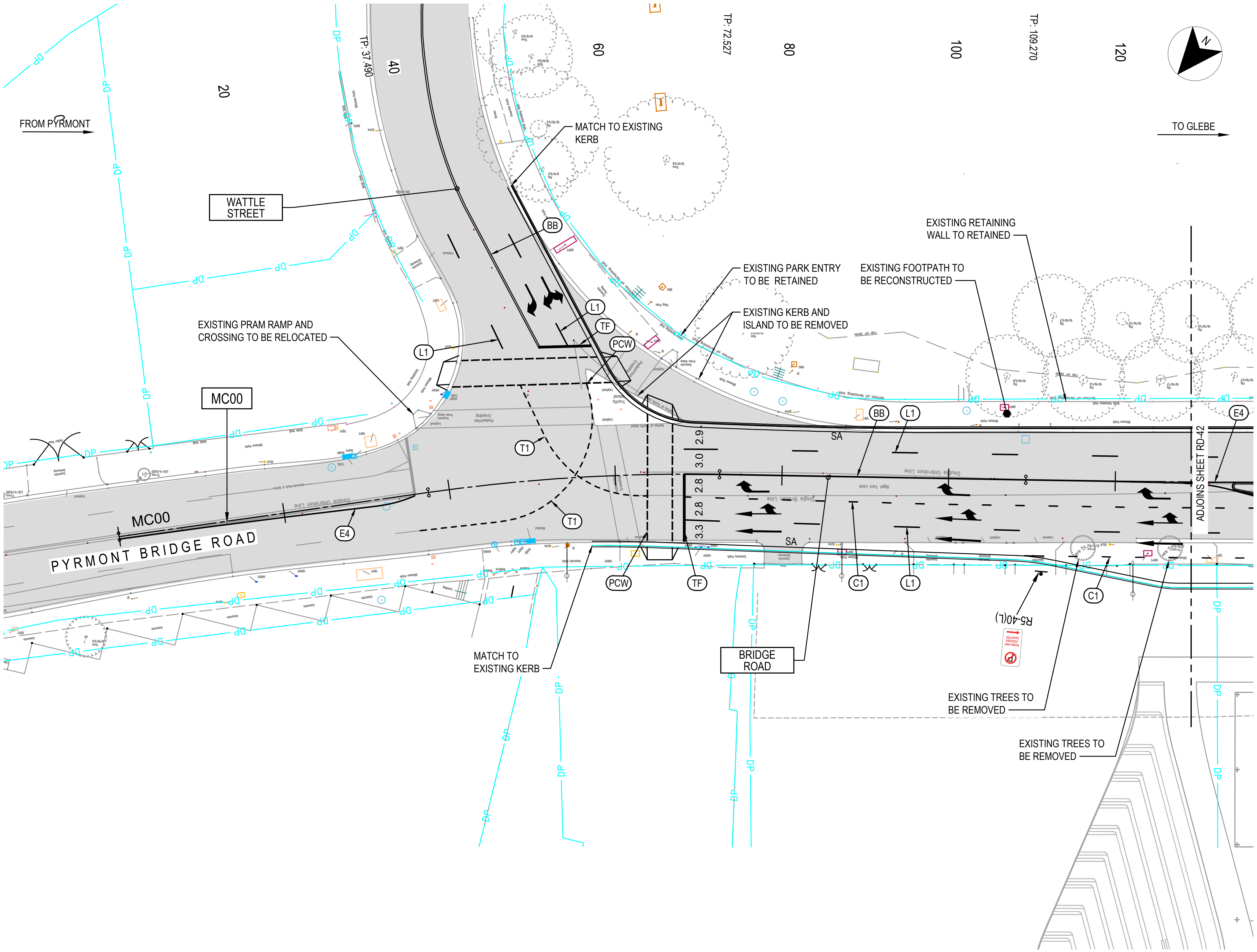
PREPARED FOR
URBAN GROWTH

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE ROAD
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
TYPICAL CROSS SECTIONS

A3

RMS REGISTRATION No. DS2018/XXXXXX
PART 01

ISSUE STATUS	EDMS No.	SHEET No.	ISSUE
CONCEPT DESIGN		RD-0011	1



GENERAL ARRANGEMENT LEGEND

- EXISTING DP BOUNDARY
- EXISTING TREE
- EXISTING WATER COURSE
- EXISTING EDGE OF GARDEN
- EXISTING FENCE
- EXISTING MANPROOF FENCE
- EXISTING GATE
- EXISTING PAVEMENT
- MC00 — MASTER CONTROL LINE LABEL
- SA — KERB TYPE, FOR DETAILS REFER TO RMS STANDARD DRAWING R0300-01
- NEW STREET LIGHT
- PAVEMENT ARROW AR1
- PAVEMENT ARROW AR2
- PAVEMENT ARROW AR3 (L OR R)
- PAVEMENT ARROW AR4 (L OR R)
- PAVEMENT ARROW ARU5
- PAVEMENT ARROW AR9
- EXISTING PAVEMENT ARROW
- C1 — PAVEMENT MARKING INDICATOR

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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

PLOT DATE / TIME: 25/9/2019 5:30:20 PM
PLOT BY: PAC82679

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
1	25.09.2019	RE-ISSUED FOR CONCEPT DESIGN		B.SOO

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 PLAN 1:500

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CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD
MM DRAWING NUMBER: CI-RD3-B20 RD-0301

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

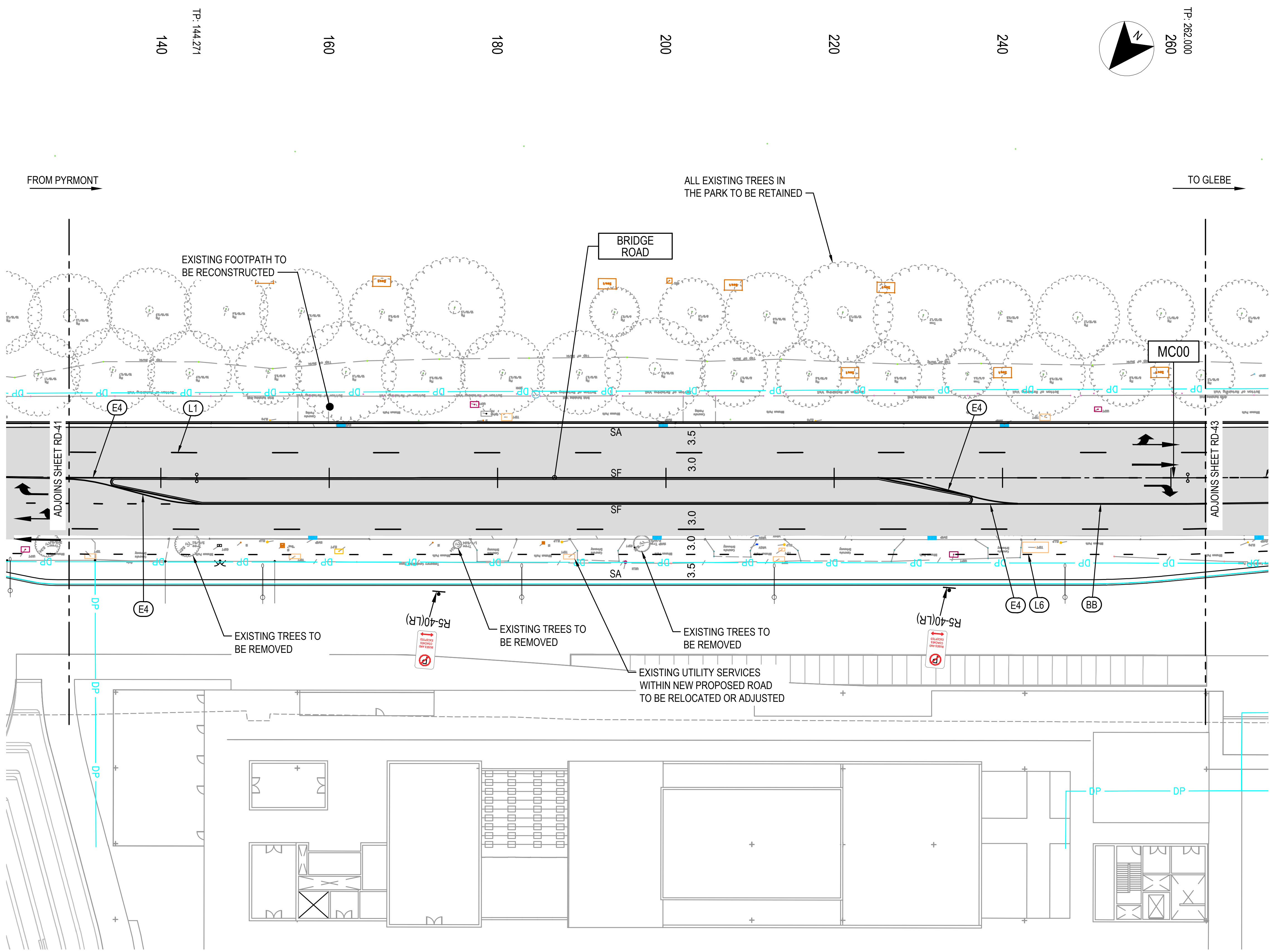
CLIENT: NSW GOVERNMENT UrbanGrowth NSW Development Corporation

PREPARED FOR: URBAN GROWTH

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE ROAD
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
ROADWORKS PLAN
SHEET 1 OF 3

A3

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01
ISSUE STATUS: CONCEPT DESIGN
EDMS No.
SHEET No.: RD-0301
ISSUE: 1



GENERAL ARRANGEMENT LEGEND

- EXISTING DP BOUNDARY
- EXISTING TREE
- EXISTING WATER COURSE
- EXISTING EDGE OF GARDEN
- EXISTING FENCE
- EXISTING MANPROOF FENCE
- EXISTING GATE
- EXISTING PAVEMENT
- MC00 — MASTER CONTROL LINE LABEL
- SA — KERB TYPE, FOR DETAILS REFER TO RMS STANDARD DRAWING R0300-01
- NEW STREET LIGHT
- PAVEMENT ARROW AR1
- PAVEMENT ARROW AR2
- PAVEMENT ARROW AR3 (L OR R)
- PAVEMENT ARROW AR4 (L OR R)
- PAVEMENT ARROW ARU5
- PAVEMENT ARROW AR9
- EXISTING PAVEMENT ARROW
- C1 — PAVEMENT MARKING INDICATOR

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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
1	25.09.2019	RE-ISSUED FOR CONCEPT DESIGN		B.SOO

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 PLAN 1:500

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CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD
MM DRAWING NUMBER: CI-RD3-B20 RD-0302

PLOT DATE / TIME: 25/9/2019 5:30:40 PM
PLOT BY: PAC82679

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

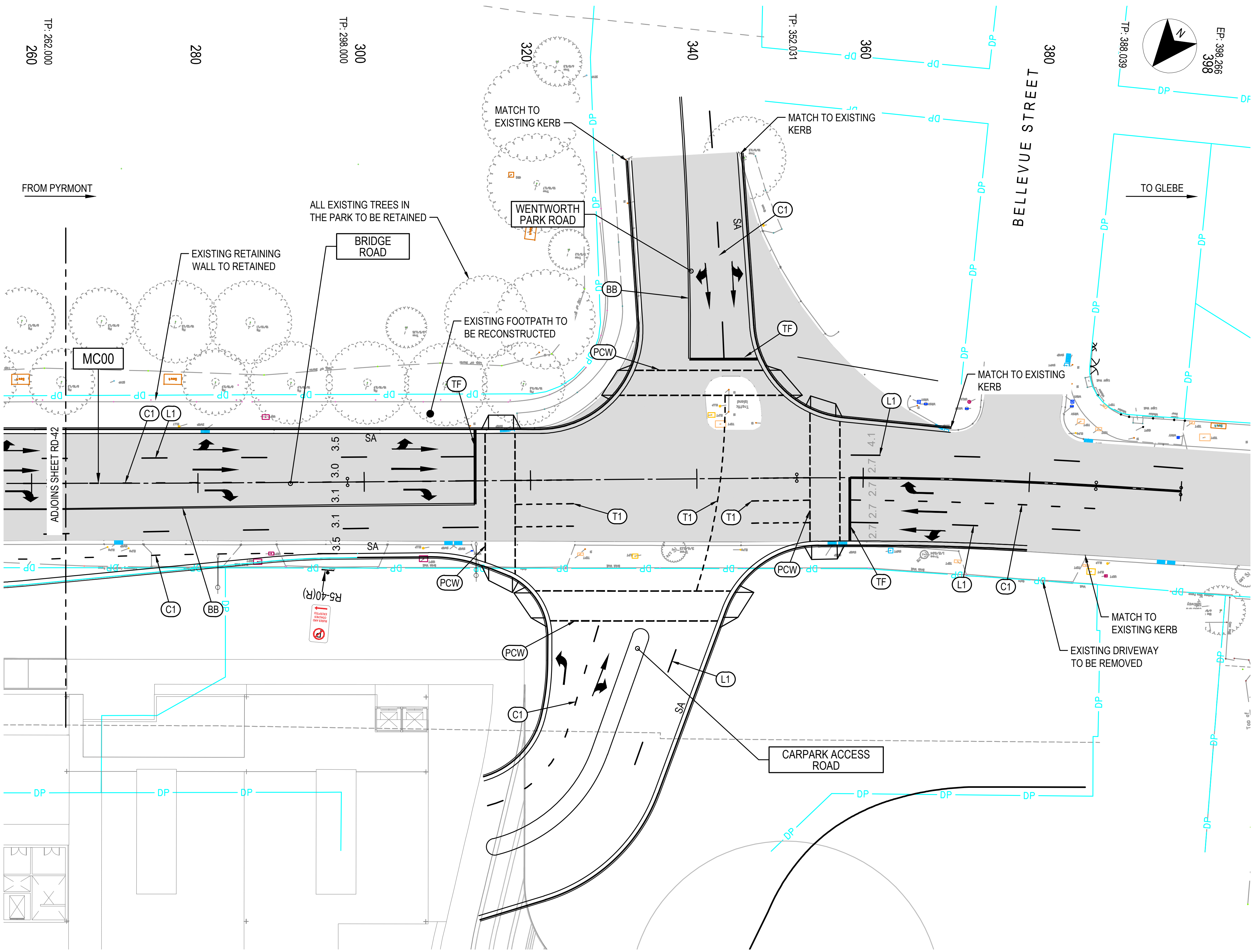
CLIENT: NSW GOVERNMENT UrbanGrowth NSW Development Corporation

PREPARED FOR: URBAN GROWTH

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE ROAD
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
ROADWORKS PLAN
SHEET 2 OF 3

A3

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01
ISSUE STATUS: CONCEPT DESIGN
EDMS No.:
SHEET No.: RD-0302
ISSUE: 1



GENERAL ARRANGEMENT LEGEND

- EXISTING DP BOUNDARY
- EXISTING TREE
- EXISTING WATER COURSE
- EXISTING EDGE OF GARDEN
- EXISTING FENCE
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- EXISTING GATE
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
1	25.09.2019	RE-ISSUED FOR CONCEPT DESIGN		B.SOO

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 PLAN 1:500

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
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Sydney, NSW 2000
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MM DRAWING NUMBER: CI-RD3-B20 RD-0303

PLOT DATE / TIME: 25/9/2019 5:31:14 PM
PLOT BY: PAC82679

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

CLIENT
UrbanGrowth NSW Development Corporation

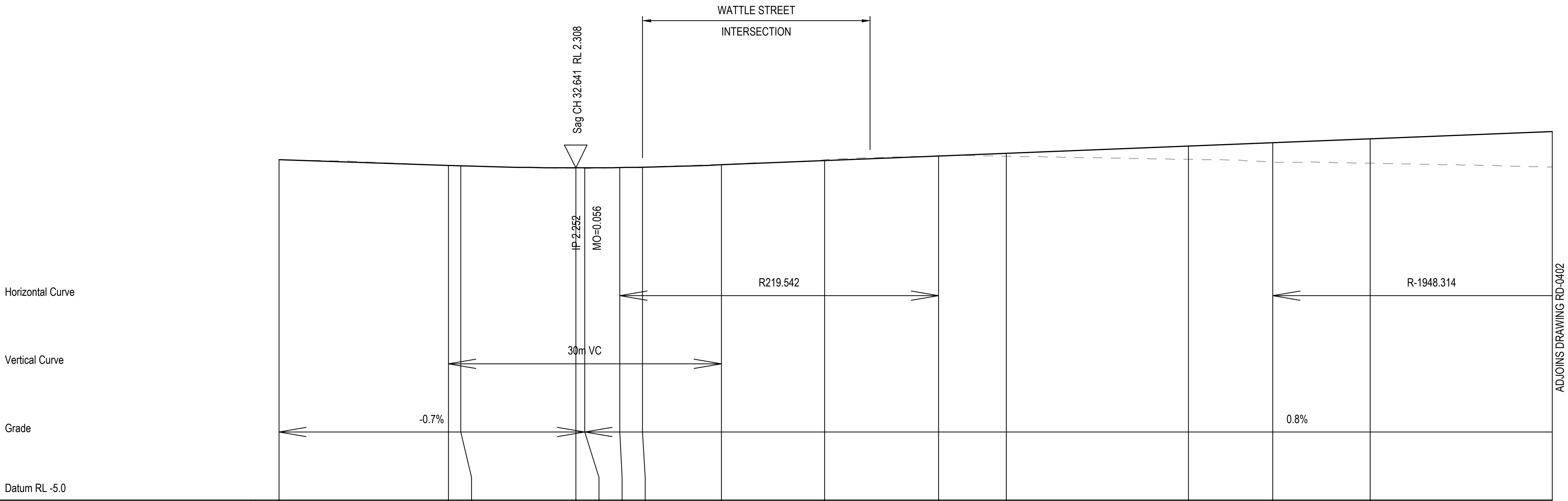
PREPARED FOR
URBAN GROWTH

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE ROAD
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
ROADWORKS PLAN
SHEET 3 OF 3

A3

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01

ISSUE STATUS: CONCEPT DESIGN
EDMS No.:
SHEET No.: RD-0303
ISSUE: 1



Proposed Level	2.49	2.36	2.35	2.31	2.31	2.31	2.32	2.37	2.46	2.56	2.62	2.78	2.86	2.94	3.10
Existing Level				2.31	2.31	2.31	2.32	2.37	2.46	2.56	2.62	2.78	2.86	2.94	3.10
Chainage	0.000	18.641	20.000	32.641	33.641	37.491	40.000	48.641	60.000	72.528	80.000	100.000	109.272	120.000	140.000

1:500 Hor - 1:100 Ver

Longitudinal Section - MC00

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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
1	25.09.2019	RE-ISSUED FOR CONCEPT DESIGN		B.SOO

SCALES ON A3 SIZE DRAWING
HORIZONTAL SCALE 1:500 (0 5 10 15 20)
VERTICAL SCALE 1:100 (0 1 2 3 4)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
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MM DRAWING NUMBER: CI-RD3-D20 RD-0401

PLOT DATE / TIME: 25/9/2019 5:33:02 PM
PLOT BY: PAC82679

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

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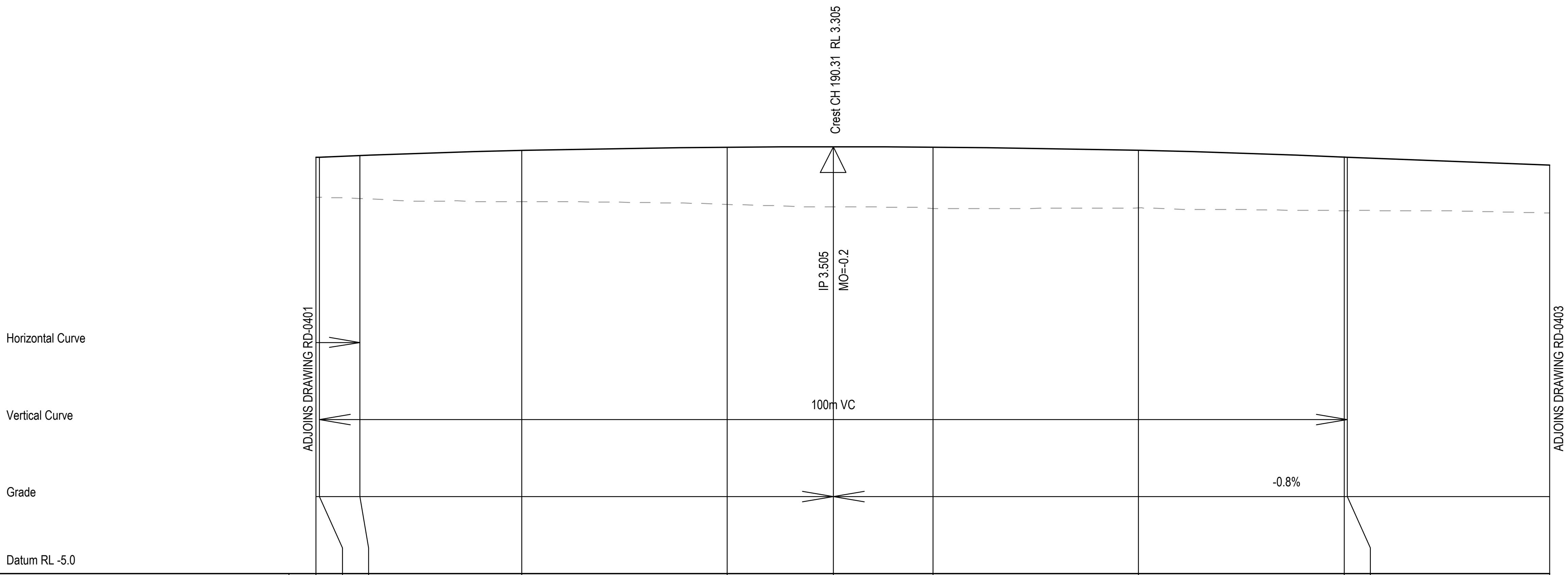
PREPARED FOR
URBAN GROWTH

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE ROAD
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
ROADWORKS LONGITUDINAL SECTIONS
SHEET 1 OF 3

A3

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01
ISSUE STATUS: CONCEPT DESIGN
EDMS No.:
SHEET No.: RD-0401
ISSUE: 1



Proposed Level	3.10	3.11	3.14	3.23	3.30	3.31	3.30	3.23	3.11	3.11	2.95
Existing Level	3.10	3.11	3.14	3.23	3.30	3.31	3.30	3.23	3.11	3.11	2.95
Chainage	140.000	140.310	144.272	160.000	180.000	190.310	200.000	220.000	240.000	240.310	260.000

1:500 Hor - 1:100 Ver

Longitudinal Section - MC00

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DESIGN LOT CODE

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EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
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SCALES ON A3 SIZE DRAWING
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
MOTT MACDONALD
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MM DRAWING NUMBER: CI-RD3-D20 RD-0402

PLOT DATE / TIME: 25/9/2019 5:33:18 PM
PLOT BY: PAC82679

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

CLIENT
UrbanGrowth NSW Development Corporation

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ULTIMO - CITY OF SYDNEY
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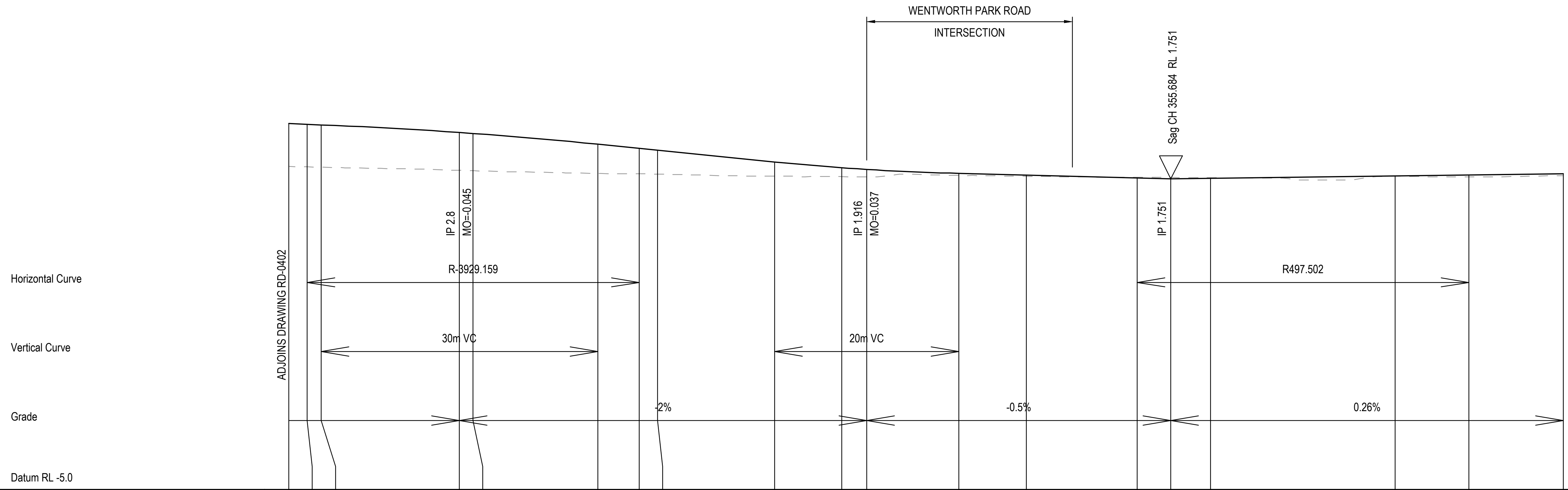
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
ROADWORKS LONGITUDINAL SECTIONS
SHEET 2 OF 3

A3

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01
ISSUE STATUS: CONCEPT DESIGN
EDMS No.:
SHEET No.: RD-0402
ISSUE: 1



Chainage	Proposed Level	Existing Level
260.000	2.95	2.95
262.010	2.93	2.93
263.511	2.92	2.92
278.511	2.75	2.75
280.000	2.73	2.73
293.511	2.50	2.50
298.011	2.41	2.41
300.000	2.37	2.37
312.703	2.12	2.12
320.000	1.99	1.99
322.703	1.95	1.96
332.703	1.87	1.87
340.000	1.83	1.83
352.030	1.77	1.77
355.684	1.75	1.75
360.000	1.76	1.76
380.000	1.81	1.81
388.036	1.84	1.84
398.267	1.86	1.86

1:500 Hor - 1:100 Ver

Longitudinal Section - MC00

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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING

EXTERNAL REFERENCE FILES

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0	9.10.2018	ISSUED FOR CONCEPT DESIGN		B.SOO
1	25.09.2019	RE-ISSUED FOR CONCEPT DESIGN		B.SOO

SCALES ON A3 SIZE DRAWING
HORIZONTAL SCALE 1:500 (0, 5, 10, 15, 20)
VERTICAL SCALE 1:100 (0, 1, 2, 3, 4)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
MOTT MACDONALD
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Sydney, NSW 2000
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MM DRAWING NUMBER: CI-RD3-D20 RD-0403

PLOT DATE / TIME: 25/9/2019 5:33:33 PM
PLOT BY: PAC82679

TITLE	NAME	DATE
DRAWN	GA.PACIBEN	25.09.19
DRG CHECK	B.SOO	25.09.19
DESIGN	GA.PACIBEN	25.09.19
DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

CLIENT
NSW GOVERNMENT
UrbanGrowth NSW Development Corporation

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BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
ROADWORKS LONGITUDINAL SECTIONS
SHEET 3 OF 3

A3

RMS REGISTRATION No.: DS2018/XXXXXX
PART: 01

ISSUE STATUS: CONCEPT DESIGN
EDMS No.:
SHEET No.: RD-0403
ISSUE: 1

EXISTING PUBLIC UTILITIES LEGEND

POLE - LIGHT	
STAY POLE	
ELEC. CABLE JUNCTION BOX	EJB
DISTRIBUTION FUSE POINT	EFP
STAY ANCHOR POLE	
POLE - POWER	EP
POLE - POWER AND LIGHT	
POLE - POWER AND TRANSFORMER	
DISTRIBUTION FUSE POINT	EFP
ELEC. CABLE MARKER	EC
GARDEN LIGHT	EGL
HIGH TENSION PYLON	
ELEC UNDERGROUND LINE	eeu
ELEC UG LINE - DIGITISED	eez
ELEC - HOUSE CONNECTION	eeh
ELECTRICITY CONDUIT	eec
MAJOR TRANSMISSION LINE	ee
MINOR TRANSMISSION LINE	

TELECOMMUNICATIONS SUMP	
TELECOMMUNICATIONS SINGLE CONCRETE PIT	
TELECOMMUNICATIONS TWIN CONCRETE PIT	
OPTICAL FIBRE CABLE MARKER	OFC
TELECOMMUNICATIONS DISTRIBUTION PILLAR	
TELECOMMUNICATIONS POLE	TPL
TELECOMMUNICATIONS LINE	et
TELECOMMUNICATIONS - DIGITISED	etz

WATER MAIN MARKER	WM
WATER HYDRANT	WH
STOP VALVE	
WATER METER	
WATER TAP	
AIR VALVE	
WATER - HOUSE CONNECTION	ewh
WATER MAIN	ew
WATER MAIN - DIGITISED	ewz

SEWER VENT PIPE	SVP
SEWER LAMPHOLE	SLH
SEWER MANHOLE COVER	
SEWER MAIN	es

EXISTING STORMWATER LINE	esw

GAS MAIN	elg

RMS TRAFFIC SIGNAL CONDUIT	rms

EXISTING UTILITY LINE TO BE DECOMMISSIONED	x x x x

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DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

CLIENT: NSW GOVERNMENT UrbanGrowth NSW Development Corporation

PREPARED FOR: URBAN GROWTH

ULTIMO - CITY OF SYDNEY
MR 00000 - BRIDGE ROAD
SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
EXISTING UTILITIES LEGEND

A3

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PART: 01

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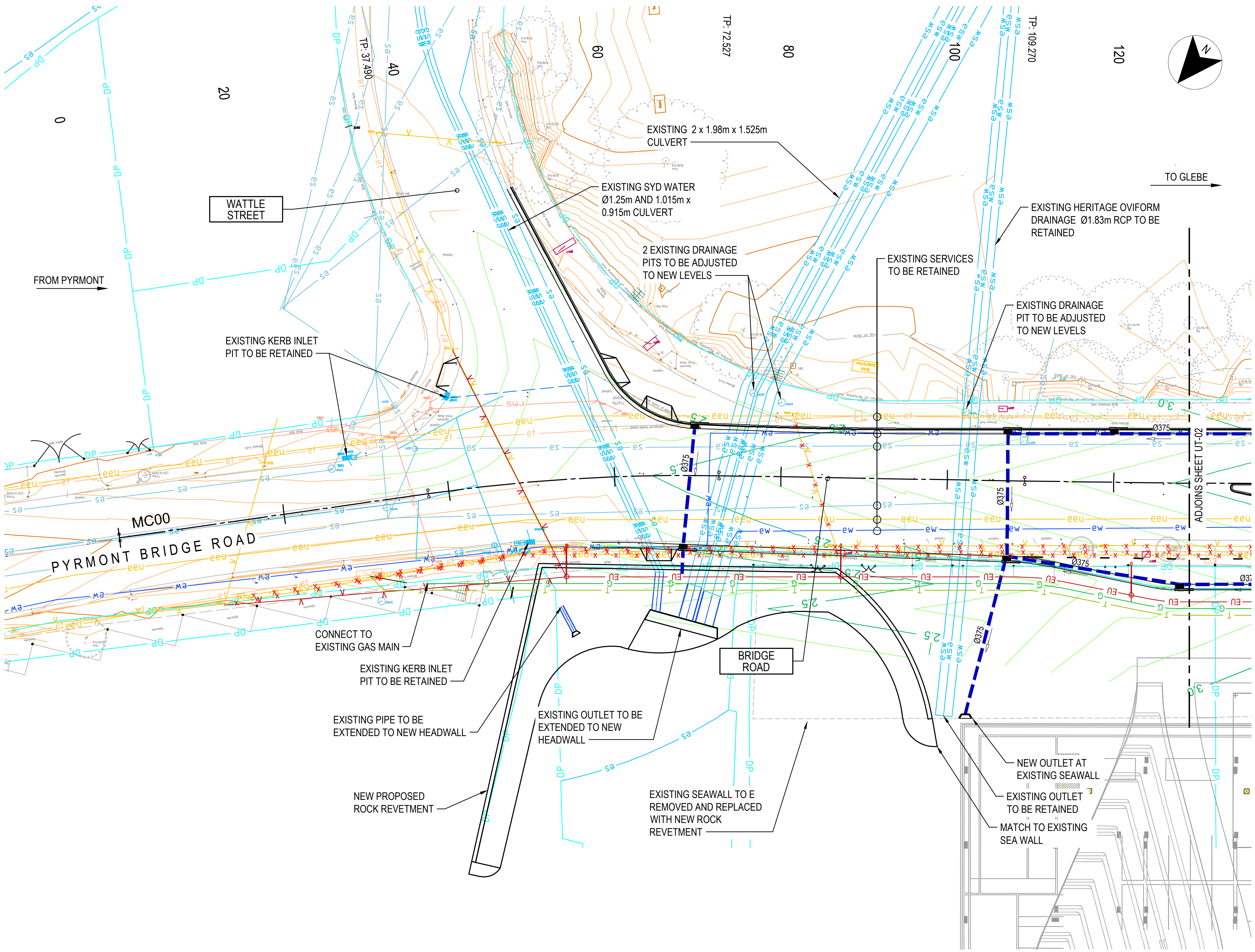

UTILITIES LEGEND

- EU — NEW UNDERGROUND DISTRIBUTION (11kV)
- V — NEW OVERHEAD POWER LINE
- T — NEW TELSTRA COMMUNICATIONS TRENCH WITH PIT
- G — NEW GAS MAIN
- PROPOSED NEW STORMWATER DRAINAGE PIT AND PIPE
- x x x x — EXISTING SERVICE TO BE REMOVED
- eWC — EXISTING WATER COURSE
- EXISTING STORMWATER PIPE (DBYD)
- 85.0 — EXISTING SURFACE CONTOURS MAJOR
- EXISITNG SURFACE CONTOURS MINOR
- 85.0 — DESIGN SURFACE CONTOURS MAJOR
- DESIGN SURFACE CONTOURS MINOR
- NEW LIGHT POLE

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PROJECT MNGR	G.BABCOCK	25.09.19

CLIENT: NSW GOVERNMENT UrbanGrowth NSW Development Corporation

PREPARED FOR: URBAN GROWTH

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BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
DRAINAGE AND PUBLIC UTILITIES PLAN
SHEET 1 OF 3

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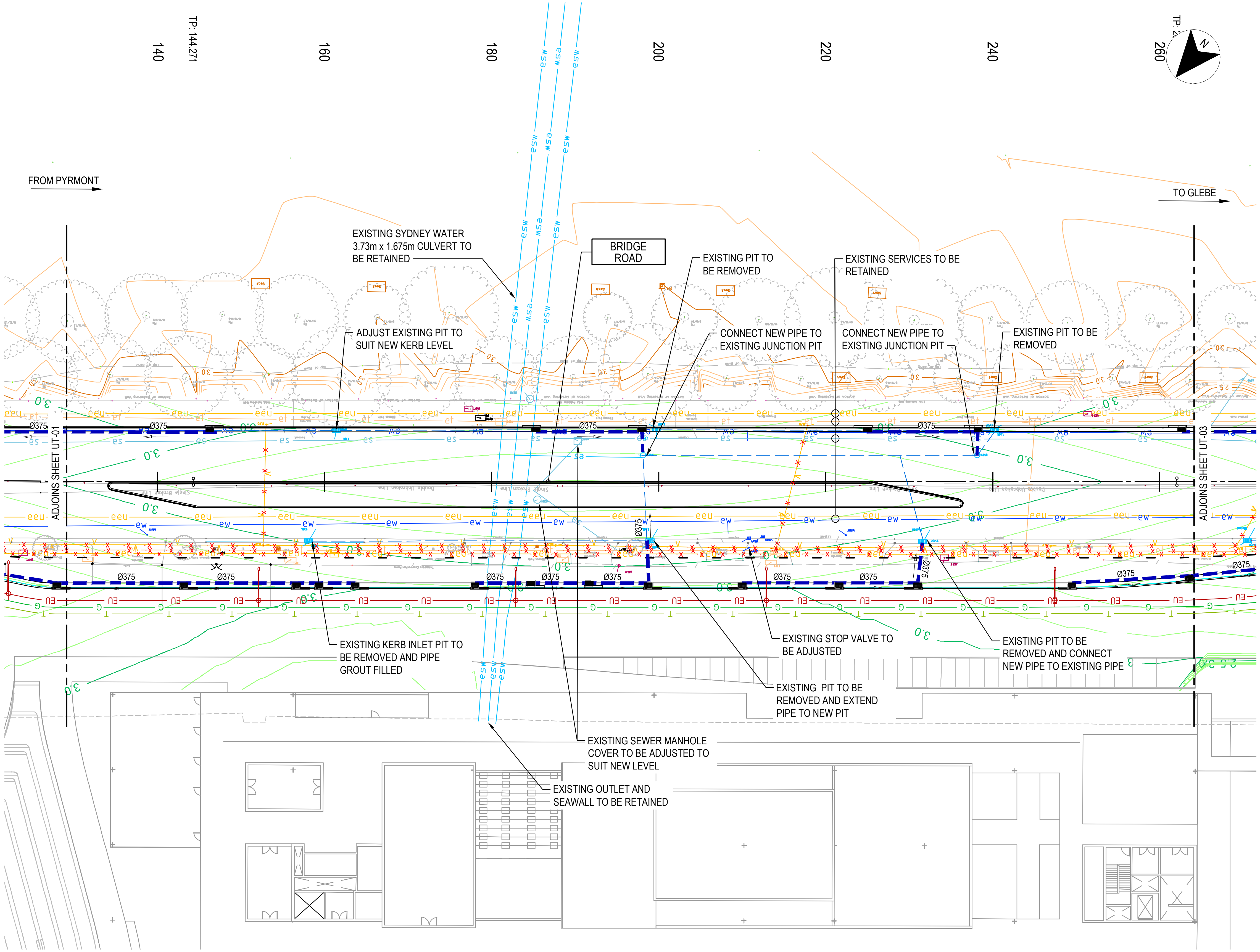

UTILITIES LEGEND

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- NEW OVERHEAD POWER LINE
- NEW TELSTRA COMMUNICATIONS TRENCH WITH PIT
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- PROPOSED NEW STORMWATER DRAINAGE PIT AND PIPE
- EXISTING SERVICE TO BE REMOVED
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- EXISTING STORMWATER PIPE (DBYD)
- EXISTING SURFACE CONTOURS MAJOR
- EXISITNG SURFACE CONTOURS MINOR
- DESIGN SURFACE CONTOURS MAJOR
- DESIGN SURFACE CONTOURS MINOR
- NEW LIGHT POLE

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DESIGN CHECK	V.SOFREVSKI	25.09.19
DESIGN MNGR	B.SOO	25.09.19
PROJECT MNGR	G.BABCOCK	25.09.19

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BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD
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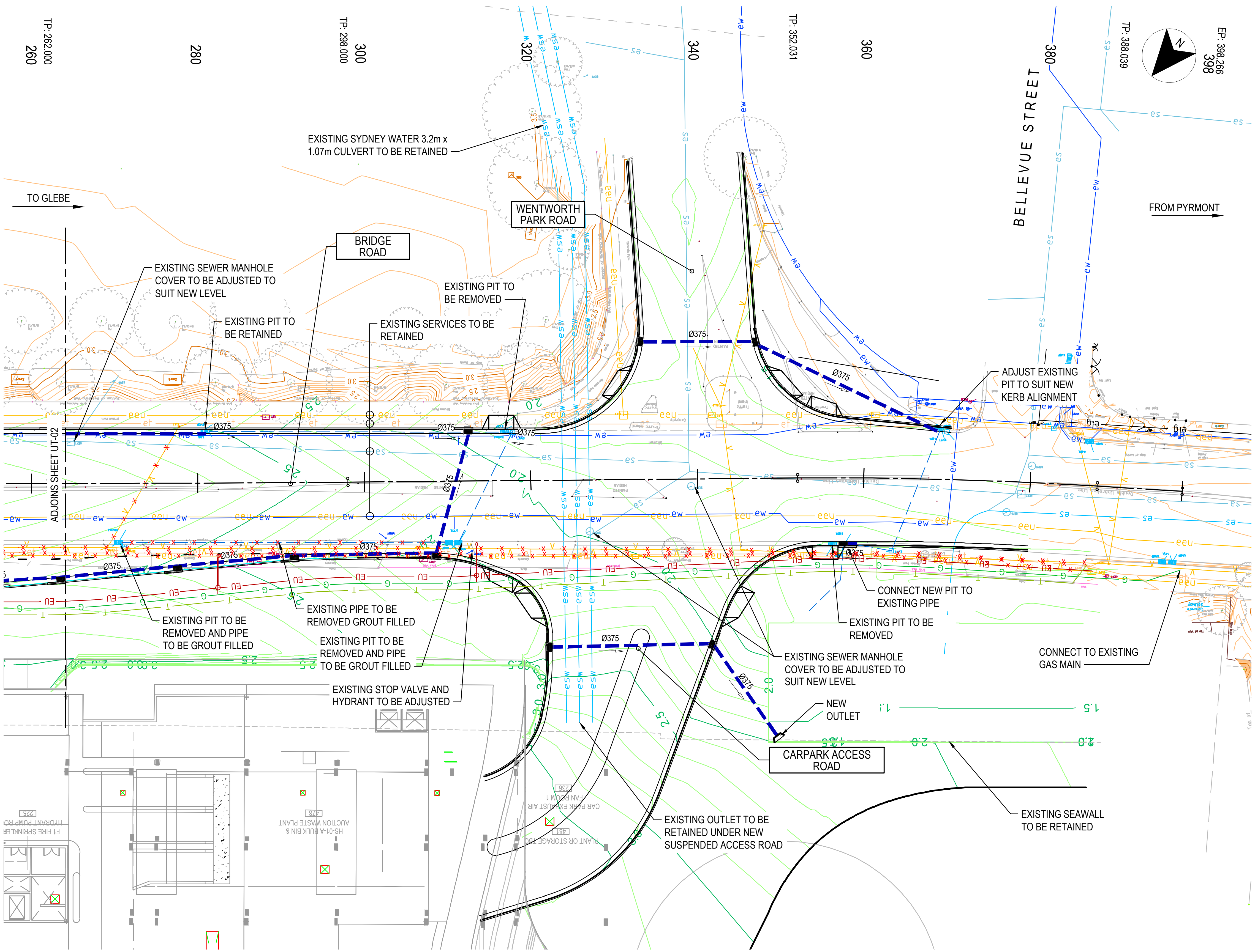

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A3

SYDNEY FISH MARKET
BRIDGE ROAD UPGRADE
FROM WATTLE STREET TO WENTWORTH PARK ROAD

DRAINAGE AND PUBLIC UTILITIES PLAN
SHEET 3 OF 3

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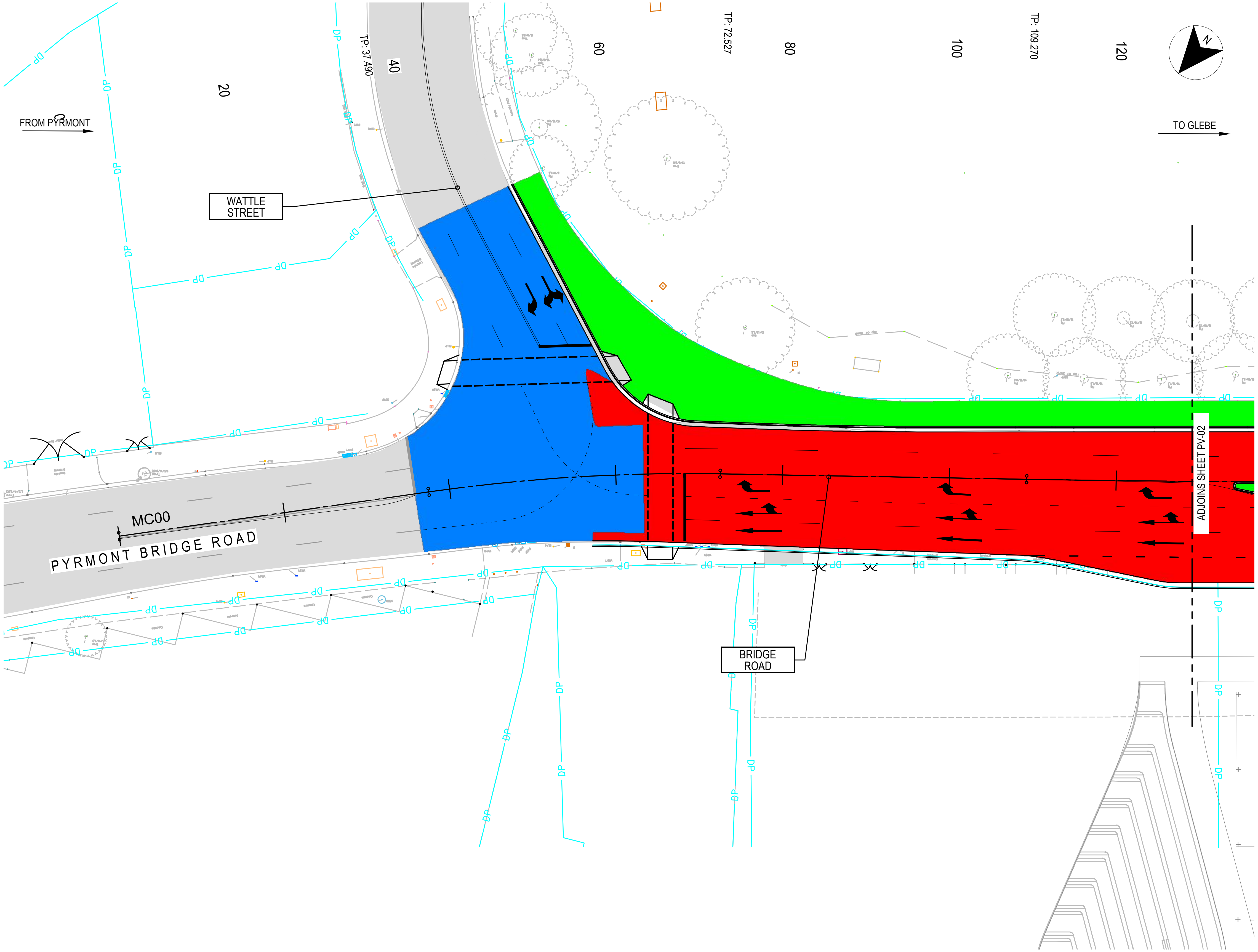

PAVEMENT LEGEND

- EXISTING DP BOUNDARY
- PAVEMENT TYPE 1 - NEW FULL DEPTH PAVEMENT
- PAVEMENT TYPE 2 - AC CORRECTIVE OVERLAY
- PAVEMENT TYPE 3 - CONCRETE PAVEMENT
- EXISTING PAVEMENT

NOTES

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PAVEMENT PLAN
SHEET 1 OF 3

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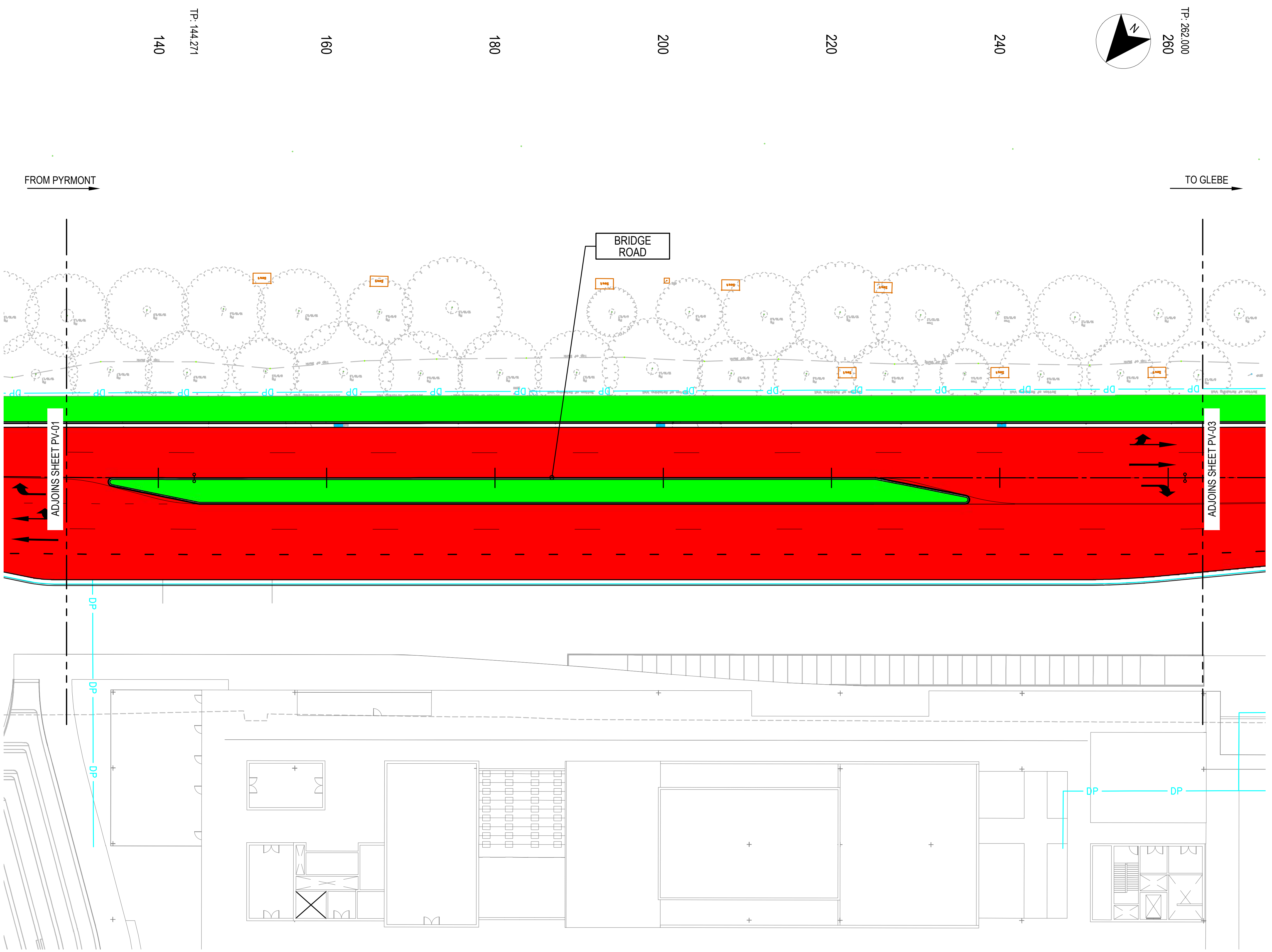

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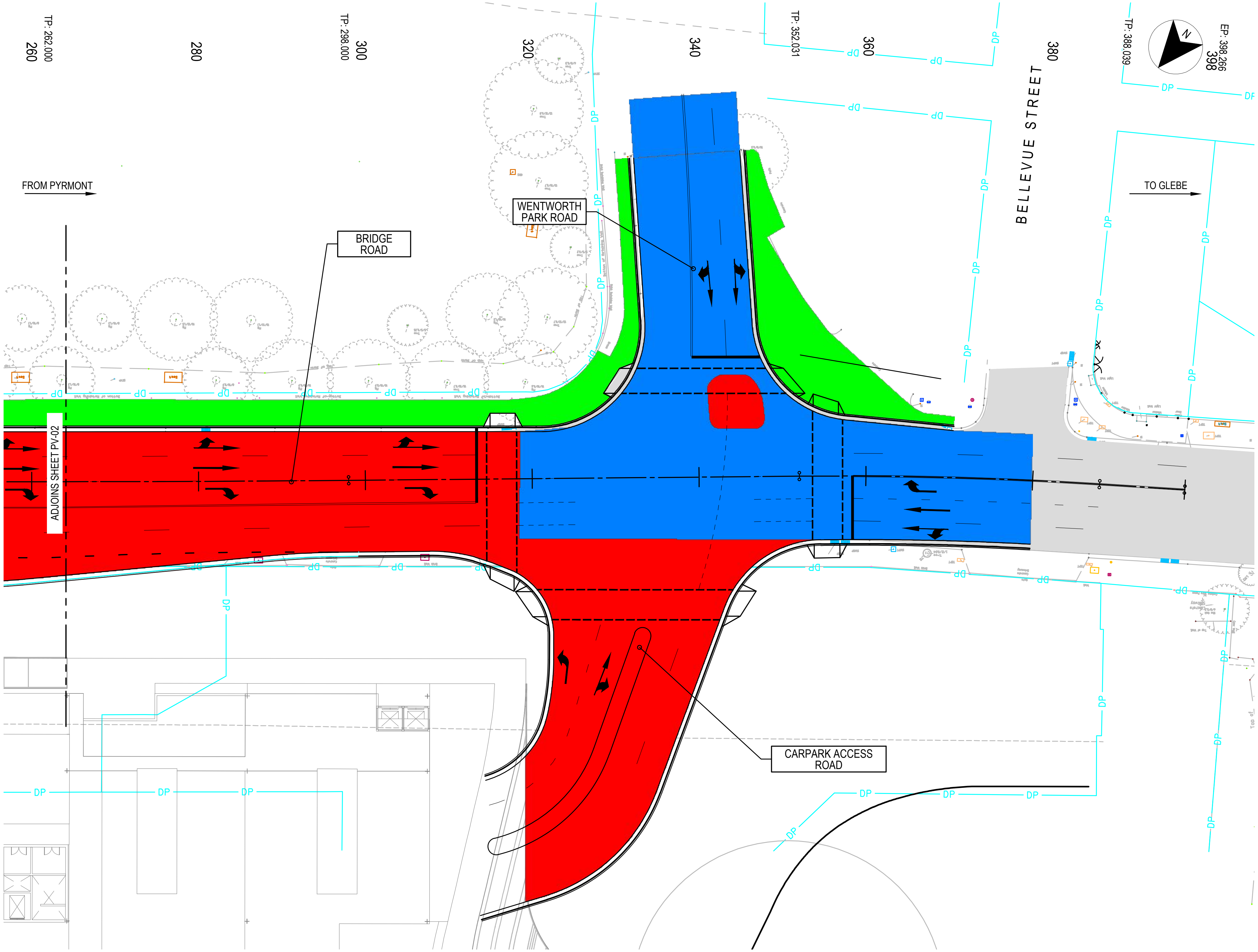

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SHEET 3 OF 3

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MOTT MACDONALD

UrbanGrowth NSW

New Sydney Fish Market

Bridge Road Upgrade - Strategic Concept Design Report

31 May 2019

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New Sydney Fish Market

Bridge Road Upgrade - Strategic Concept Design Report

31 May 2019

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	05.10.2018	Brian Soo	Vlad Sofrevski	Graham Babcock	Issue for RMS review
B	31.05.2019	Brian Soo	Vlad Sofrevski	Graham Babcock	Re-issue for RMS review

Document reference: 385951-Bridge Road Concept Design Report

Information class: Standard

Contents

Executive summary

Mott MacDonald with partners Arcadis and Royal Haskoning DHV are providing Structural, Civil and Maritime Engineering Design Services to support the development of the new Sydney Fish Markets. The vision for the new development is that of a world class facility designed to accommodate future growth and establish itself as an icon of the Bays District.

The new Sydney Fish Market is located along Bridge Road in between Wentworth Park Road and Wattle Street. The existing Bridge Road will be upgraded to support the new market and also to improve the safety and performance of the intersection with Bridge Road, Wattle Street and Wentworth Park Road as part of increased traffic from the new fish market including ongoing growth and development.

This report summarises the designs that have been developed during the concept phase to feed into the State Significant Assessment Development Application (SSA-DA) submission.

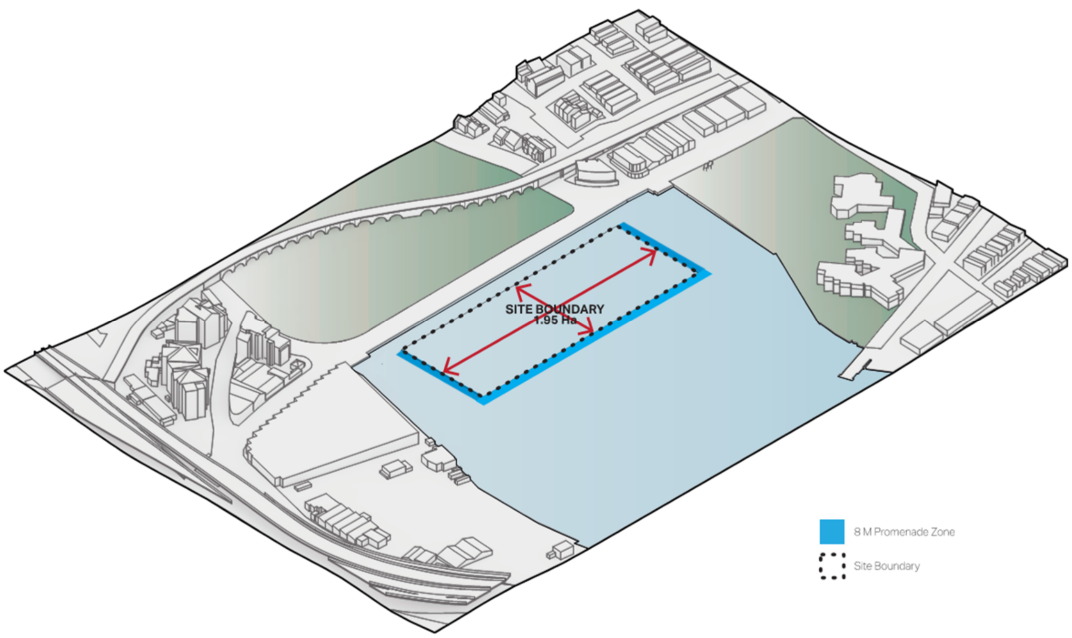
1 Introduction

1.1 Description of Project

UrbanGrowth NSW Development Corporation (UrbanGrowth NSW) have engaged Mott MacDonald with partners Arcadis and Royal Haskoning DHV to provide structural, civil and maritime Engineering Design Services to support the development of the new Sydney Fish Markets. The vision for the new development is that of a world class facility designed to accommodate future growth and establish itself as an icon of the Bays District.

The new facility will be situated in Blackwattle Bay, adjacent to Pyrmont Bridge Road, adjacent to the existing Fish Markets site, as indicated in Figure 1 below.

Figure 1: Site Layout



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1.2 Scope of Report

This report covers the design philosophy, key design parameters and constraints and assumptions that have been made in developing the engineering scheme for the new facility.

The New Sydney Fish Market project requires upgrade of the existing Bridge Road to support the new vehicle access to the new market. The upgrade is also required to improve the safety and performance of the intersection with Bridge Road, Wattle Street and Wentworth Park Road as part of increased traffic from the new fish market including ongoing growth and development.

1.3 Project Team

Mott MacDonald are providing structural, civil and maritime engineering services, supported by Royal Haskoning DHV and Arcadis as sub-consultants. They supplement the team's capabilities with their proven expertise in delivering world class civil foreshore and maritime design.

1.4 Limitations of this Report

This report has been prepared to support the project DA submission. Therefore, there remain many unknowns regarding the functional and architectural requirements of the project that will be developed as the design progresses.

This report summarises the design decisions that have been made in forming a base scheme and preliminary cost estimate. Specific details of large areas of the design are yet to be developed.

2 Road Design

2.1 Design Speed

The strategic concept design was based on design speed of 60 km/h for all roads and intersections. The existing roads are posted with a 60 km/h speed limit.

2.2 Typical Cross Section

The typical cross section for Bridge Road consists of following configurations:

- Variable width verge/footpath along the westbound carriageway, reflecting the existing conditions
- Westbound – Two through lanes with 3.0m centre through lane and 3.5m kerbside lane;
- 3.1m wide median island; and
- Eastbound – Two 3.0m through lanes and 3.5m bus drop off lane.
- Verge/footpath along the eastbound carriageway, integrated with the new development.

The proposed road formation is wider than the existing configuration and cannot be accommodated within the existing road corridor. To this, the design retains the existing road boundary on the southern (park) side of Bridge Road and therefore the required widening is occurring on the northern (development) side of the road corridor.

The typical cross sections for Bridge road at the approach to the intersections are:

- Wattle Street Intersection
  - Westbound – Two through lanes with 3.0m centre through lane and 3.5m kerbside through lane; and
  - Eastbound – 3.1m right turn lane with 3.0m shared through and right turn lane and 3.5m kerbside through lane.
- Wentworth Park Road
  - Westbound – 3.1m right turn lane with 3.0m centre through lane and 3.5m kerbside shared through and left turn lane

2.3 Road Geometry

The horizontal and vertical geometry for the proposed works was prepared using Austroads guidelines and RMS supplements as appropriate.

2.3.1 Horizontal Geometry

The proposed horizontal geometry for Bridge Road between Wattle Street and Wentworth Park Road is maintains existing as much as possible.

The Wattle Street intersection has been modified to accommodate the dual right turns from Bridge Road and from Wattle Street.

The Wentworth Park Road intersection has been modified to now include a new intersection leg connecting the development. Also, a new right turn lane from Bridge road into the new development has been added. Vertical Geometry

The vertical geometry for Bridge Road between Wattle Street and Wentworth Park Road was raised by 900mm for the new development levels and then tied back to existing levels at the two intersections.

2.4 Design Departures

Following is a summary of the elements of this design, identified at this strategic stage, that present potential departures from the relevant design standards.

These departures will need to be further reviewed and investigated during next stages of the design with consideration also given to the reasons for departure and, if not rectified, ultimately will need to be accepted and approved by the Approval Authority for the road (assumed RMS).

- At the western Wattle Street intersection leg, Bridge Road eastbound through lane, eastbound right turn lane and westbound through lane widths are less than 3.0m. This is due to the fact that the Bridge Rd upgrade ties in with existing conditions at the intersection within the limits of the existing road corridor.

- At the eastern Wentworth Park Ave intersection leg, Bridge Road eastbound through lane and westbound right turn lane widths are less than 3.0m. This is due to the fact that the Bridge Road upgrade ties in with existing conditions at the intersection within the limits of the existing road corridor.

3 Stormwater Drainage

3.1 Transverse Drainage

There is multiple transverse drainage infrastructure located across Bridge Road which formed part of the main drainage system servicing the upstream catchment. This drainage infrastructure is mainly Sydney Water Corporation assets and the table below provides a brief summary of the infrastructure

Table 1: Existing Major Drainage Infrastructure

Road Chainage	Size	Remarks
60.0	DN 1.25m RCP	
60.0	1.015m x 0.915m box culvert	
72.0	2 x 1.98 x 1.525 box culvert	
102.0	DN 1830 RCP	Junction pit is located on westbound footpath where the upstream heritage oviform pipe connects
180.0	3.73 x 1.675m box culvert	
323.0	3.2 x 1.07m box culvert	

Source: SWC DBYD and Hydra Plans

All the major drainage infrastructure listed above will be retained and no works have been proposed except modification/adjustment to several junction pits within the road reserved to raise the pit covers to suit the new finished road levels.

3.2 Pavement Drainage

3.2.1 Layout

The stormwater design for the project consists of upgrade works as follows:

- New kerb inlet pits along the new kerb and gutter on Bridge Road;
- Adjustment to existing kerb inlet and junction pits to suit the new road finished level;

3.2.2 Stormwater Modelling

A preliminary modelling of the proposed stormwater system was undertaken using the DRAINS software package. The design was undertaken in accordance with Road and Maritime Services (RMS) requirements for a local/collector road with a design recurrence internal of the 10 year ARI storm event.

3.2.2.1 Flow Width Analysis

In accordance with Austroads Guide to Road Design Part 5A states that the flow width shall not exceed 1.0m for the design recurrence interval of the 10 year ARI for local/collector road. An analysis was undertaken to calculate the flow width in each of the kerbs and position the pits accordingly, which form part of these works.

3.2.3 Water Quality

No water quality measures are proposed as part of these works

4 Structures

4.1 Wentworth Park Boundary Retaining Wall

The existing Wentworth Park boundary retaining wall adjacent to Bridge Road reserved will be retained and part of the existing wall will be buried under the new westbound footpath. Any existing pedestrian access between the park and the footpath will be retained.

4.2 Existing Blackwattle Bay Sea Wall

The existing sea wall along the northern edge of Bridge road will be retained except a short section of the wall adjacent to Wentworth Park Road intersection and approximately 45m of the existing sea wall between Road Chainage 55.0 to 100.0 will be replaced with new sea revetment wall.

4.3 Major Traffic Sign Structure

There is an existing major traffic sign structure as shown in Figure 1 that will be impacted by the new works. This sign structure will be relocated to new eastbound kerbside.

Figure 2: Existing traffic sign structure on eastbound lane

Source: Photo by Brian Soo

5 Pavements

The pavement designs for the project have not been undertaken at this stage of the project. Mott Macdonald expect the pavement design and profile will be provided by RMS in subsequent stage to enable Mott MacDonald to document in the design drawings.

As part of the strategic concept design submission, Mott MacDonald has identified the extent of new pavement works and mill and re-sheet/corrective overlay.

6 Public Utilities

6.1 Ausgrid

The existing Ausgrid electrical infrastructure on the site has been identified based on Dial Before You Dig (DBYD) records. Electrical assets within Bridge Road are located behind eastbound kerb line and the assets consists of overhead and underground High Voltage (HV) electrical cables.

The exact depths and positions of the existing reticulation mains are unknown thus further investigation are required to determine the exact existing layout.

It is expected that all existing aerial infrastructure along the Bridge Road would be abandoned or relocated underground. Furthermore, City of Sydney will likely require undergrounding of existing aerial infrastructure in the streets bounding the site. In addition, it is expected the existing underground assets to be relocated into the new road services corridor.

Existing street lighting along the eastbound kerbside will be relocated to suit the new eastbound kerb line.

6.2 Telstra and Optus

The existing Telstra and Optus communication infrastructure is located along behind the eastbound kerb line and it is expected the existing infrastructure would be abandoned and will be relocated into the new road services corridor.

The exact depths and positions of the existing communication cables are unknown thus further investigation are required to determine the exact existing layout.

6.3 Sydney Water

The existing Sydney Water infrastructure on the site has been identified based on Dial Before You Dig (DBYD) records. These records indicate the presence of the following infrastructure:

- A DN 200 DICL potable water main along the eastbound kerbside lane;
- A DN 375 CI sewerage main along the westbound kerbside lane;
- Numerous major drainage infrastructure across Bridge Road. Details are described in previous section.

It is expected the existing potable and sewerage mains underneath Bridge Road would be remained untouched/undisturbed. It has been identified that several potable water surface fixtures (e.g. valve & hydrant) and sewerage manhole will require adjustment to the new Bridge Road finishes surface level.

6.4 Jemena

The existing Jemena gas infrastructure on the site has been identified based on Dial Before You Dig (DBYD) records. Gas assets within Bridge Road is located behind eastbound kerb line and the assets consists of an DN 110 Nylon gas main.

The exact depths and positions of the existing gas main is unknown thus further investigation are required to determine the exact existing layout. It is expected the existing infrastructure would be abandoned and will be relocated into the new road services corridor.

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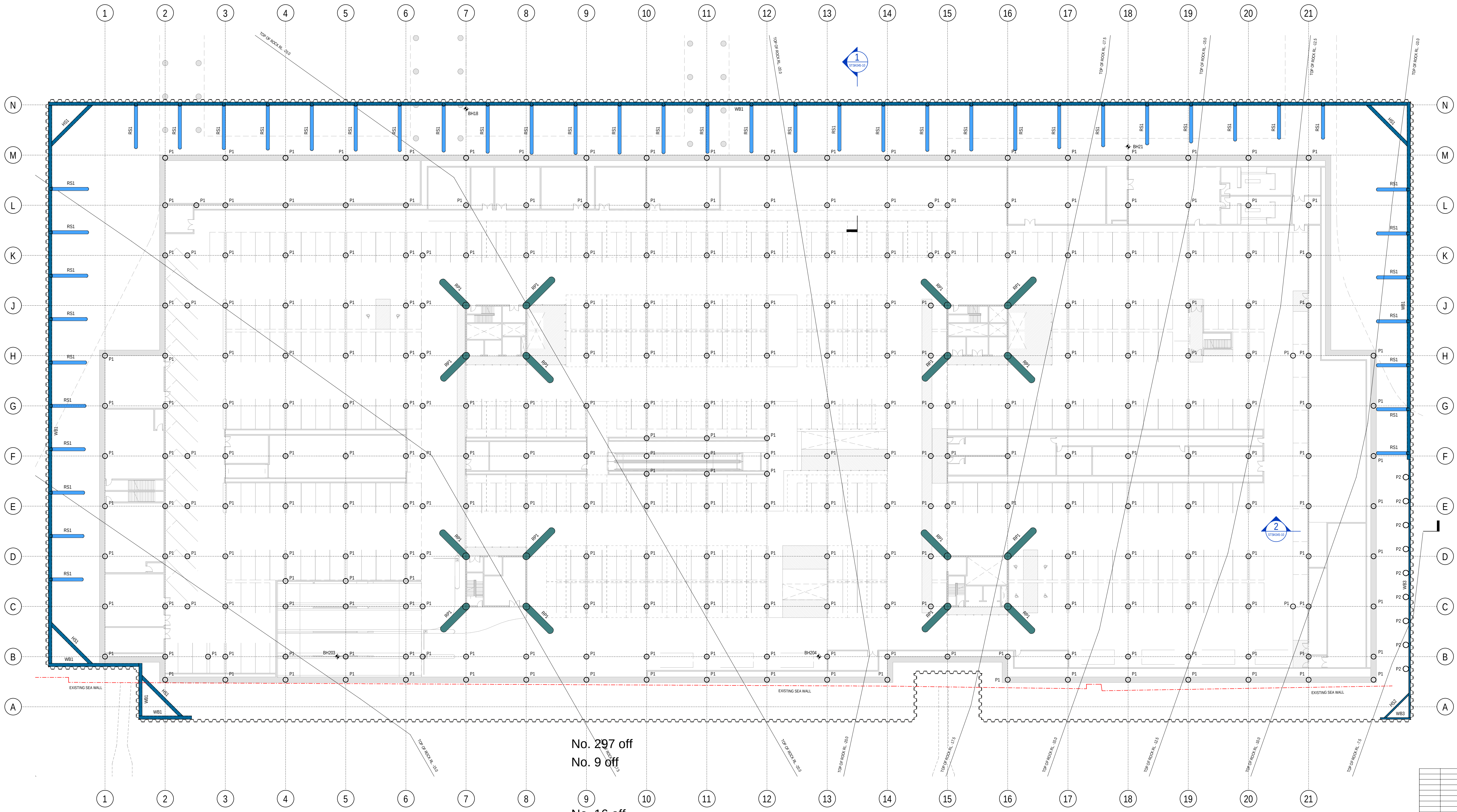
C. Temporary Sheet Pile Wall Reference Design



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OVERALL SITE - FOUNDATION PLAN
SCALE 1 : 250

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~730m

NOTES:

ROCK CONTOURS SHOWN ARE INDICATIVE ONLY

MEMBER SCHEDULE

PILES
P1 = 914.4 x 20mm CHS (1500mm SOCKET INTO ROCK)
P2 = 1016 x 20mm CHS AT 4500mm Cts. MAX. (4500mm SOCKET INTO ROCK)

RAKING PILE
RP1 = 1219.2 x 20mm CHS (1500mm SOCKET INTO ROCK)

SHEET PILES
AZ34

WAILER BEAMS
WB1 = 800x600x28.0mm FABRICATED RHS
WB2 = 310UC96.8

RAKING STRUTS
RS1 = 610 x 24.6mm CHS AT 8000mm Cts. MAX. (1000mm SOCKET INTO ROCK)

HORIZONTAL STRUTS
HS1 = 800x600x28.0mm FABRICATED RHS
HS2 = 310UC96.8

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If this drawing is printed or plotted at a size other than A0 - DO NOT SCALE DIMENSIONS FROM DRAWING
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Rev	Issued	Revision Description	Date
1	T.B.	ISSUED FOR INFORMATION	??.??.????

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Client
URBANGROWTH NSW

Project
SYDNEY FISH MARKETS

Title
OVERALL SITE - FOUNDATION PLAN

Scale (A0)			
1 : 250			
Drawn	Checked	Approved	Drawing Status
T.Bosman	J.Parkes	G.Babcock	INFORMATION
Project Number	Drawing Number		Revision
385951	STSK045-01		1

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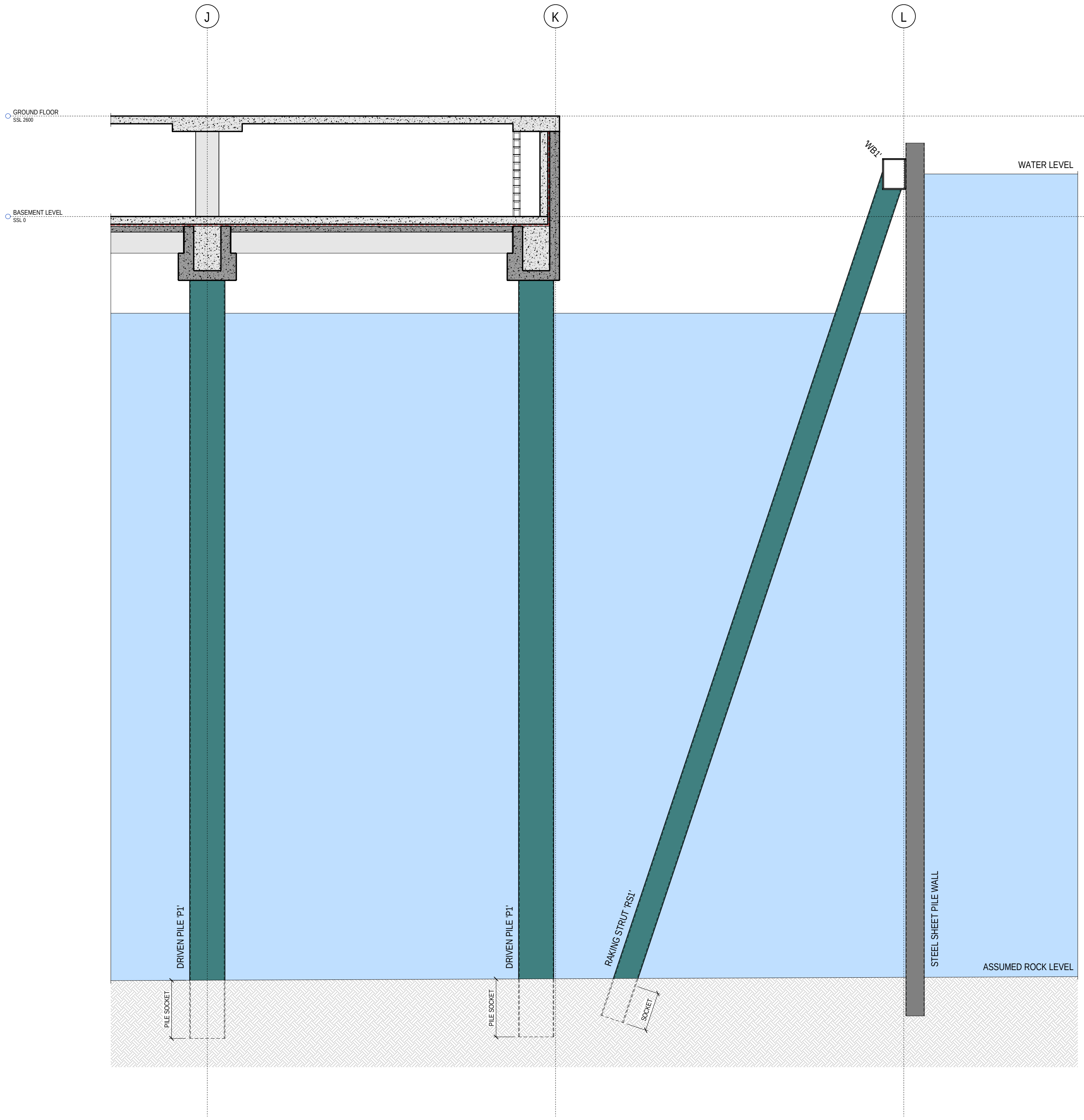

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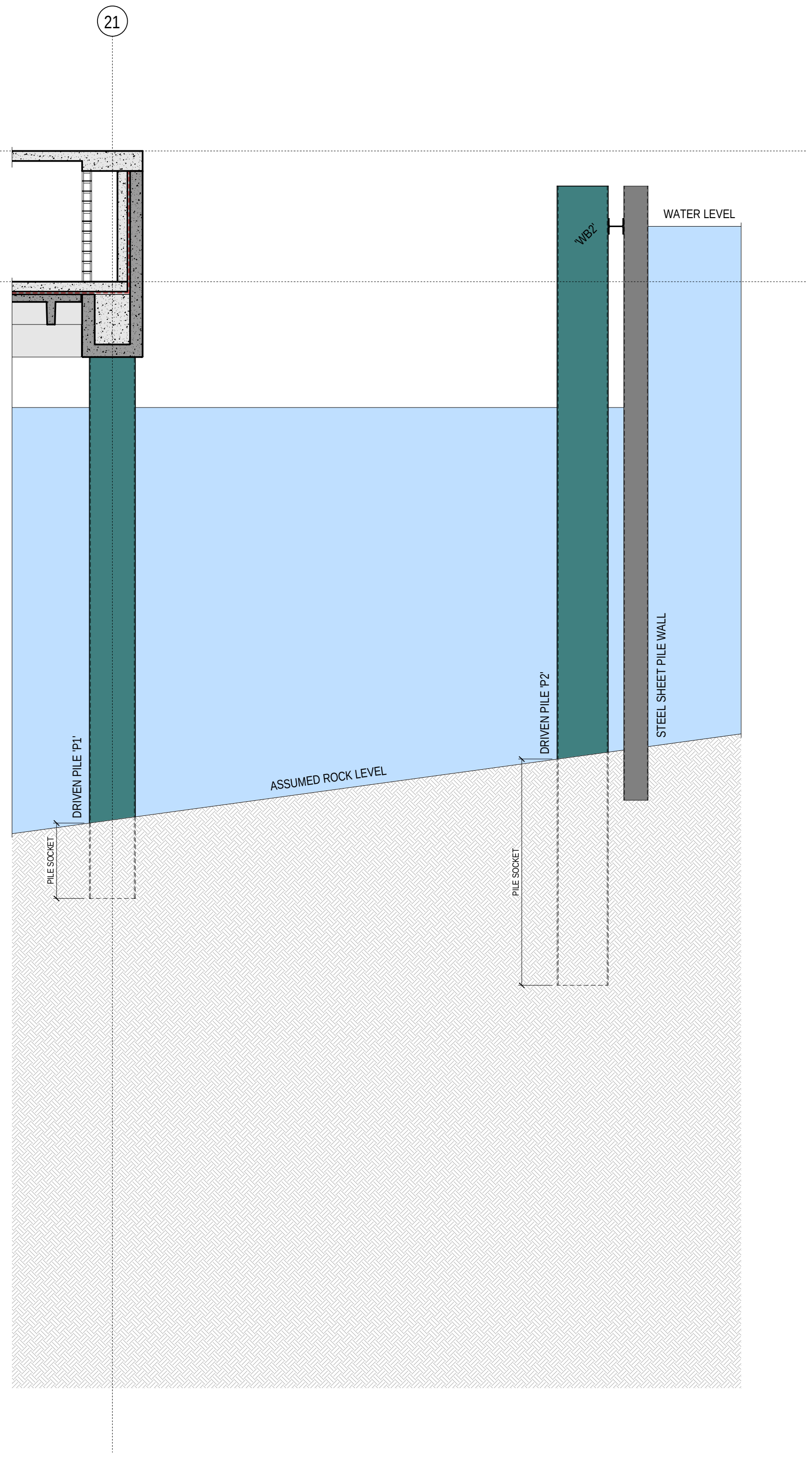

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Key Plan

NOTES:

ROCK CONTOURS SHOWN ARE INDICATIVE ONLY

MEMBER SCHEDULE

PILES
P1 = 914.4 x 20mm CHS (1500mm SOCKET INTO ROCK)
P2 = 1016 x 20mm CHS AT 4500mm Cts. MAX. (4500mm SOCKET INTO ROCK)

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HORIZONTAL STRUTS
HS1 = 800x600x28.0mm FABRICATED RHS
HS2 = 310UC96.8

Rev	Issued	Revision Description	Date
1	T.B.	ISSUED FOR INFORMATION	19.02.2018

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URBANGROWTH NSW

Project
SYDNEY FISH MARKETS

Title
FOUNDATION SECTIONS - SHEET 1

Scale (A0)
1 : 50

Drawn	Checked	Approved	Drawing Status
T.Bosman	J.Parkes	G.Babcock	INFORMATION

Project Number	Drawing Number	Revision
385951	STSK045-10	1

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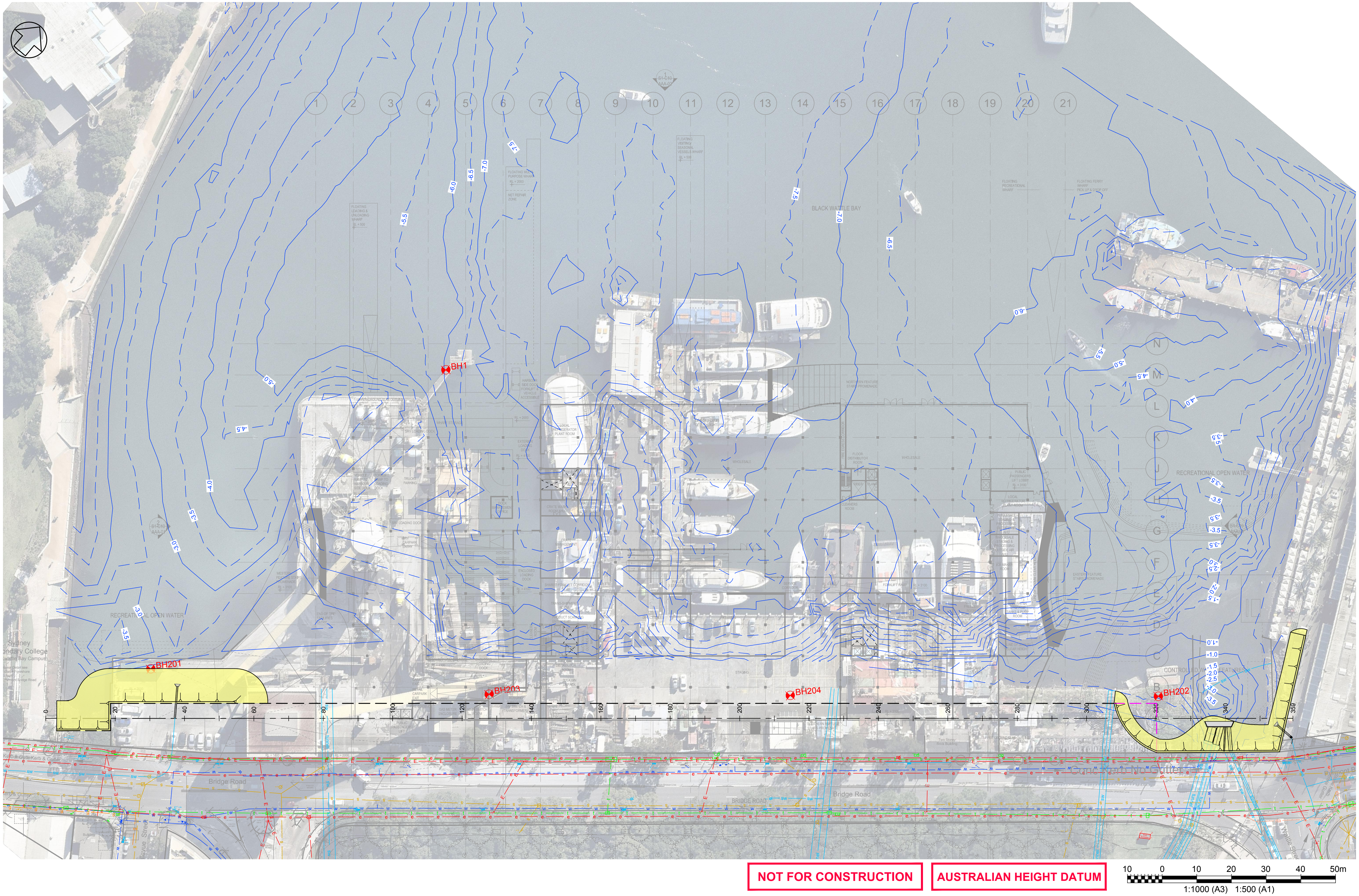
D. Rock Revetment Design


BLACK WATTLE BAY
RECREATIONAL OPEN WATER
BH1
BH201
BH202
BH203
BH204
Bridge Road
NOT FOR CONSTRUCTION
AUSTRALIAN HEIGHT DATUM
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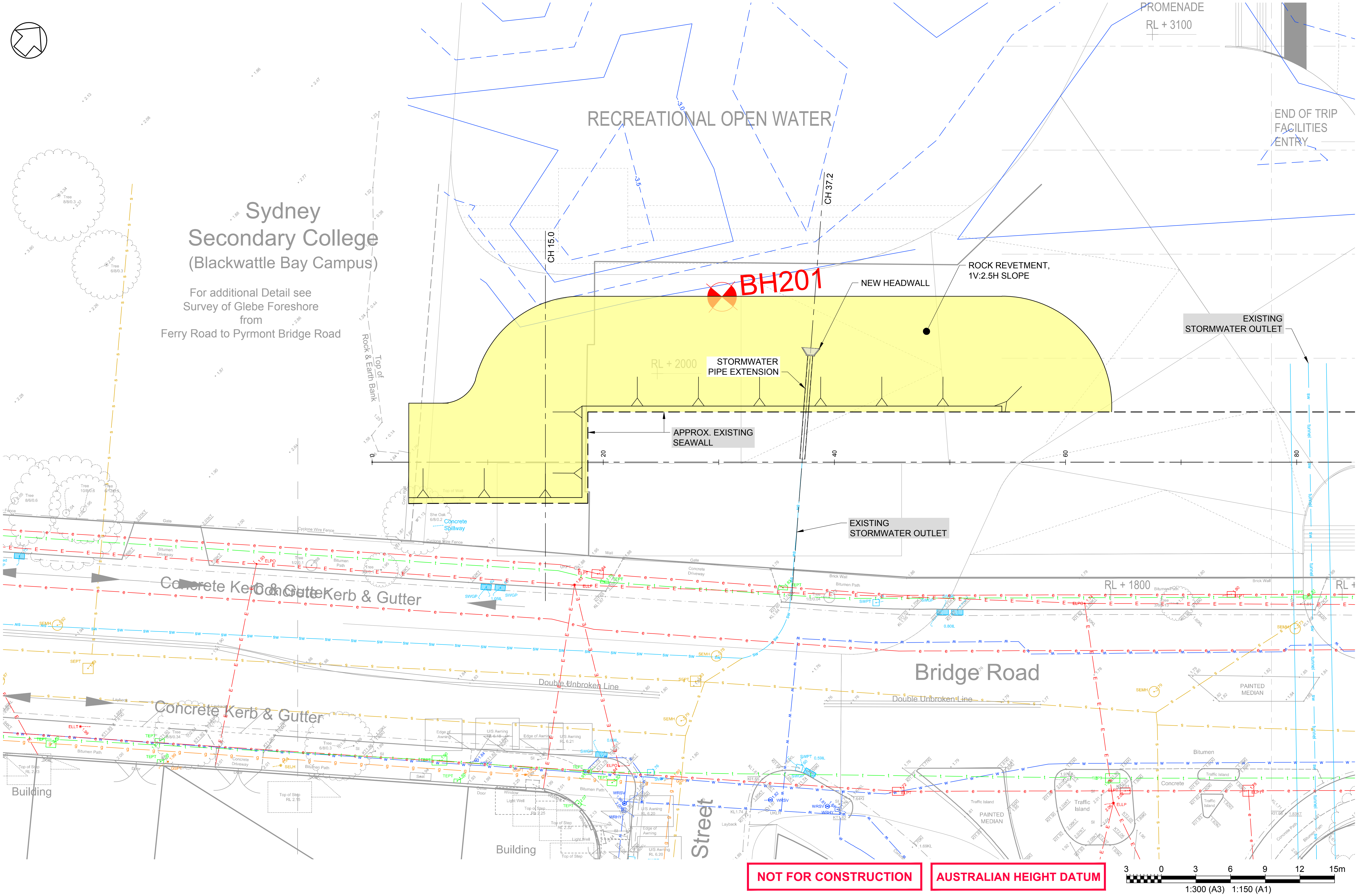
SYDNEY FISH MARKETS



SAVED: 18-Jul-18

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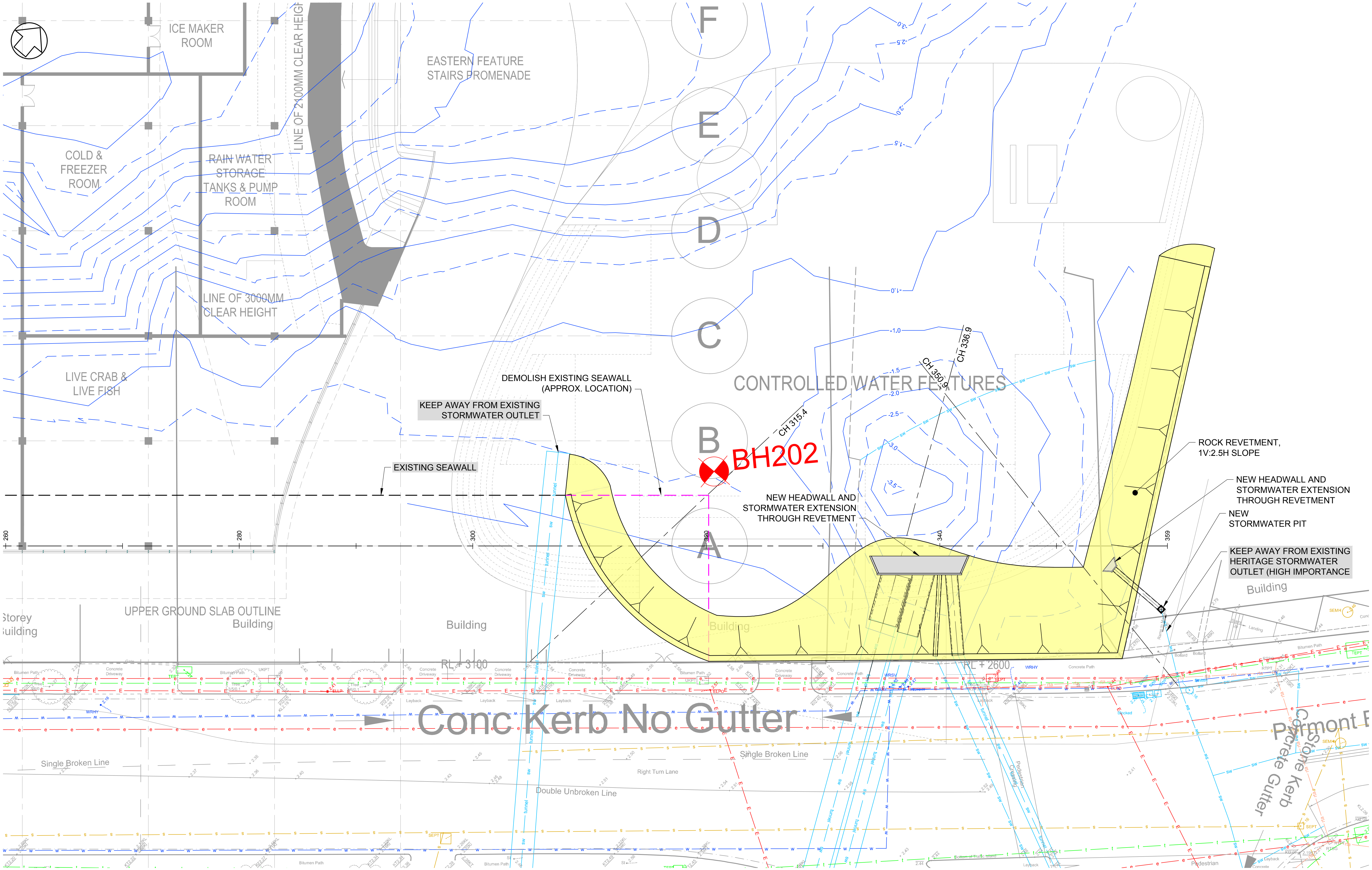

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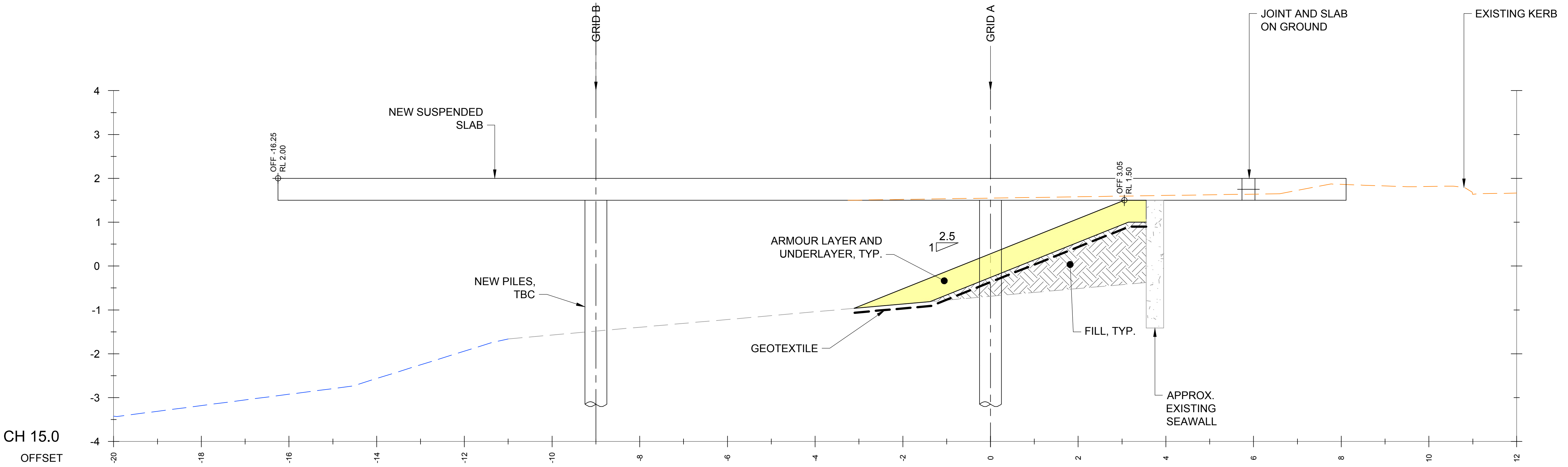
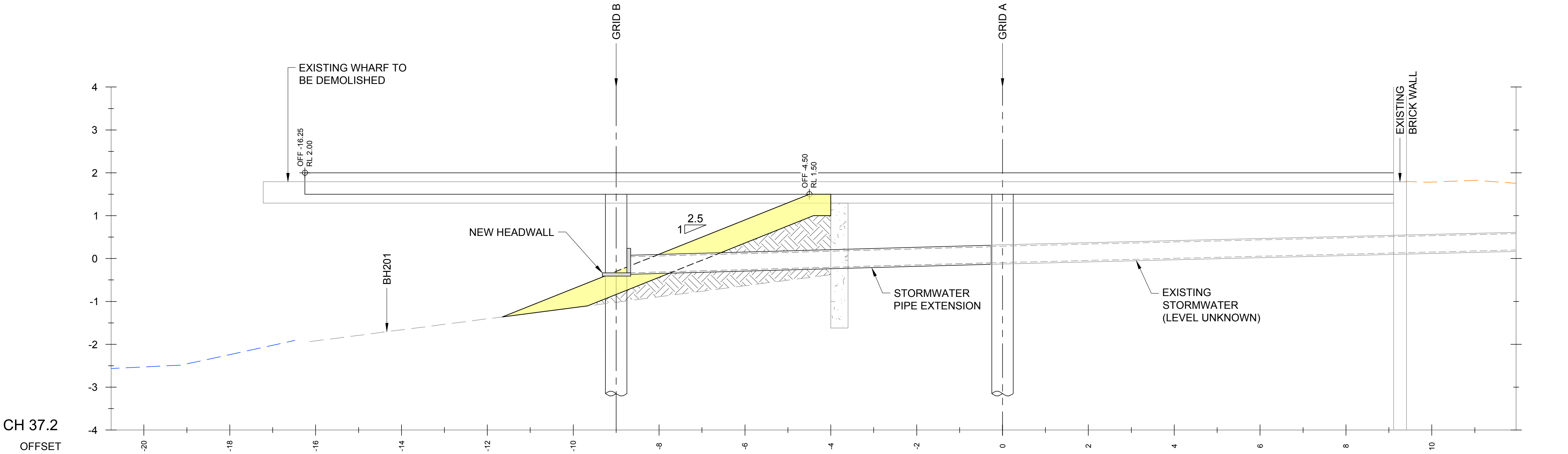
SYDNEY FISH MARKETS





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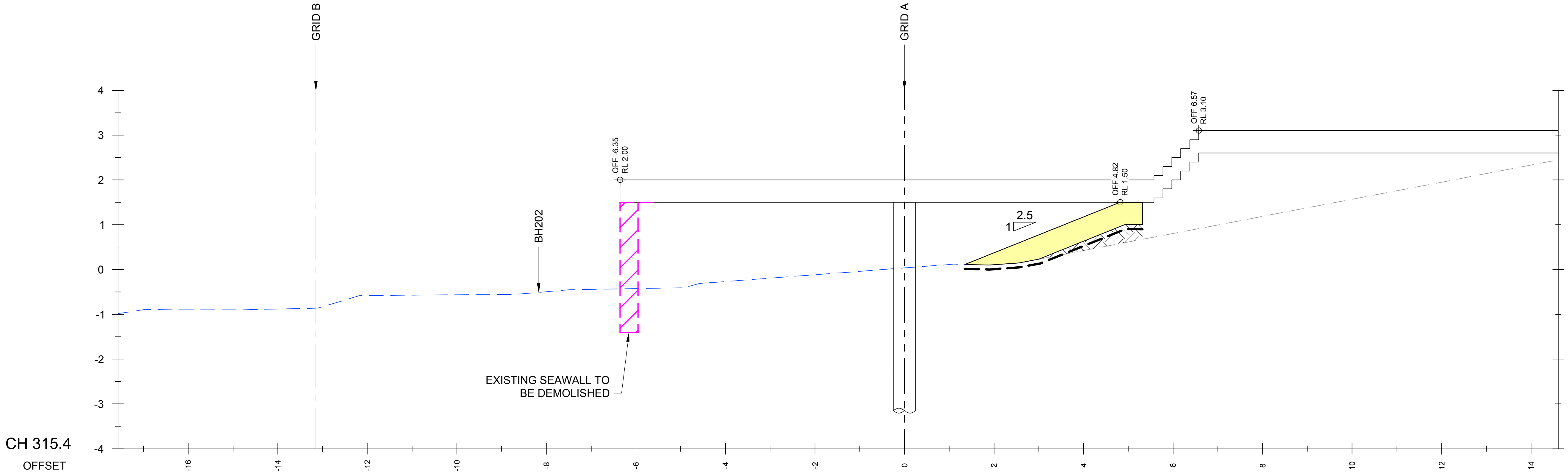

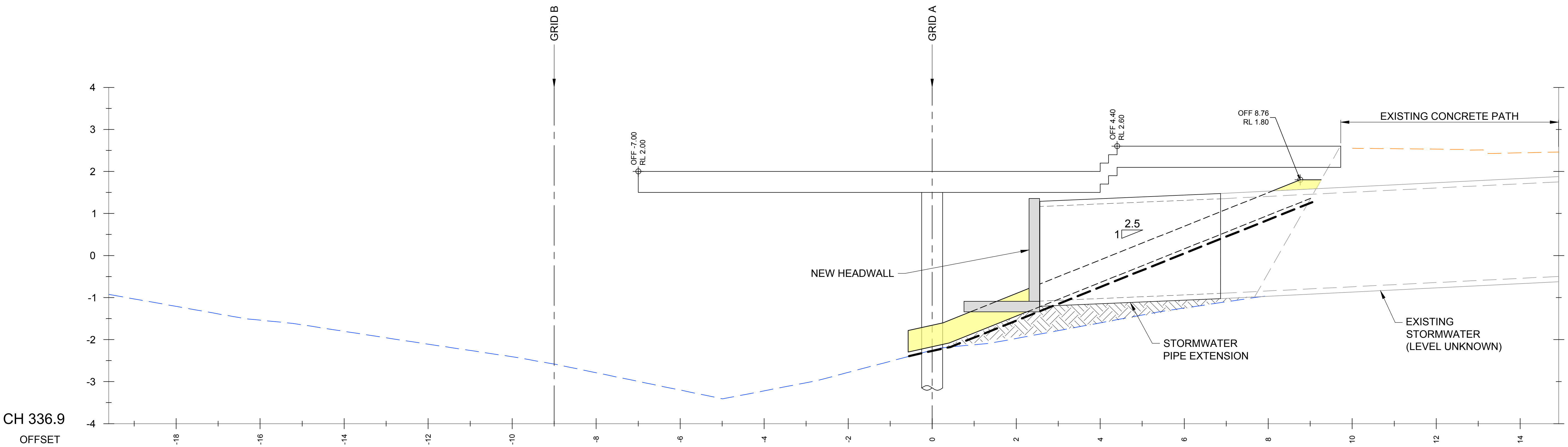

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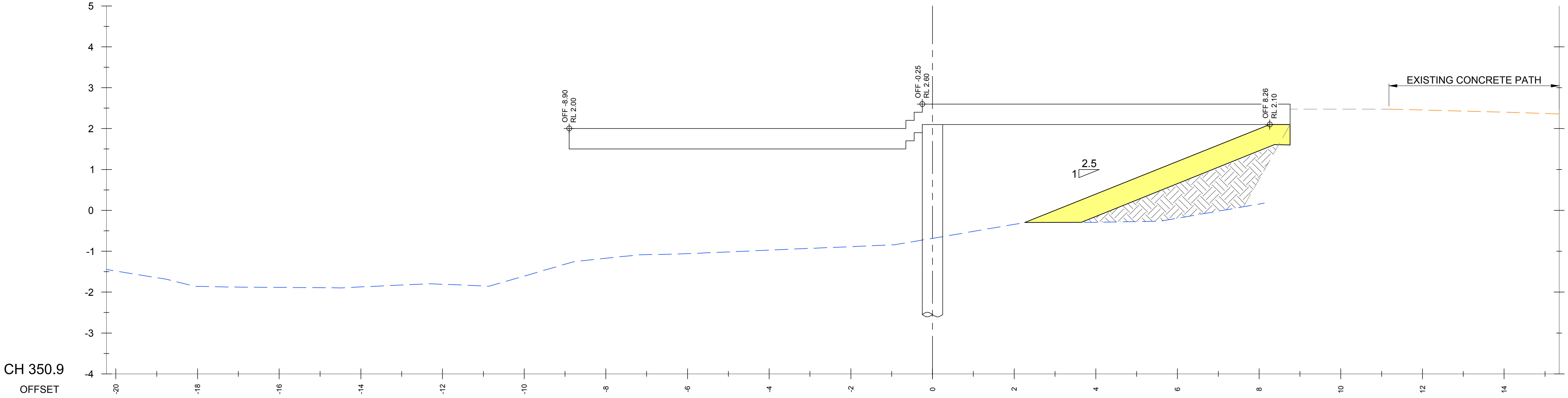

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SAVED: 18-Jul-18

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