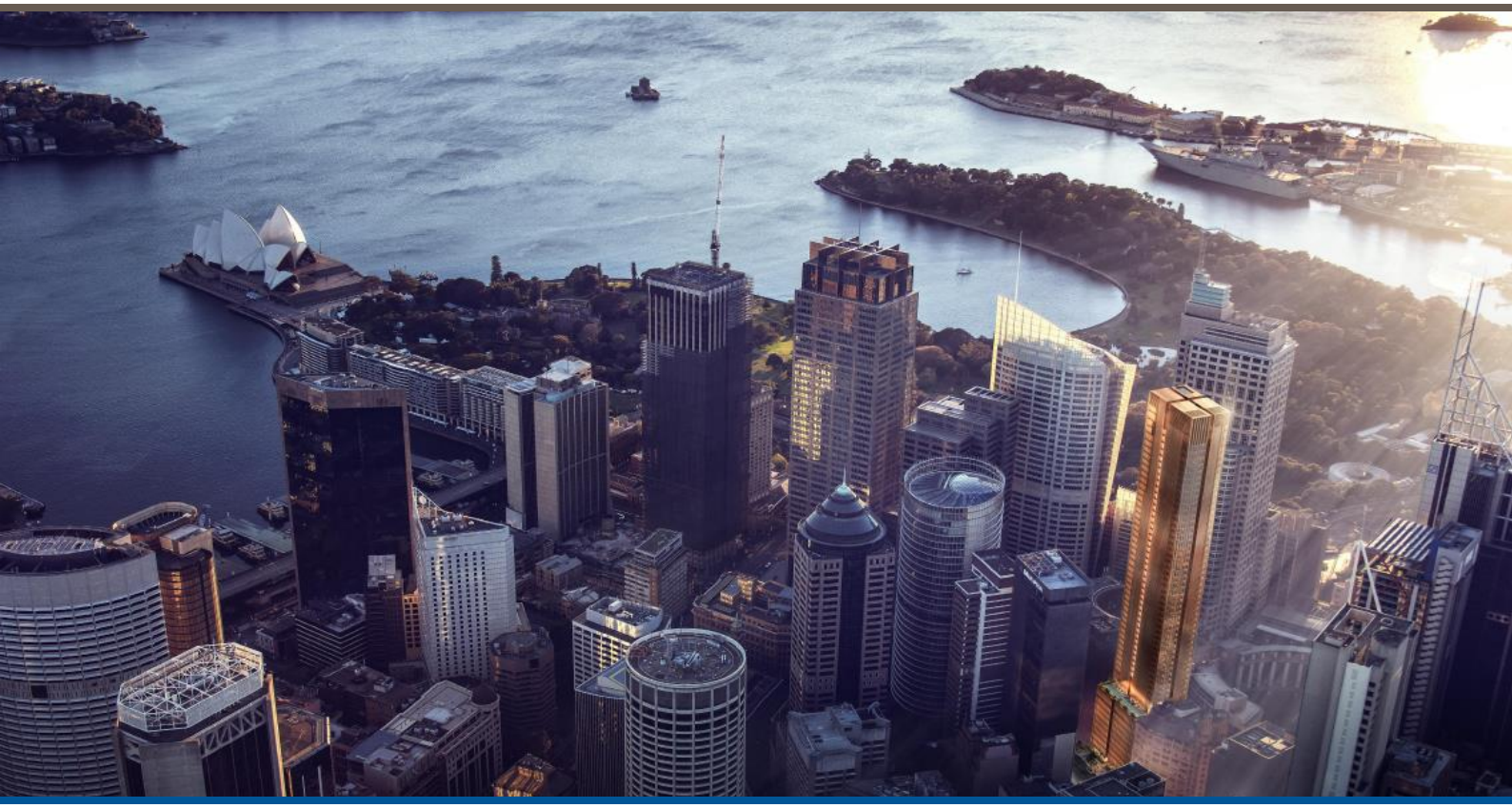
Proposed Development at 4 -6 Bligh Street Sydney

Geotechnical Investigation Report

Holdmark



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02 December 2022

PROPOSED DEVELOPMENT AT 4 -6 BLIGH STREET SYDNEY

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2 December 2022

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EXECUTIVE SUMMARY[1]

The geotechnical investigation report has been prepared by Tetra Tech Coffey (Coffey) to accompany a detailed State Significant Development Application **(SSDA)** for the mixed-use redevelopment proposal at 4 – 6 Bligh Street, Sydney. The site is legally described as Lot 1 in Deposited Plan 1244245.

This report has been prepared to address item 13 (Ground and Water Conditions) of the Secretary's Environmental Assessment Requirements **(SEARs)** issued for the project (SSD-48674209) and the issues in geotechnical perspective as required by Sydney Metro Underground Corridor Protection Technical Guidelines (Sections 6.2 and 7).

Geotechnical investigation was carried out in November 2018 including the drilling of three boreholes BH101, BH102 and BH 103 to inform the ground conditions. This geotechnical investigation report presents the results of the investigation include the following:

- A general overview of the existing site condition and proposed development.
- Geotechnical factual data from the geotechnical investigation.
- Interpreted rock properties and critical geological features and assess likely in-situ stress conditions within the rock mass.
- Interpreted geological sections, including areas around the interface of the proposed development and the Sydney Metro underground tunnels.
- Interpret groundwater conditions and groundwater inflow assessment.
- Location of underground services in vicinity of the development site.
- Recommendations for footing design, concept solution of shoring and excavation.

Based on the findings of the geotechnical investigation, the interpreted ground conditions of the proposed development site consisted of fill underlying by Sandstone and Shale. The groundwater inflow assessment indicated that the basement inflow is assessed to be less than 3 ML/year, thus application of groundwater licence and water supply is not required as per groundwater guidelines from DPI Water. However, approval for pumping of water to the stormwater system will need to be secured from the City of Sydney.

[1] This executive summary must be read in the context of the full report and the attached limitations.

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1. INTRODUCTION

This report has been prepared to accompany an SSDA for the mixed-use redevelopment proposal at 4 – 6 Bligh Street, Sydney.

The Council of the City of Sydney, as delegate for the Minister for Planning and Public Spaces (the Minister), is the Consent Authority for the SSDA under an Instrument of Delegation issued by the Minister on 3 October 2019.

The application seeks consent for the construction of a 59-storey mixed-use hotel and commercial development. The purpose of the project is to revitalise the site and deliver new commercial floorspace and public realm improvements consistent with the City's vision to strengthen the role of Central Sydney as an international tourism and commercial destination.

A separate development consent (D/2018/892) relating to early works for the proposed application was granted for the site on 31 January 2020. Consent was granted for the demolition of the existing site structures, excavation and shoring of the site for three basement levels (to a depth of RL9.38m) to accommodate the proposed mixed-use hotel and commercial development. As such, this application does not seek consent for these components and instead seeks to rely upon and activate D/2018/892 for early works.

Specifically, development consent is sought for:

- Site establishment, including removal of two existing trees along the Bligh Street frontage and de-commissioning and removal of an existing substation (s2041) on the site.
- Construction of a 59-storey hotel and commercial office tower. The tower will have a maximum building height of RL225.88 (205m) and a total gross floor area (GFA) provision of 26,796sqm, and will include the following elements:
    - Five basement levels accommodating a substation, rainwater tank, hotel back of house, plant and services. A porte cochere and four service bays will be provided on basement level 1, in addition to 137 bicycle spaces and end of trip facilities on basement level 2.
    - A 12-storey podium accommodating hotel concierge and arrival at ground level, conference facilities, eight levels of commercial floor space and co-working facilities, and hotel amenities including a pool and gymnasium at level 12.
    - 42 tower levels of hotel facilities including 417 hotel keys comprising standard rooms, suites and a penthouse.
    - Two tower levels accommodating restaurant, bar, back of house and a landscaped terrace at level 57.
    - Plant, servicing and BMU at level 59 and rooftop.
- Increase to the width of the existing Bligh Street vehicular crossover to 4.25m and provision of an additional 4m vehicular crossover on Bligh Street to provide one-way access to the porte cochere and service bays on basement level 1.
- Landscaping and public domain improvements including:
    - Replacement planting of three street trees in the Bligh Street frontage,
    - Construction of a landscape pergola structure on the vertical façade of the north-eastern and south- eastern podium elevations,
    - Awning and podium planters, and
    - Provision of a feature tree at the level 57 terrace.

- Identification of two top of awning building identification signage zones with a maximum dimension of 1200mm x 300mm. Consent for detailed signage installation will form part of a separate development application.
- Utilities and service provision.
- Installation of public art on the site, indicatively located at ground level.

This report has been prepared in response to the requirements contained within the following documents:

- Secretary's Environmental Assessment Requirements (**SEARs**) dated 1 October 2022 and issued for the SSDA.
- Sydney Metro Underground Corridor Protection Technical Guidelines Version 2 (**SM-Tech**) dated April 2021

Specifically, this report has been prepared to respond to the SEARs and requirement issued below.

Document	Item	Description of requirement	Section reference (this report)

SEARs	13	• Ground and Water Conditions
		  ○ Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on:
		  ▪ Groundwater resources in accordance with the Groundwater Guidelines
			Section 3 onwards

SM-Tech	6.2 and 7	• Development Application Lodgement ○ Geotechnical Investigation Report in accordance with Section 7.1 - Geotechnical Investigation of the guideline	

This report presents our findings from a geotechnical investigation conducted for the proposed redevelopment of 4-6 Bligh Street in November 2018. The purpose of this report is to:

- Present a general overview of the existing site condition and proposed development.
- Document geotechnical factual data from the geotechnical investigation.
- Interpret rock properties and critical geological features and assess likely in-situ stress conditions within the rock mass.
- Present interpreted geological sections, including areas around the interface of the proposed development and the Sydney Metro underground tunnel.
- Interpret groundwater conditions.
- Prepare recommendations for footing design, methods of shoring and excavation.

2. THE SITE

2.1 SITE INFORMATION

The site for the purposes of this SSDA is a single allotment identified as 4-6 Bligh Street, Sydney and known as Lot 1 in Deposited Plan 1244245. The site has an area of 1,218sqm, and is identified in Figure 1.

The site is relatively flat, with a slight slope ranging from 21m AHD in the north-western corner to 19.5m AHD in the south-western corner.

The site is located within the north-eastern part of Central Sydney in a block bound by Bligh Street to the west, Hunter Street to the south, Chifley Square/Phillip Street to the east, and Bent Street to the north. The surrounding buildings are generally characterised by a mix of commercial office and hotel uses with ground level retail, restaurant and café uses and are of varying heights, ages and styles, including a number of State and local listed heritage buildings.

The site is also located in proximity to a number of Sydney Metro City & Southwest (opening 2024) and Sydney Metro West (opening 2030) station sites.

Specifically, the site is located to the immediate east of the Sydney Metro Hunter Street station (east site), which is located on the corner of Hunter Street and Bligh Street, and approximately 350m east of the Sydney Metro Hunter Street station (west site). The Hunter Street station sites are part of the Sydney Metro West project. SEARs for the preparation of Concept SSDAs for the sites were issued in August 2022.

Approximately 150m to the south of the site is Sydney Metro Martin Place Station site, located to the south of Hunter Street between Castlereagh Street and Elizabeth Street. The Martin Place Station site is currently under construction and forms part of the Sydney Metro City & Southwest project.

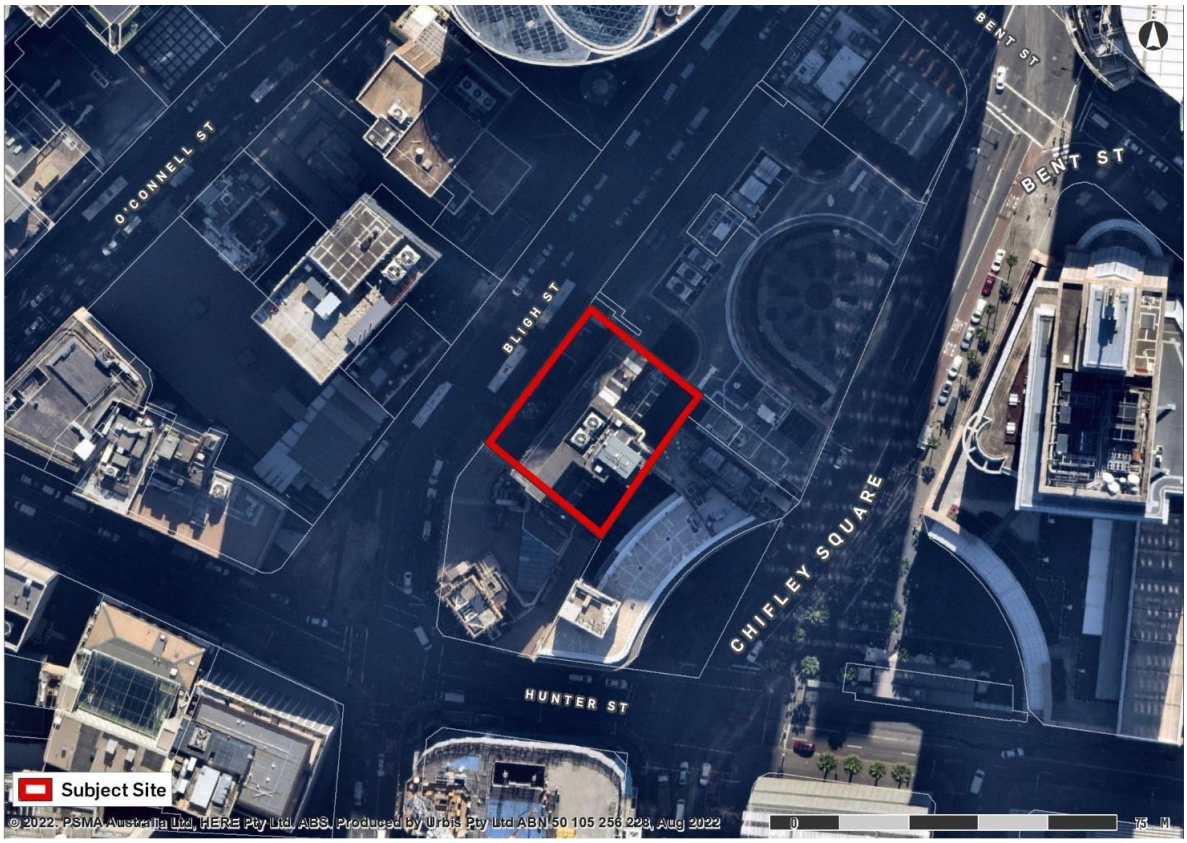
The site is occupied by a vacant commercial office building with ground floor retail and basement car parking known as “Bligh House”. Completed in 1964, Bligh House is a 17-storey tower inclusive of a three-storey podium with the podium levels built to the Bligh Street alignment and the tower setback from the street frontage. The building was designed by Peddle Thorp and Walker and was constructed as part of the post-World War II development boom in the Sydney CBD. The podium overhang along the footpath provides continuous pedestrian protection. Vehicle access to the site is off Bligh Street via a single 2.6m wide driveway that is restricted by a security gate under one-lane, two-way access arrangements. The driveway provides access to the basement car park, containing 21 car parking spaces.

The site contains no vegetation; however, two existing street trees are located adjacent to the site boundary on Bligh Street.

Development consent for the demolition of the existing site structures, excavation and shoring of the site for three basement levels (to a depth of RL9.38m) was granted by City of Sydney on 31 January 2022 (D/2018/892).

It is understood that Holdmark is proposing to extend the excavation to five basement levels (to RL 3.38 m AHD).

The drawings for the proposed development is included in Appendix E.



Source: Urbis

Figure 1: Site Identification Plan

Figure 2 shows the proposed development is bounded on three sides by heritage buildings: the Sofitel Wentworth Building to the northeast, Qantas House to the southeast, and 61-101 Phillip Street to the southwest.

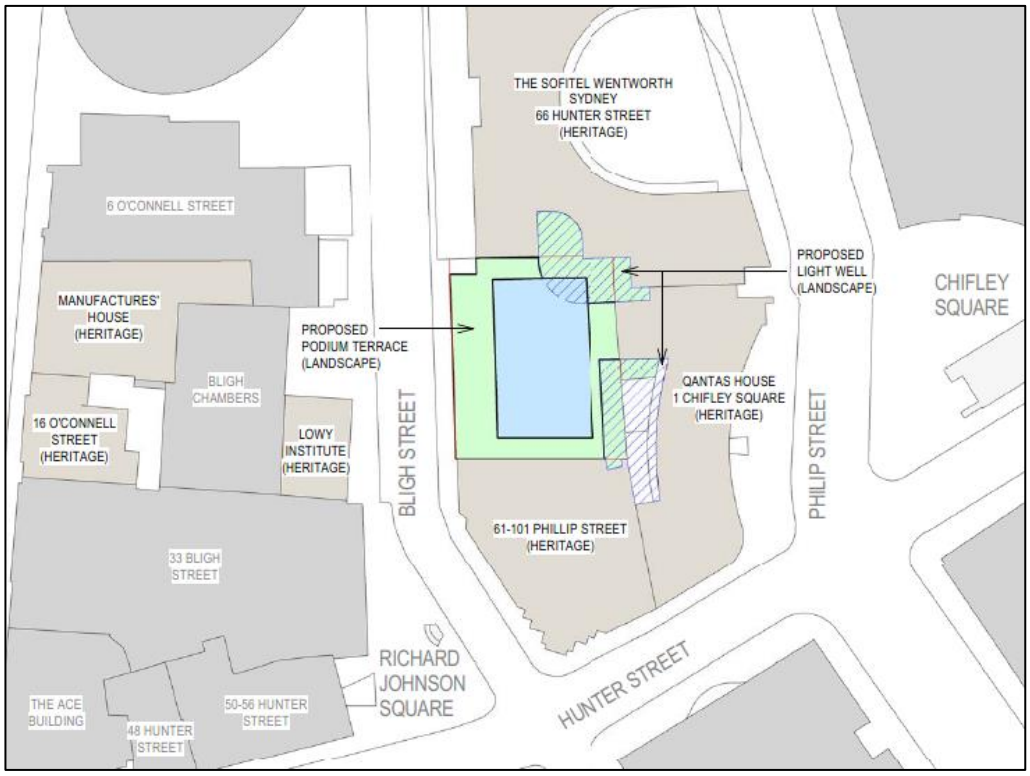


Figure 2: Heritage Buildings Surrounding 4 – 6 Bligh Street

2.2 LOCAL GEOLOGY

The Sydney 1:100,000 Geological Sheet indicates that the site locality is underlain by Hawkesbury Sandstone that is typically medium to coarse grained quartzose sandstone with beds 1 m to 3 m thick. Major joint sets trending north-south and east-west in an orthogonal pattern, with a subordinate northwest-southeast trending set. The north-south (trending about 10° to 15° east of north) joint set is more dominant set, with a subvertical dip and typical spacing of 1m to 5m. The east-west trending joints tend to be spaced at 5 m to 15 m intervals.

Figure 3 shows the mapped delineation of near vertical structural features in Sydney CBD (Pells, Braybrooke & Och – 2004). The known geological features near the proposed development are:

- The Pittman LIV dyke running east west across the CBD, located to the north of the site.
- The GPO Fault Zone orientated in a NNE – SSW direction, located to the west of the site. From Energy Australia Cable Tunnel investigation along Bridge Street it is expected that the GPO Fault Zone may be up to 60m wide. There are two distinct sections of faulted rock forming the edges of the fault zone, each approximately 20 m wide, with relatively intact rock in between.
- Martin Place Swarm Joint running in a NNE – SSW direction sub-parallel to the GPO Fault Zone. The Martin Place Swarm Joint is located to the east of the site. This zone comprises closely spaced jointing with minor normal and reverse faulting.

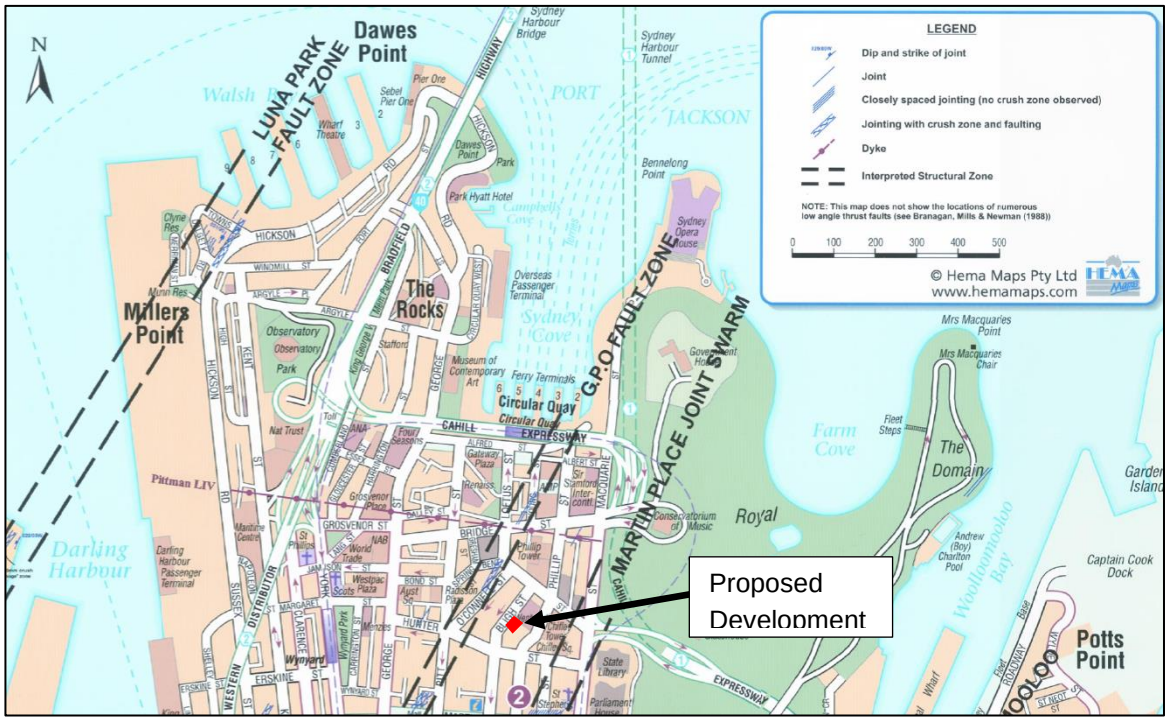


Figure 3: Geological Structural Features in Sydney CBD (Pells, Braybrooke & Och – 2004)

2.3 LOCATION OF SYDNEY METRO TUNNELS

Figure 4 shows indicative locations of the Sydney Metro tunnel alignments as follows:

- Sydney Metro West tunnels are running from west to east underneath the proposed development. The Eastbound tunnel is located underneath the central core of the development and the Westbound tunnel is located underneath the southern corner of the development
- Sydney Metro City & Southwest tunnels are running from north to south. The eastern tunnel is located adjacent to the eastern corner and the western tunnel is located at approximately 14 m from the western corner of the development.

These are shown more precisely in the attached surveyor's drawing (from Transport for NSW) in Appendix F.

Figure 4: Indicative Location of Future Sydney Metro Rail Corridor

The tunnel will be about 7 m diameter with the crown at about -1 m AHD, which is anticipated to be approximately 10 m vertical distance below the lowest basement floor level of 3.3 m AHD. The eastern corner of the basement has a triangular area about 14 m^2 that encroaches into the acquisition zone but does not overlap the tunnel structure.

Figure 4 also shows a potential underground structure running adjacent to the south-western boundaries of the site, which connects the Martin Place Station to Bligh Street. Information regarding this underground structure will be required during detailed design stage for to assess the interactions with the proposed development.

3. GEOTECHNICAL INVESTIGATION

The site is currently significantly access-restricted. On a site visit on 26 September 2018, Coffey identified three locations at which boreholes could be drilled in the existing basements at night when the basement was vacant. These locations are shown on Figure 5.

BH101 and BH102 were located in the upper level basement carpark at elevation 17.925 m AHD and were drilled with a specialist small track-mounted equipment. Target depth for these boreholes was 30 m but was restricted to what could be drilled in a single shift. The achieved depths of boreholes were 29.3 m (-11.375 m AHD) and 22.38 m (-4.45 m AHD) respectively.

BH103 was located in the pump room in the lower basement at elevation 12.8 m AHD. BH103 was not accessible by vehicle mounted rig and was drilled with portable equipment. The target depth for BH103 was 15 m and actual depth achieved was 15.3 m (-2.5m AHD).

The boreholes were drilled by specialist geotechnical drilling subcontractor BG Drilling. Boreholes were initially advanced through the concrete floor slabs and sub-base by diatube, and then cored through rock to

final depth. Rock core was boxed, logged, photographed then transported to our core storage facility for Point Load Strength Index (Is50) testing at approximately 1 m depth intervals.

A Coffey geotechnical engineer was present throughout the field work to locate the boreholes, collect samples and interpret/log the rock core. The borehole logs are presented in Appendix B.

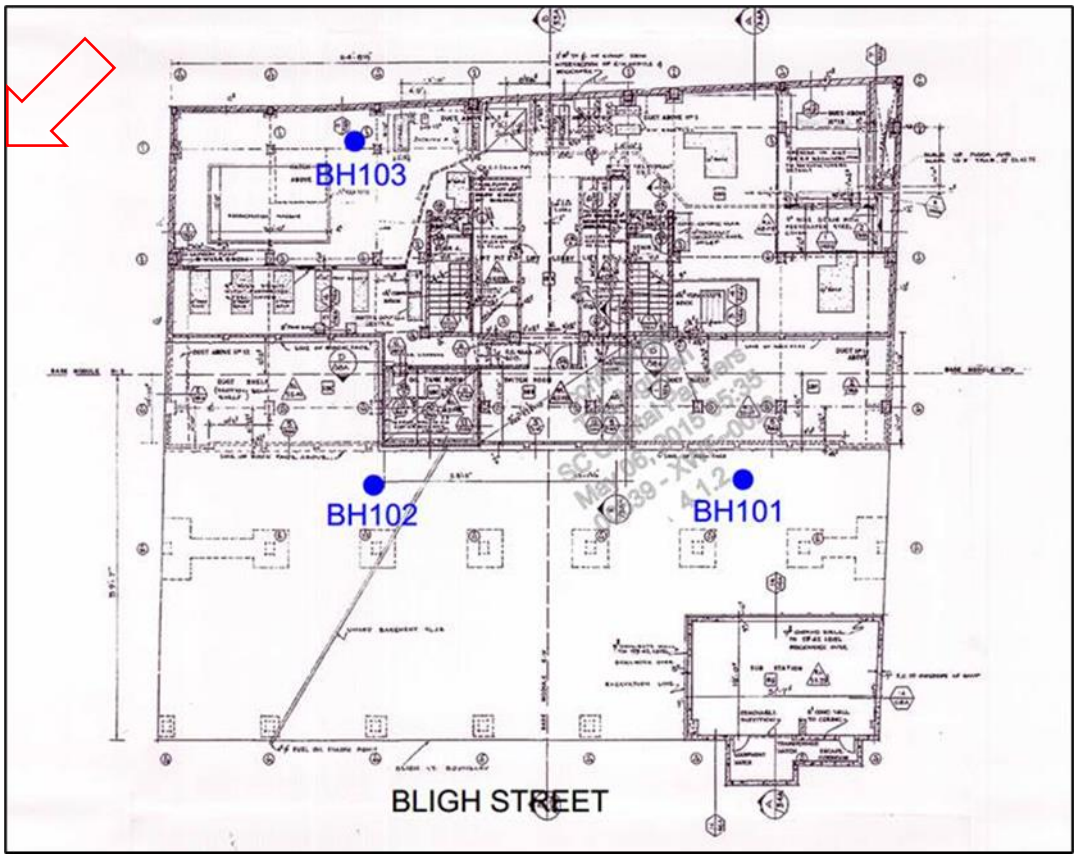


Figure 5: Approximate borehole locations

On completion, groundwater monitoring wells were installed in the boreholes to allow future monitoring of groundwater levels and collection of groundwater samples for contamination assessment. The screened lengths of the geotechnical monitoring wells are shown in the well construction logs also in Appendix C. Data loggers were installed in each well to record groundwater level for a planned monitoring period of four weeks.

4. GEOTECHNICAL MODEL

4.1 ROCK CONDITIONS ENCOUNTERED IN BOREHOLES

The geotechnical investigation conducted provides information on rock conditions below current basement levels. The rock conditions encountered are described in the borehole logs and core photographs. The following is a broad characterisation of the results.

Unit 1: Rock above proposed lower basement level of 3.3 m AHD

BH101 and BH102 drilled from upper basement level of about 17.9 m AHD encountered mainly fresh or slightly weathered, medium strength sandstone to11.5 m and 10.5 m AHD respectively, then mainly high strength sandstone to about 5.1 m AHD in BH101 and 6.2 m AHD in BH102.

BH103 which commenced at about 12.8 m AHD also encountered mainly fresh or slightly weathered, mainly medium strength sandstone, but with some high strength, more fractured zones. This unit extended to about 5 m AHD.

Unit 2: Rock near proposed lower basement level of 3.3 m AHD

Near and immediately below the proposed lower basement level for the new development, all three boreholes encountered distinctly or slightly weathered, interbedded sandstone, shale and brecciated shale, with variable strength and defect patterns. The specific conditions varied in each borehole. Figure 6 show the nature of the Unit 2 rock.

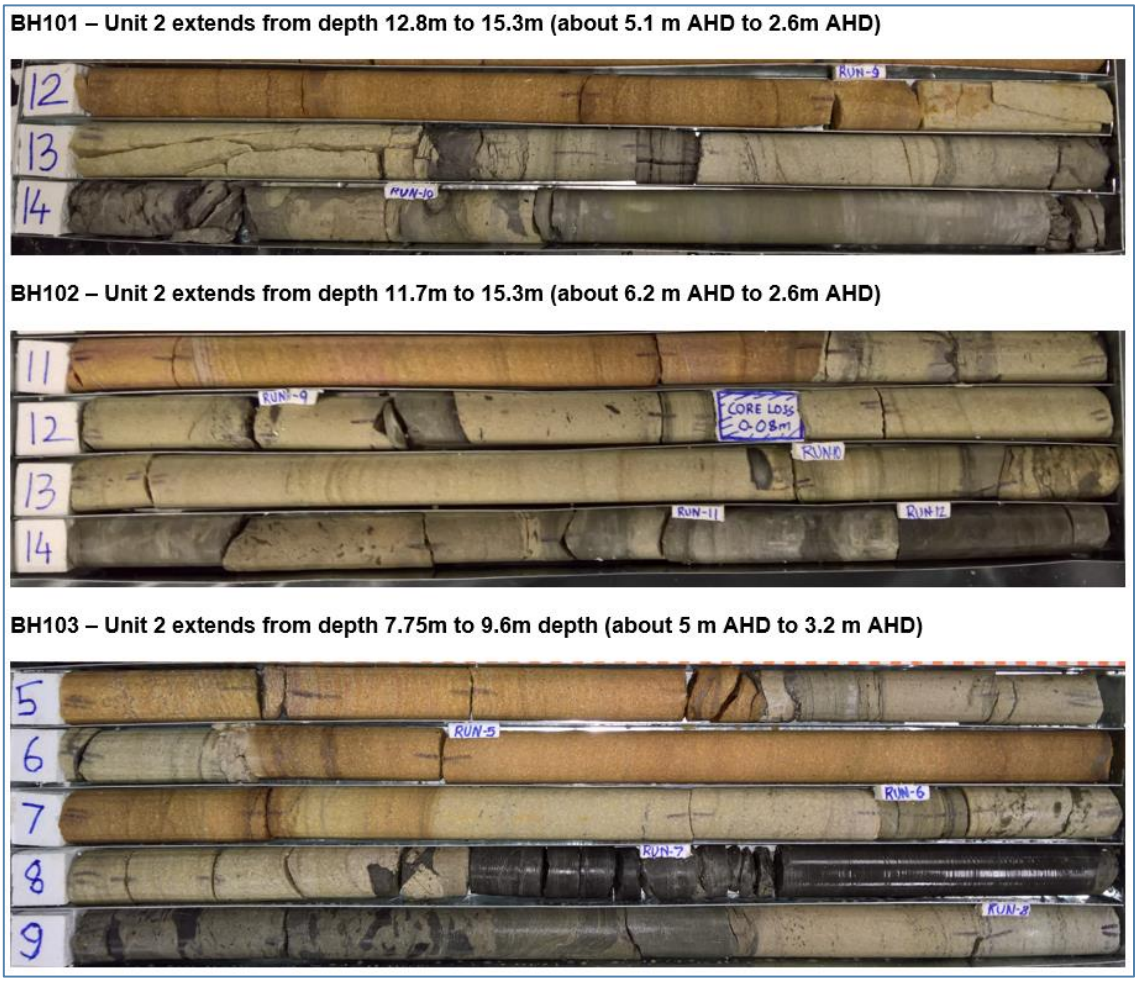


Figure 6: Nature of Unit 2 rock

Unit 3: Rock below proposed basement level.

Below Unit 2, all three boreholes encountered predominantly high strength sandstone to termination depths, which were below tunnel crown level.

4.2 GEOTECHNICAL MODEL

Based on the information from the boreholes and previous desk study, a geotechnical model has been developed and is presented in Table 1. The layer thicknesses shown are in a downward progression starting from ground surface level. Interpreted geological sections have been developed based on the review of the geotechnical information and are presented in Appendix B.

Table 1: Geotechnical Model

Geotechnical Unit	Materials	Rock classification	Base of Unit
Unit 0	Unobserved ground. Likely to comprise fill including surface concrete, pavements & asphalt overlying residual soil grading to sandstone	Not applicable for soil strength materials. Sandstone could vary from Class V to Class II	Above 17.9m AHD in BH101 and BH102. Unknown in BH103
Unit 1	Moderately weathered to fresh, medium and high strength sandstone	Class II and Class I Sandstone	5.1m AHD in BH101 6.2m AHD in BH102 5m AHD in BH103
Unit 2	Interbedded sandstone, shale and shale breccia, varies from highly to slightly weathered, and from low to high strength, fractured	Class III Shale based on defect patterns and variable strength	2.7m AHD in BH101 2.3m AHD in BH102 3.2m AHD in BH103
Unit 3	Fresh medium and high strength sandstone	Class II and Class I Sandstone	Below -11.4m AHD in BH101 Below -4.5m AHD in BH102 Below -2.5m AHD in BH103

Notes to Table 1

- *Rock classification is based on the system presented in Pells P.J.N., Mostyn, G. and Walker, B.F., (1998), "Foundations on Sandstone and Shale in the Sydney Region", Australian Geomechanics, December 1998, pages 17-29.*

5. HYDROGEOLOGICAL CONDITIONS

5.1 LOCAL GROUNDWATER REGIME

The closest identified surface water body is Sydney Harbour which is located approximately 500 m to the north of the site.

Groundwater seepage would typically be present at the soil/rock interface and in bedrock joints and bedding partings. Bedrock seepage in sandstone bedrock could be assumed as typically flowing downwards toward local drainage features (such as drained basements and infrastructure) or the regional water table, along horizontal bedding planes and sub-vertical joints. Groundwater levels may vary in response to rainfall and as a result of development in the area.

The rock mass permeability will be governed by the joints, faults and bedding planes. Due to the expected variability in rock conditions across the site it is anticipated that the permeability will also vary widely from a higher permeability in zones of "broken" rock or open defects (such as the defects observed in Unit 2) to relatively low permeability in areas of relatively intact bedrock with tight defects.

5.2 GROUNDWATER LEVELS

5.2.1 Observation during Investigation in 2018

Standpipe piezometers were installed in BH101, BH102 and BH103 to enable groundwater level monitoring. Piezometer completion details are summarised in Table 2, and also presented on the borehole logs in Appendix D.

Table 2: Piezometer completion details

Borehole	Eastings (m)	Northings (m)	Depth (m)	Ground Surface RL (m AHD)	Screen Level Interval (m AHD)	Screen Lithology
BH101	334465.60	6251284.97	29.33	17.93	12.10 to -7.40	Sandstone
BH102	334477.59	6251298.59	22.38	17.93	16.55 to -4.45	Sandstone
BH103	334491.89	6251287.55	15.31	12.79	9.49 to -2.51	Sandstone

Manual groundwater measurements were undertaken in the three wells during the following the completion of borehole drilling and installation of the piezometer. Continuous data loggers have been installed in the boreholes on the 6 November 2018. We were able to obtain hourly groundwater reading at BH102 and BH103 between the period of 6 November 2018 to 12 November 2018 (no continuous data from BH101 was recorded due to technical difficulties).

The available groundwater monitoring data (both manual readings and measurements from data loggers), together with the daily rainfall records (from the Bureau of Meteorology Station at Sydney Observatory (station no. 66002)), is provided in Appendix D. Groundwater level between 7.21 and 7.74 m AHD was recorded during our investigation. Table 3 presents the measured groundwater level from our manual readings.

Table 3: Measured groundwater levels from manual readings

Borehole	Date of measurement	Recorded groundwater level (m AHD)
BH101	2 November 2018	7.80
	4 November 2018	7.36
	5 November 2018	7.33
	12 November 2018	7.27
BH102	2 November 2018	7.58
	4 November 2018	7.74
	5 November 2018	7.72
	12 November 2018	7.52
BH103	5 November 2018	8.19
	12 November 2018	7.21

Figure 7 below presents groundwater level contours and flow directions at the site based on groundwater level measurements on 12 November 2018. As shown on Figure 7, the groundwater appears to flow in a south, south-south east direction. This flow direction is potentially due to drainage to existing drained basements and infrastructure (such as the Eastern Suburbs Railway tunnel) south of the development.

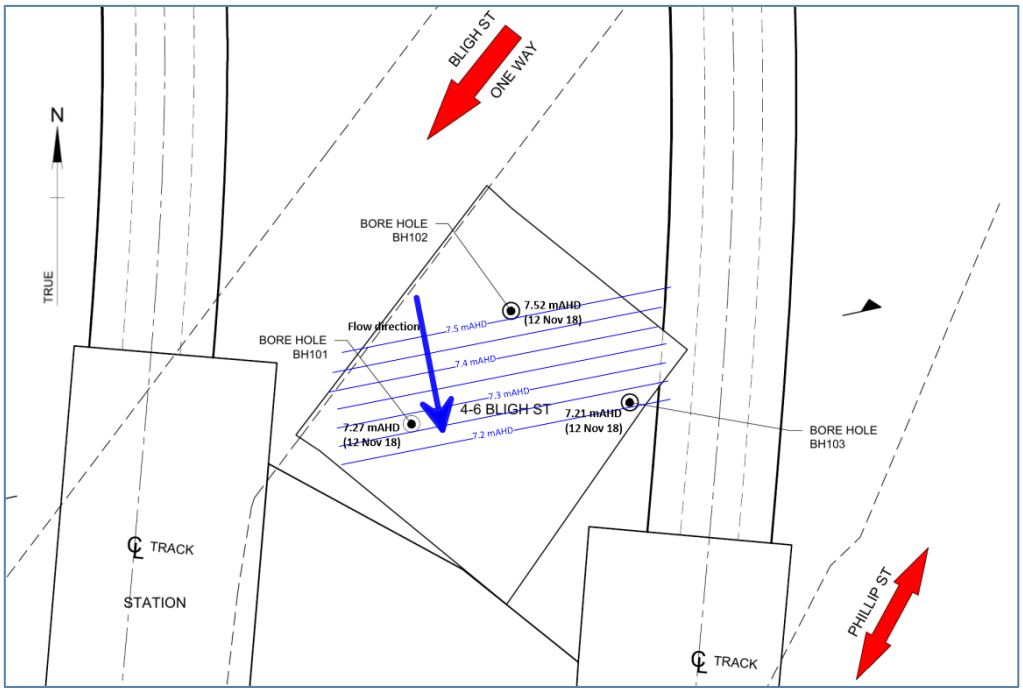


Figure 7: Groundwater levels (m AHD) and interpreted flow direction (based on 12 Nov 2018 records)

Groundwater level fluctuations due to tidal water level changes was not noticeable from our monitoring.

The minor groundwater raise observed at BH102 and BH103 on the 9 and 10 of November 2018 may be in response to the rainfall event on 8 November 2018, where 21.8 mm of rain was recorded. However, further monitoring of the groundwater levels will be required to assess the influence of groundwater level at the site due to significant rain events.

5.2.2 Observation in 2022

A Coffey engineer visited site on 13 October 2022 and measured groundwater levels at three existing piezometers, BH101, BH102 and BH103. The results are shown in Table 4 and the piezometer locations are shown in Figure 8.

Table 4: Groundwater levels observed on 13 October 2022

Piezometer location	Surface elevation (m AHD)	Casing stickup (m above ground)	Depth to water (m below top of casing)	Date and time	Groundwater level (m AHD)
BH101	17.9	-0.11	11.45	13 Oct 22 9:55am	6.3
BH102	17.9	-0.08	10.69	13 Oct 22 9:45am	7.1
BH103	12.8	-0.08	5.47	13 Oct 22 10:00am	7.3

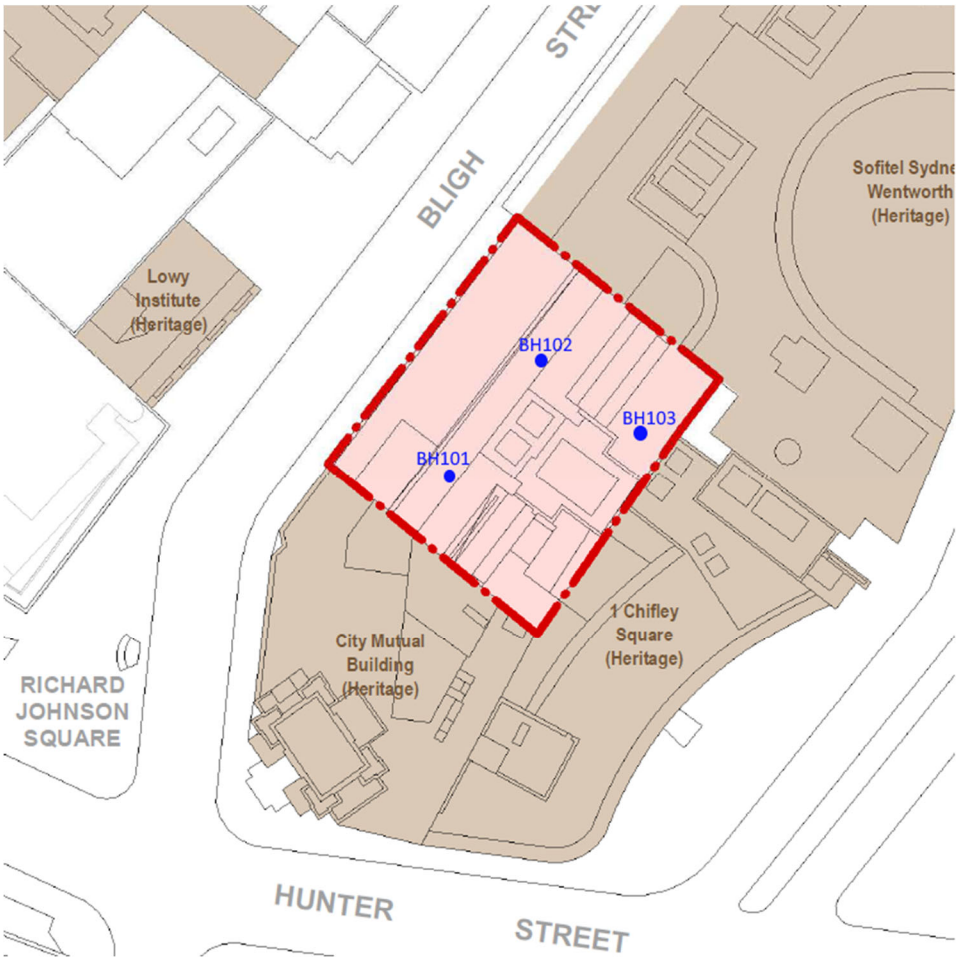


Figure 8: Piezometer locations

It is noteworthy that these levels were observed following nine months of “very much above average” rainfall in the Sydney region (source: Bureau of Meteorology), refer to Figure 9, and can therefore be assumed to represent groundwater levels higher than the long term average.

The current two-level basement does not penetrate the groundwater table. An extension of the basement at the site to provide five levels is expected to intersect approximately the top metre of the groundwater table.

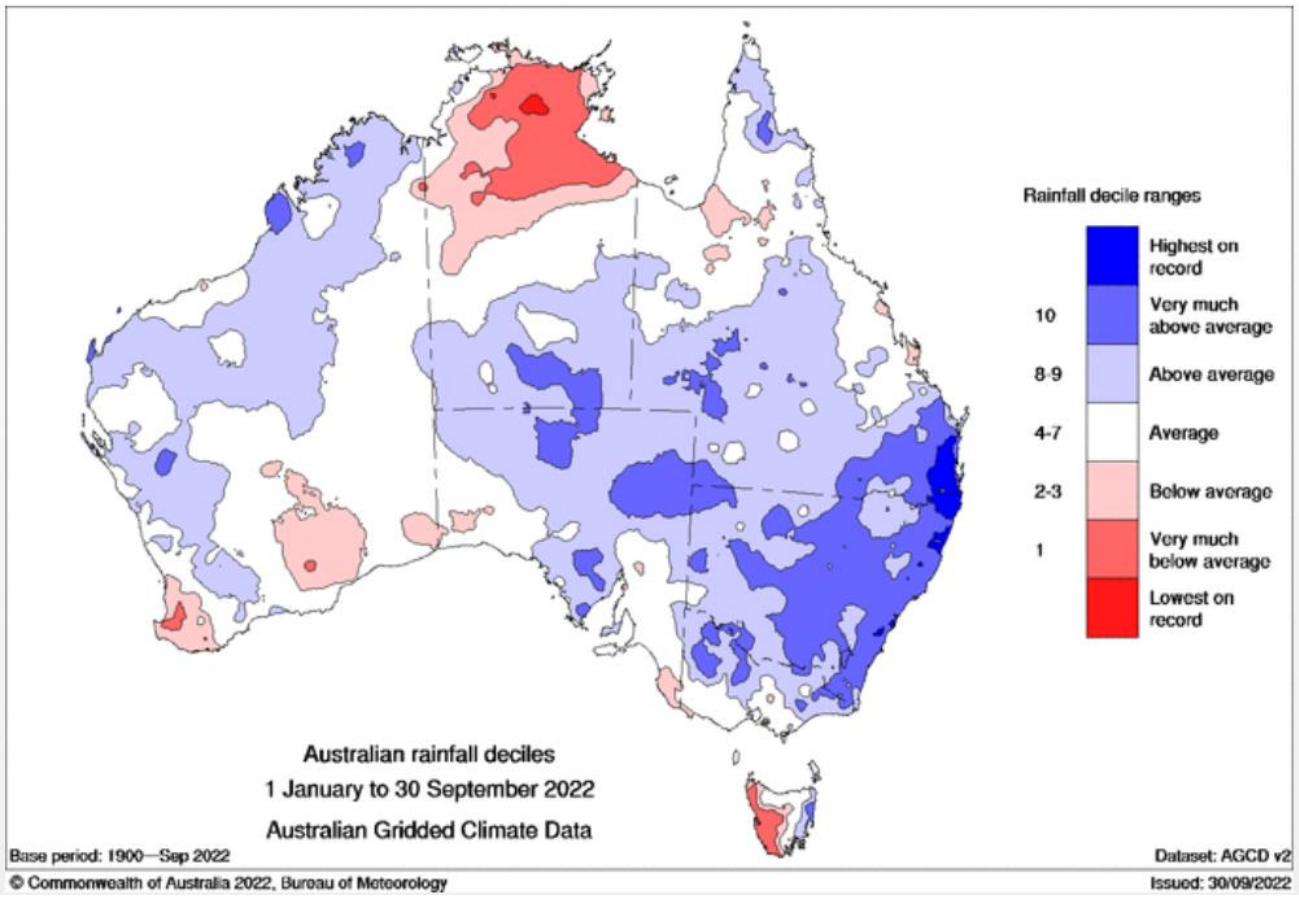


Figure 9: Australian rainfall deciles for 1 Jan 2022 to 30 September 2022

6. GEOTECHNICAL CONSIDERATIONS

6.1 EXCAVATABILITY

A summary of the excavatability of the encountered soil and rock is contained in Table 5, and is suggested as a guide only. Excavation contractors should inspect the rock core, engineering logs and core photographs to make their own judgement as to likely productivity and specific plant.

Table 5: Guidelines for excavation

Material	Likely Plant Requirements
Unit 0 Fill, Residual to extremely weathered, very low to low strength sandstone	Bulldozer blade, excavator bucket
Unit 0 Highly weathered to moderately weathered, low strength sandstone	Bulldozer with ripper, excavator bucket. Higher strength zones may require a rock breaker
Unit 1 to 3 Moderately weathered to fresh, medium and high strength sandstone	Cat D10 or equivalent. Higher Strength bands may require a rock breaker or rock saw.

Contractors should form their own assessment for selection of excavation equipment and estimation of production rates. Alternative excavation methods (such as saw cutting or rock grinding of sandstone) is

recommended at property boundaries to avoid over-breaking and to reduce vibrations caused by mechanical excavation.

The use of hydraulic impact hammers for bulk excavation, trimming the sides of excavations, and detailed excavation, will cause vibrations that could affect vibration sensitive structures and services. Assessment of the potential impacts of excavation induced vibrations should be considered as part of detailed design and excavation planning. The vibration limits in Table 6 below are commonly recommended to reduce the risk of vibration damage to sensitive receptors.

Table 6: Ground vibration limits for various types of structures

Type of Structure	Peak Particle Velocity (mm/s)
Historic buildings or monuments	2
Residential or low-rise buildings in good condition	10
Reinforced concrete commercial/industrial buildings in good condition	25

It is recommended that a limit is selected considering the structure of concern. It should be noted that limits set by the relevant authorities may override these recommendations.

As-built information of the surrounding buildings will be required for the impact assessment, and to ensure any proposed wall reinforcements (such as ground anchors, if required) do not impact on the basement and foundations of adjoining buildings. It is recommended that condition surveys, and background settlement surveys of the surrounding buildings be undertaken prior to, during, and after excavation.

6.2 GROUNDWATER CONDITIONS

Based on the observed groundwater levels (between 7.1 and 7.74 m AHD), we anticipate the bulk excavation level (underside of footings) will be approximately 7 m below the existing groundwater table, this level takes into account deeper excavations occurring at footings and lift cores. Further monitoring will be required to assess variability in groundwater levels.

Coffey considers a drained basement design will be feasible. However, it is possible that the fractured Unit 2 sandstone (around the base of the excavation) may act as a conduit for groundwater flow, and higher seepages during excavation may occur through this material. If predicted inflow rates (not undertaken as part of this report) exceed the current water allocation for the site, purchasing of additional water shares should be considered. If measured inflow rates at the completion of the excavation exceed expectations, grouting of fractured zones of higher groundwater seepage should be considered.

For a drained excavation structure, permanent floor and wall drainage will need to be maintained throughout the life of the structure. It is expected that such a drainage system would include a sub-floor drainage blanket with slotted drainage pipes and sump and pump system with the ability to effectively back flush the system for long-term maintenance.

It is recommended that the drainage design be reviewed by an experienced groundwater professional.

It is anticipated that the groundwater will be pumped to the stormwater system where it will flow to Sydney Harbour. Approval for pumping of water to the stormwater system will need to be secured from the City of Sydney. Application for a groundwater licence and water supply works is not required based on groundwater inflow assessment provided in Section 6.3.

6.3 GROUNDWATER INFLOW

Groundwater inflow assessment was carried out using commercial software Geostudio SEEPW 2018 R2. The analysis considered the transient groundwater inflow into the basement with a footprint dimensions of 37 m x

32 m and a bulk excavation level at approximately RL 0.3 m AHD (underside of foundation level). The design groundwater level is assumed at RL 7.2 m.

With reference to Bertuzzi (2014) and Tammetta and Hewitt (2004), the adopted hydraulic conductivity of the rock material is summarised in Table 7.

Table 7: Hydraulic conductivity of rock material

Rock Material	Hydraulic Conductivity (m/s)
Sandstone - Class II or Better	1×10^{-8}
Shale – Class III	1×10^{-7}

A plane strain analysis has been undertaken considered a section from East to West (Chifley Square to Bligh Street) as shown in Figure 10.

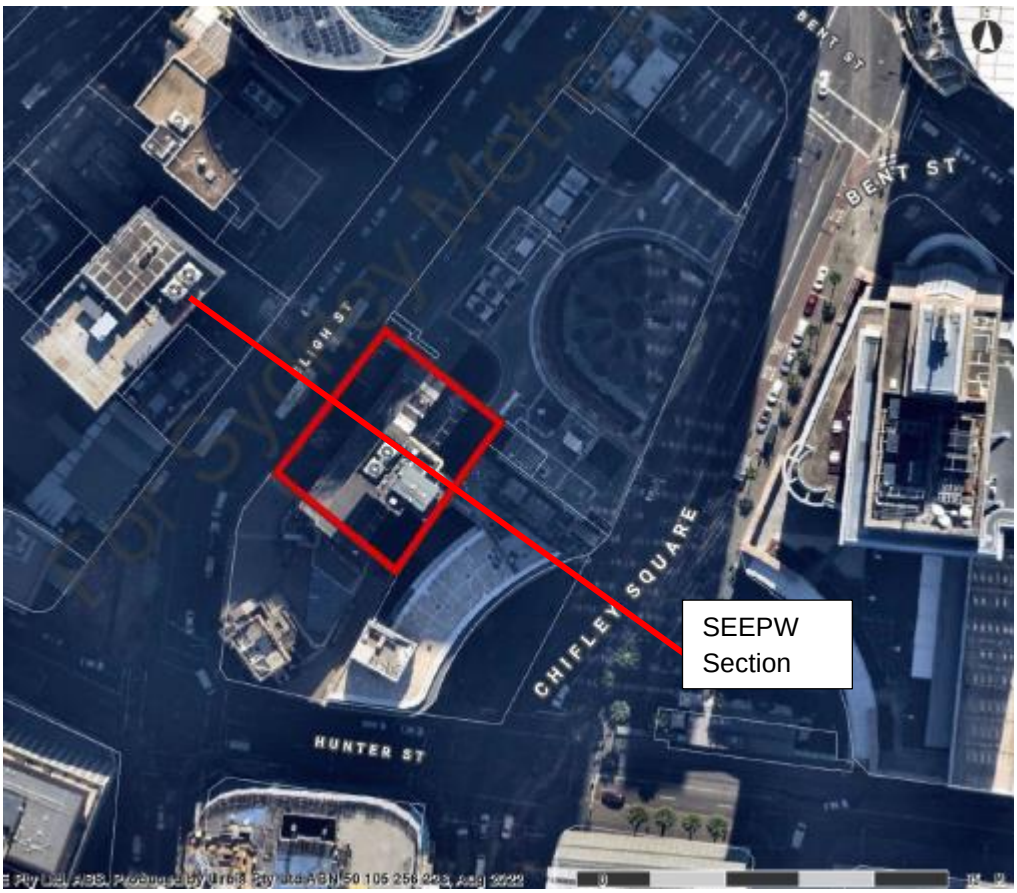


Figure 10: Location of section for SEEPW analysis

Figure 11 illustrated the mesh used for the SEEPW analysis for the inflow assessment and Figure 12 illustrated the direction of flow into the excavation. The analysis indicated that the long term groundwater inflow rate is assessed to be 6×10^{-5} m/s equivalent to 1.85 megalitres (ML) / year. Inflow assessment by analytical approach was also conducted which indicated the inflow rate is approximately 2.5 ML / year. Inflow assessment by SEEPW and analytical solution are provided in Appendix G.

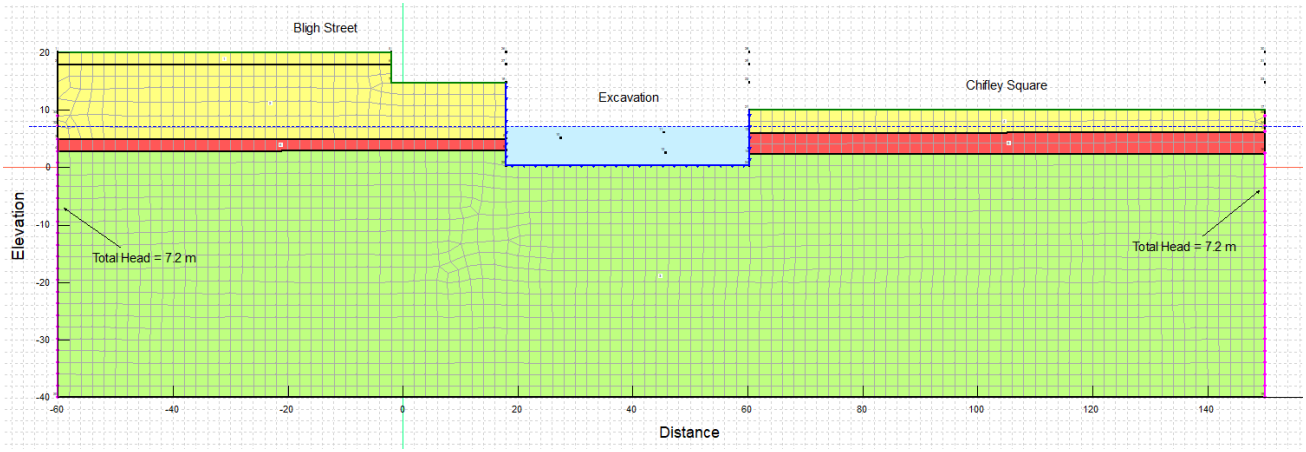


Figure 11: SEEPW mesh for inflow assessment

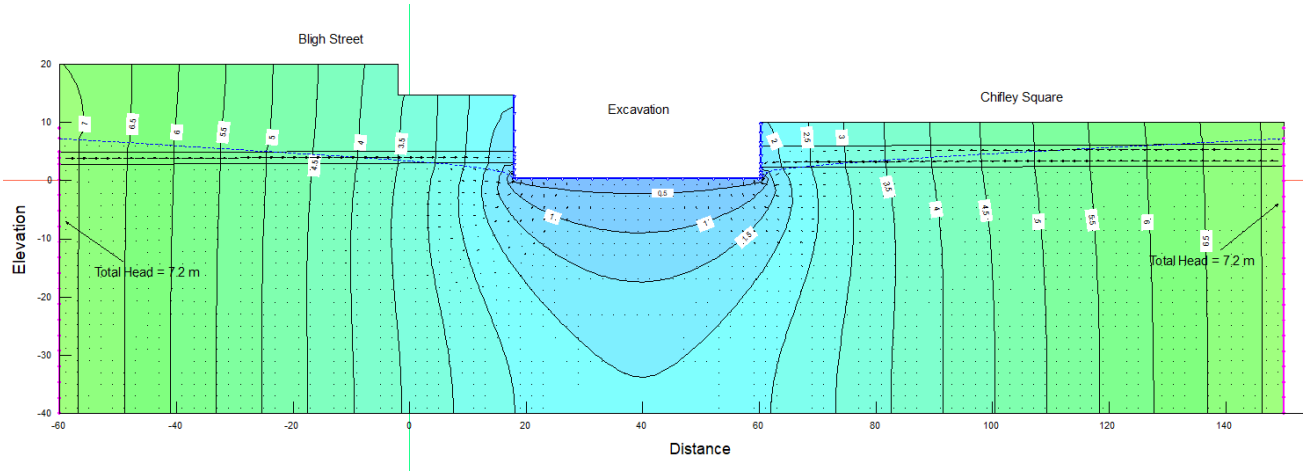


Figure 12: Direction of inflow into excavation

Water NSW provides for a water access licence exemption for aquifer interference activities taking 3ML or less of groundwater per year. Under the exemption, a person can take up to 3 ML of groundwater through an aquifer interference activity per authorised project per water year without needing to obtain a water access licence, provided:

a) the water is not taken primarily for consumption or supply; and

b) the person claiming the exemption keeps a record of the water taken under the exemption and provides this to the Minister within 28 days of the end of the water year; and

c) the records are kept for 5 years.

In relation to the potential for groundwater induced settlement impacts, basement excavation to RL 0.3 m AHD would lead to around 7 m of groundwater drawdown in the bedrock at the excavation (assuming a design groundwater level of 7.2 m AHD, a bulk excavation level of 0.3 m AHD) and lesser drawdowns away from the excavation. A consideration of typical compressibility parameters for Sydney sandstone / shale indicates that this amount of drawdown in bedrock would result in negligible groundwater induced settlement.

The future basement is proposed for car parking and certain services which are considered to pose no unacceptable impact to groundwater quality.

Given the above discussion and considering groundwater resources in the context of the site's location in the northern part of the Sydney CBD, Coffey concludes that impact to groundwater resources for inclusion of a five-level basement would have negligible groundwater related impacts and that a water access licence would not be required.

6.4 ROCK PARAMETERS

6.4.1 Rock Mass Design Parameters

The site-specified rock mass parameter was assessed based on available gINT borehole data obtained from the site and drill hole database in CBD.

The recommended geotechnical characteristic parameters are presented in Table 8 for Units 1 and 3 (Class II and Class I Sandstone) and Unit 2 (Class III Shale). The equivalent Mohr-Coulomb parameters were referred from the vertical stress ranges and the recommended UCS, GSI and mi.

Table 8: Recommended rock mass parameters for Units 1 to 3

Design Approach	Parameter		Unit 1 and 3 (Sandstone-II/I)	Unit 2 (Shale-III)
Intact parameters based on the laboratory scale	UCS (MPa)	Typical Range	12 – 50	2-20
		Design	28	7.5
	Modulus E_i (MPa)		6,500	2,000
	Poisson's ratio ν		0.2	0.25
	Tensile strength σ_t (MPa)		3	0.5
	m_i		12	8
Rock mass based on equivalent continuum	Unit weight γ (kN/m^3)		24	23
	GSI		74	50
	Hoek – Brown	m_b	4.8	1.34
		s	0.05	0.0039
		a	0.501	0.506
		c′ (kPa)	1,000	360
		φ′ (degrees)	53	30
		σ_t (kPa)	300	25
	Elastic modulus (MPa)	E_m	2,500	300

6.4.2 Defect parameters

For the spot rock bolt and its kinematic analysis in Units 1 and 3 (Sandstone II/I), the geological structure (defects) conditions are assessed.

The site gINT available boreholes indicate that the rock mass in situ is governed by bedding parting (the BP). The dip angle of the BP varies from 0° to 20° horizontally.

From BHs, it would not be easy to assess the BP dip direction. It is suggested that the detailed design analysis carry out for two cases: The BP direction toward the excavation face and the BP adverse direction

towards the excavation face. The support requirements should be identified during excavation, and Coffey recommends regular face mapping by a geotechnical professional at vertical intervals of not greater than 2 m.

The BP mean spacing from the borehole's observation is about 1m.

No apparent inclined defect was observed at the available boreholes in Units 1 and 3 (Class II/I Sandstone).

The following shear strength in Table 9 for defects in Units 1 and 3 are recommended. Unit 2 (Shale Class III) should be a homogenous model in the pattern rock bolt analysis.

Table 9: Shear strength for defects in Sandstone

Condition Type	Defect Description	Infill Type	Friction φ' (°)	Cohesion c' (kPa)	Stiffness (MPa/m)	
					Normal, k_N	Shear, k_S
1	Tight rough surface	Clean or hard mineral	38	5	4,000	400
2	1 - 5mm infill	Firm clay	30	5	3,000	300
3	5 - 10mm infill	Firm/Soft clay	25	5	2,000	100

Three types of spot rock bolt designs are recommended for the above three defects.

6.5 LOCATION OF EXISTING UTILITIES AROUND DEVELOPMENT

For the design of the retention system, it is essential to identity the location of existing underground utilities in close vicinity of the proposed excavation site to avoid any adverse impact induce on existing services. A Dial-before-you-dig (DYBD) has been conducted to locate the existing services and summarised in Table 10.

Prior to the commencement of excavation, the asset owners / authorities have to be informed about the construction activities and minimum clearance distances from the utilities (refer to the asset owner requirements) are required to be maintained at all times during the construction activities to avoid any damage to the services.

Service locating will be required Shoring detailed design phase

Impact assessment should be conducted to assess the impact of the proposed development on the services at the detailed shoring design phase.

Table 10: Summary of services in close proximity of the proposed development site

Service	Authority	Location	Approximate Distance from Site Boundary (m)
Stormwater	City of Sydney	Along Bligh Street	6 - 9
		Along Hunter Street	> 30
		Along Philip St	> 20
Water Main	Sydney Water	Along Bligh Street	3
		Along Hunter Street	> 30
		Along Philip St	> 20
Electricity	Ausgrid	Along Bligh Street	-
		4 – 6 Bligh Street	-

Gas	Jemena Gas	Along Bligh Street	2.5 to 6
		Along Hunter Street	30
		Along Philip St	20
Substation Chamber	Ausgrid	At boundary between 4 - 6 Bligh Street and 10 Bligh Street	-
	Ausgrid	68 Hunter Street	
Telecom	Vocus	Blight Street	> 10
	Primus	Blight Street	> 10
		Hunter Street	> 30
	AARNet (Fibre Optic)	Blight Street	> 10
	Optus	Along site boundary at Bligh Street	-
		Along Hunter Street	-
		Along Philip St	-
	NBN	Along boundary at Bligh Street	-
		Pits at 4 – 6 Bligh Street	-
		Along Hunter Street	-
		Along Philip St	-
	Uecomm	Along Philip St	>10 m
		Along Hunter Street	> 30 m
		Along Philip St	> 30 m

7. REGIONAL ROCK STRESSES

7.1 STRESS DIRECTIONS

This section presents the results of an assessment of the regional stress regime within the Hawkesbury Sandstone, which is known to have significant horizontal virgin stress fields. The direction of the principal horizontal stress is described in Enever *et al.* (1990) in Sydney as being north-northeast direction with stress magnitudes for rocks down to 200m depth described as follows:

- Major horizontal stress (σ_1) = 2.5 x overburden pressure; orientation 28^o magnetic
- Minor horizontal stress (σ_2) = 1.5 x overburden pressure; orientation 118^o magnetic
- Vertical stress (σv) = overburden pressure; orientated vertically

7.2 STRESS MAGNITUDES

Pells (2002) suggests the following stress magnitudes within Hawkesbury Sandstone to depths up to 150 m:

- Major horizontal stress (σ_1) = 1.5 + 1.2σ_v to 2.0σ_v (MPa)
- Minor horizontal stress (σ_2) = 0.5σ_1 to 0.7σ_1 (MPa)
- Vertical stress (σ_v) = 0.024H (MPa) where H = depth below ground surface

These stress magnitudes and directions may be influenced by topographic features, such as deeply incised watercourses or basement excavations, which can concentrate horizontal stress fields beneath the feature. Parker et al. (1999) also describes possible sites in Sydney where horizontal stress can be locally higher due to local structural features (i.e. faults and dykes) influencing the stress field.

7.3 RECOMMENDED DESIGN VALUES

Available stress data for Hawkesbury Sandstone in the Sydney CBD, North West Rail Link and CBD Metro projects are presented in Figure 13 and Figure 14 for the major and minor stress fields respectively.

Based on that test data available, the following design horizontal stress regime is recommended for Sandstone at this site:

$\sigma_1 = \sigma_{h(N-S)} = 1.5MPa + 2\sigma_v$

$\sigma_2 = \sigma_{h(E-W)} = 1.0MPa + 1.2\sigma_v$

The vertical pressure (σ_3) will be the overburden pressure plus the surcharge of adjacent buildings.

Figure 13 and Figure 14 also present a range of design values that may be used to assess the sensitivity of the various in-ground design elements. The following high and low stress regimes are recommended for Sandstone:

High stress: $\sigma_1 = \sigma_{h(N-S)} = 2.5MPa + 2\sigma_v$ $\sigma_2 = \sigma_{h(E-W)} = 1.5MPa + 1.2\sigma_v$

Low stress: $\sigma_1 = \sigma_{h(N-S)} = 0.5MPa + 2\sigma_v$ $\sigma_2 = \sigma_{h(E-W)} = 0.5MPa + 1.2\sigma_v$

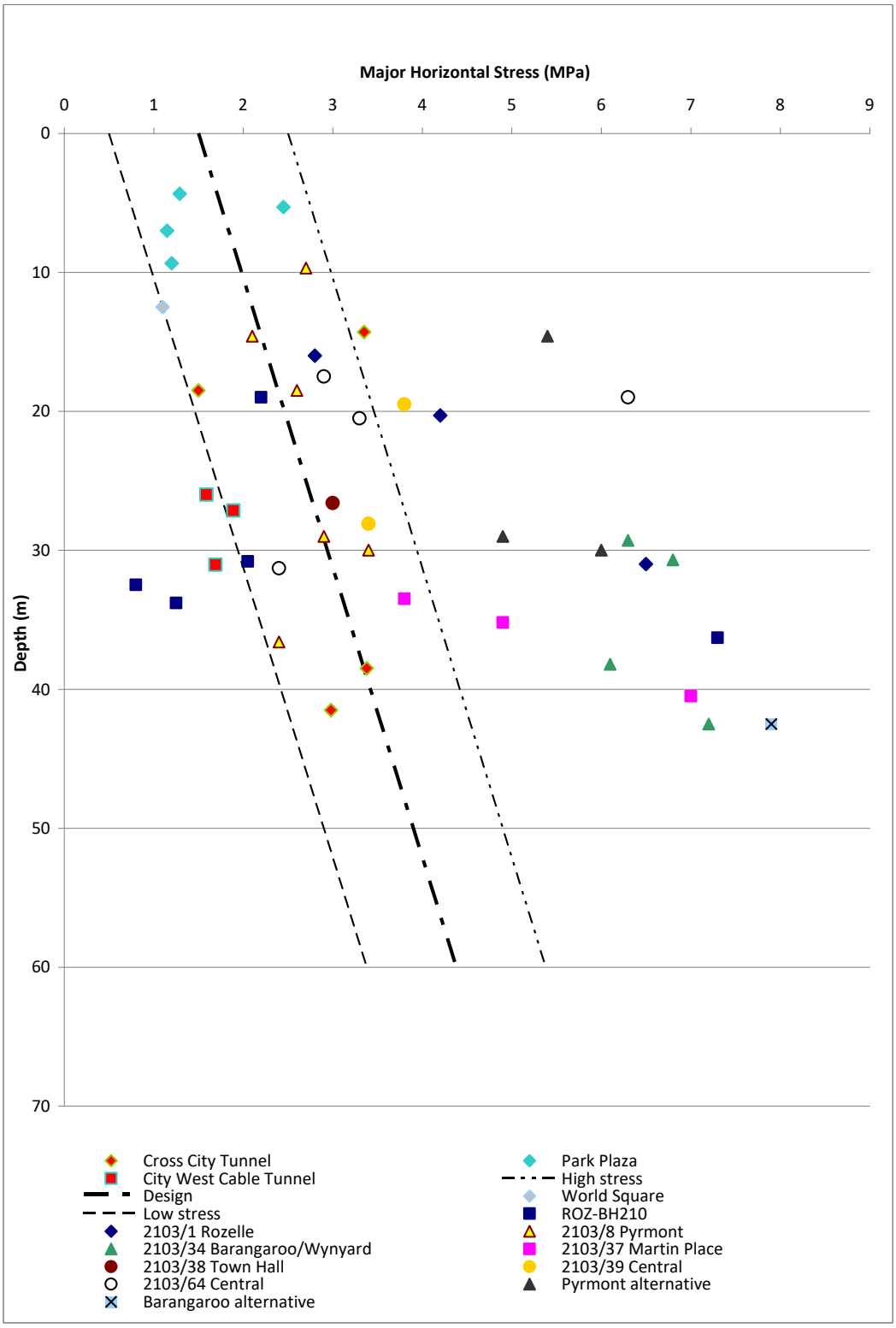


Figure 13: Major horizontal stress (σ_1) vs depth

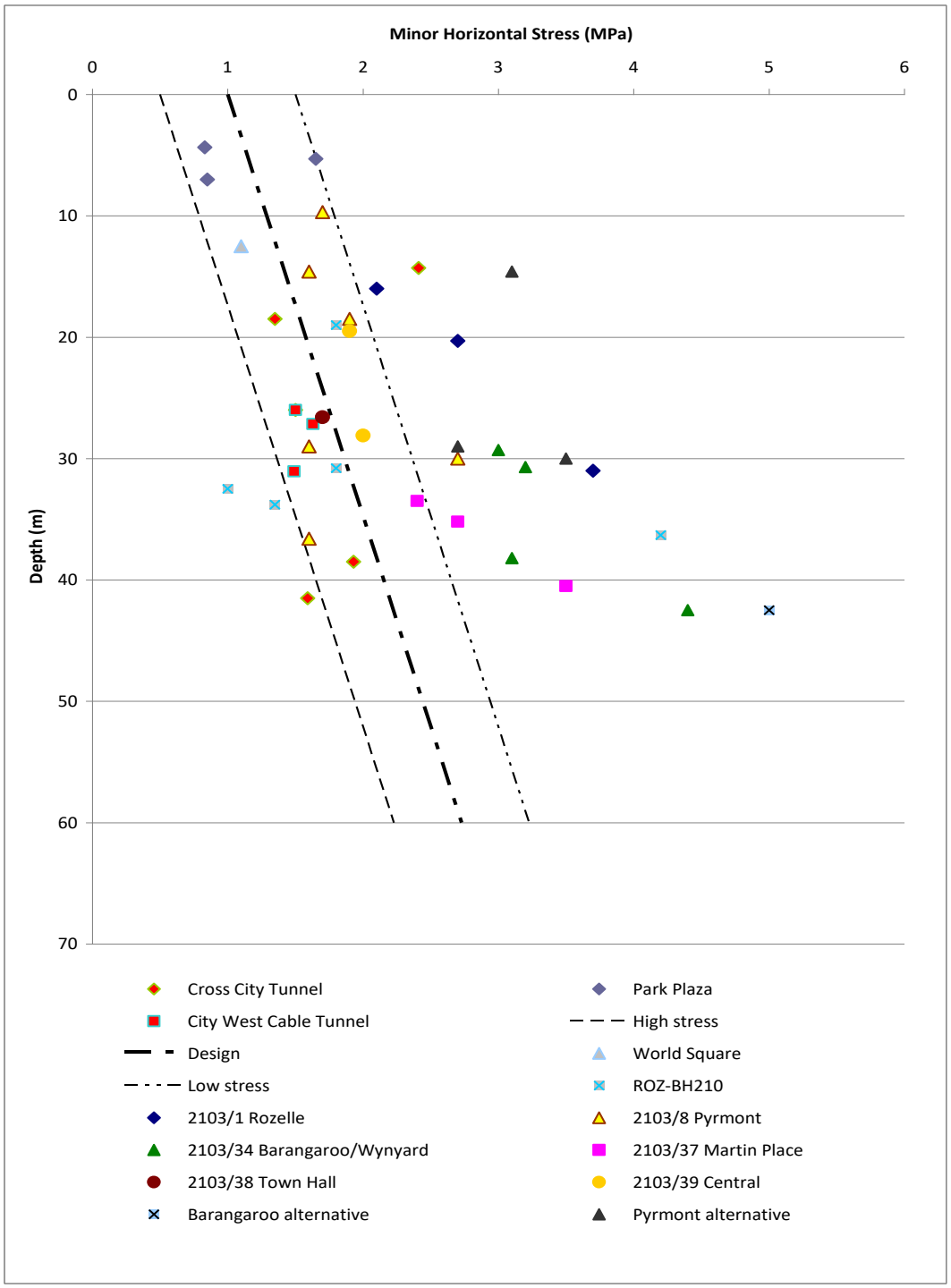


Figure 14: Minor horizontal stress (σ_3) vs depth

8. EXCAVATION AND RETENTION

8.1 CONCEPT EXCAVATION SUPPORT REQUIREMENTS

Permanent excavation support is typically controlled by site constraints, tolerable ground movements and requirements to restrain poor quality rock. Table 11 contains a concept assessment of support options for the geotechnical units.

Table 11: Concept support options

Material	Support Options
Unit 0 **May contain** • **Fill,** • **Residual soil and extremely weathered sandstone** • **Class IV Sandstone** • **Class III Sandstone**	• Unsupported excavation at suitable batter slopes • Retaining walls • Soil nails • Mesh and shotcrete (minimum 75 mm thick), with adequate drainage for the Class IV sandstone. • Pattern rock bolting in low strength sandstone and in fractured zones within the better rock • Mesh support by doweling and shotcrete (minimum 75 mm thick) or fibre reinforced shotcrete, with drainage.
Unit 1 and Unit 3 **Class II and Class I sandstone**	• Spot bolting and localised shotcrete • Possible localised pattern bolting and shotcrete
Unit 2 (if encountered) **Class III Shale**	• Fractured areas: Shotcrete & pattern bolting (allow 2m grid) • Unfractured areas: Spot bolting as needed

The detailed shoring design should be conducted for State Significant Development Application for the mixed-use redevelopment at 4-6 Bligh Street, Sydney.

8.2 RETAINING WALLS FOR UNIT 0

Where excavations cannot be battered, soil and more weathered sandstone could be supported using shoring walls such as conventional soldier pile wall. Use of the existing basement walls could be considered subject to suitable support during demolition of the existing building.

Temporary anchor installation would require the permission of adjacent property owners where anchors cross boundaries or easements.

It is recommended that a detailed analysis be undertaken, including assessment of surcharge loads, to develop a suitable retention support system. As a guide, Table 12 below presents typical design parameters for retaining wall design. These parameters should be reviewed following geotechnical investigation of the site.

Table 12: Parameters for retaining wall design

Material	Bulk unit Weight γ (kN/m3)	'Active' Earth Pressure Coefficient, K_a	'At Rest' Earth Pressure Coefficient, K_0	'Passive' Earth Pressure Coefficient, K_p	C' (kPa)	ϕ' (deg)
Unit 0 Fill	20	0.4	0.5	2.5	0	25
Unit 0 Residual Soil & very low strength sandstone	20	0.27	0.5	3.7	30	35

Active earth pressure coefficients may be adopted where wall movements of about 1% of the wall height can be tolerated. Movements of this magnitude may not be tolerable for excavations beside heritage structures or other assets. At rest pressure coefficients should be adopted where less movement can be tolerated, but a well-constructed wall will still undergo movements of the order of 0.1% to 0.3% of the wall height where at rest pressures are adopted.

Applicable surcharge loads should be added to earth pressures.

Where subsequent rock excavation exposes the toes of the retention system piles, rock bolts may need to be installed above the toe of the pile to provide restraint and local shotcrete and mesh may be required to support and protect the foundation of the piles.

8.3 SUPPORT FOR ROCK

Vertical cuts are generally feasible in Class II or better Hawkesbury Sandstone with spot bolt support from a retaining wall. Rock bolt support, possibly with shotcrete and mesh, is necessary in sections of the excavated rock faces below any existing shoring walls to retain fractured zones of rock.

It is noted that the detailed rock shoring design should be conducted. To identify the final shoring requirement, an experienced geotechnical engineer or engineering geologist should carry out regular inspections as the excavation progresses. To assess the need for bolting and rock face support (for short and long-term safety) it is recommended that the rock faces be assessed at not more than 2 m depth intervals on all excavated faces.

Where long-term support is required below the site retention system rock bolts must be provided with a high level of corrosion protection if they cannot be maintained (i.e. inspected and replaced, if necessary). Stainless steel bolts or multiple layers of corrosion protection such as encapsulating plain or galvanised bolts in both grout and PVC sheaths may be required.

8.4 ROCK ANCHORS

Rock anchors should be inclined downwards to anchor into Unit 1 Sandstone. The actual design load capacity of anchors should be based on a performance specification, verified by proof-testing. For preliminary design of anchors, the following allowable and ultimate bond stresses are recommended:

Table 13: Recommended bond stresses for ground anchors and soil nails

Unit	Allowable (Working) Bond Stress (kPa) [(1)]	Ultimate Bond Stress (kPa) [(1)]
1	1000	2000
2	500	1000

Notes

1) For bond lengths not less than 3m and not more than 7m (except for a single bore multianchor system)

The recommended values are given on the provision that each anchor is proof loaded to 1.3 times maximum working load (temporary anchors) and to 1.5 times maximum working load (permanent anchors) prior to locking off at the required working load.

8.5 EXCAVATION INDUCED GROUND MOVEMENTS & HERITAGE BUILDINGS

The proposed excavation will cause ground movements on the adjacent sites. It is important to undertake a study on the potential impact of these ground movements on the heritage buildings and other surrounding structures due to the proposed basement excavation.

Many factors can influence the size of these movements, such as ground conditions, design and construction quality.

For excavation in soils (fill, residual soil and extremely weathered rock), documented data has shown that for well-designed and constructed shoring, vertical and lateral movements can be about 0.1% to 0.3% of the retained thickness of soil. Likely ground movements should be assessed during design of the shoring system.

In rock excavation, lateral movement occurs due to relief of *in situ* locked-in horizontal stresses. There are relatively high natural horizontal stresses within Sydney sandstone. From our experience of deep basements in Sydney, typical lateral movements range from 0.5 mm to 2 mm per metre depth of excavation, depending on rock quality and presence of bedding seams.

Lateral ground movements due to stress relief have been measured at distances of up to 1.5 to 2 times the basement depth from the edge of excavations. These typically show that movements can be up to 30% of the displacement around the excavation perimeter at a distance approximately equal to the excavation depth. Stress relief ground movements are unlikely to be significant at distances greater than twice the excavation depth. However, these approximations will be affected by local geological structures and should only be used as a rough guide. A detailed analysis of induced ground movement on the surface and around heritage buildings should be conducted in the shoring design under different proposals.

9. FOUNDATION DESIGN

The borehole investigation suggests that, whilst the bulk excavation may terminate in Unit 1 Sandstone, the poorer Unit 2 will be at shallow depth below the floor and may be encountered in footing excavations for pad or strip footings.

The presence of the Unit 2 rock in the zone of influence of pad or strip footings would reduce the bearing capacity at bulk excavation floor level. Unit 2 rock is expected to be variable in strength and defects, and may not be suitable as a foundation for a high rise structure.

Table 14 below presents serviceability and Limit State geotechnical design parameters that may be used for design of pad footings and bored piles into the different classes of sandstone. For temporary works and demolition, it may be necessary to found structures or cranes on Unit 1 rock. The parameters in Table 14 may be adopted for Unit 1 provided footings are founded at an elevation equivalent to at least 2 footing widths above Unit 2 rock.

Table 14: Preliminary geotechnical foundation design parameters

Unit	Serviceability End Bearing Pressure (MPa)	Ultimate End Bearing Capacity (MPa)	Ultimate Shaft Adhesion (kPa)	Young's Modulus (MPa)
Unit 1 Sandstone Note A	8	80	2,000	1,500
Unit 2 Shale & Sandstone	3	25	600 [a]	600
Unit 3 Sandstone	8	80	2,000 [a]	1,500

Notes to Table 8

A. These parameters may only be adopted where the footing is founded at a height above Unit 2 rock equivalent to more than 2 footing widths, e.g. if the footing is 2m wide, it must found at 4m AHD higher than the elevation of the top of Unit 2 rock.

B. *For piles, shaft adhesion should only be assumed where piles have a minimum socket of at least 1 pile diameter and a clean socket of roughness category R2 or better is achieved. Values may have to be reduced if wall smear or polish is present.*

C. *The design values assume that all footings are proved by core drilling or spoon testing. Design values may need to be reduced if less field testing is conducted.*

D. *If foundations are to resist uplift, the ultimate shaft adhesion should be reduced by a factor of 0.7. Uplift piles should also be checked for an inverted cone pull-out mechanism.*

E. *Serviceability bearing pressures are intended to achieve settlements of less than 1% of the least footing dimension, which may not within tolerance of the structures.*

Limit state design methods are recommended to comply with AS2159-2009 “Piling – Design and installation”. In accordance with AS2159-2009, the geotechnical strength reduction factor, Φg, is dependent on assignment of an Average Risk Rating (ARR) which takes into account various geotechnical uncertainties, redundancy of the foundation system, construction supervision, and the quantity and type of pile testing. The assessment of Φg therefore depends on the structural design of the foundation system as well as the design and construction method, and testing (if any) to be employed by the designer and piling contractor.

To assist you with preliminary design we recommend Φg of 0.6 be adopted for footings on sandstone. The final selection of Φg should be reviewed by Coffey at the detailed design stage.

The descriptions of subsurface conditions described in this report are based on experience in the vicinity of the site. Ground conditions can change over relatively short distances. The recommendations of this report should be reviewed following a geotechnical investigation comprising drilling and groundwater measurements. In addition, assessment during construction with appropriate input from an experienced geotechnical engineer is also recommended.

The document entitled “Important Information about Your Coffey Report” presents additional information on the uses and limitations of this report.

10. REFERENCES

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3. *Parker, C.J., Whiteley, R.J., and Gee, B. (1999). Innovative investigation techniques used for geotechnical modelling of the Northside Storage Tunnel Project. Sydney 10th Aust Tunnelling Conf. pp193-205.*
4. *Pells et al. (1998) “Foundations on Sandstone and Shale in the Sydney Region” Aust. Geomech. Jnl. Dec 1998.*
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6. *Bertuzzi, R. (2014) “Sydney Sandstone and Shale Parameters for Tunnel Design”, Australian Geomechanics Vol. 49 No. 2, June 2014, pp 95 – 104.*
7. *Tameetta, P. and Hewitt, P. (2004), “Hydrogeological Properties of Hawkesbury Sandstone in the Sydney Region”, Australian Geomechanics Vol. 39 No. 3, September 2004, pp 91 – 107.*

APPENDIX A: LIMITATIONS

IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

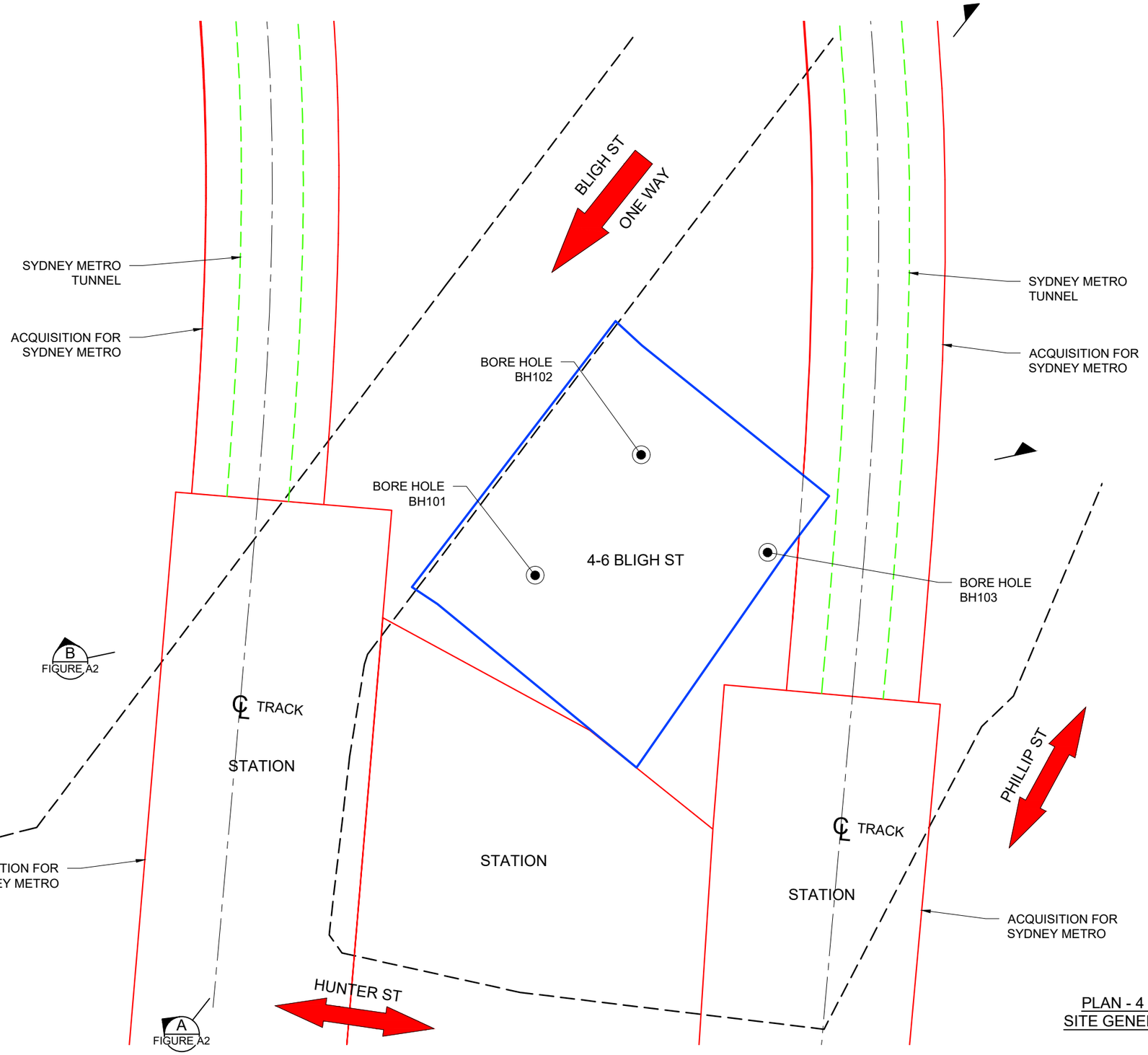
Rely on Tetra Tech Coffey for additional assistance

Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

APPENDIX B: SITE PLAN AND GEOLOGICAL SECTION



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TRUE

BORE HOLE INFORMATION

BOREHOLE #	EASTING	NORTHING	ELEVATION
BH101	334465.60	6251284.97	17.93
BH102	334477.59	6251298.59	17.93
BH103	334491.89	6251287.55	12.79

PLAN - 4 - 6 BLIGH STREET
SITE GENERAL ARRANGEMENT
SCALE 1:500

REVISION No.	DESCRIPTION	DRN.	ENG.	CHK.	APP.	DATE.
A	FOR INFORMATION	RL	LC	AB	AB	16.11.18

SCALE: 5 0 5 15 25
Scale (metres) 1:500
(DO NOT SCALE FROM DRAWING)

DRAWN:	R. LINDREA
ENGINEER:	L. CHO
CHECKED:	A. BROADBENT
APPROVED:	A. BROADBENT
DATE:	15.11.18
SCALE:	AS SHOWN
ORIGINAL SIZE:	A3

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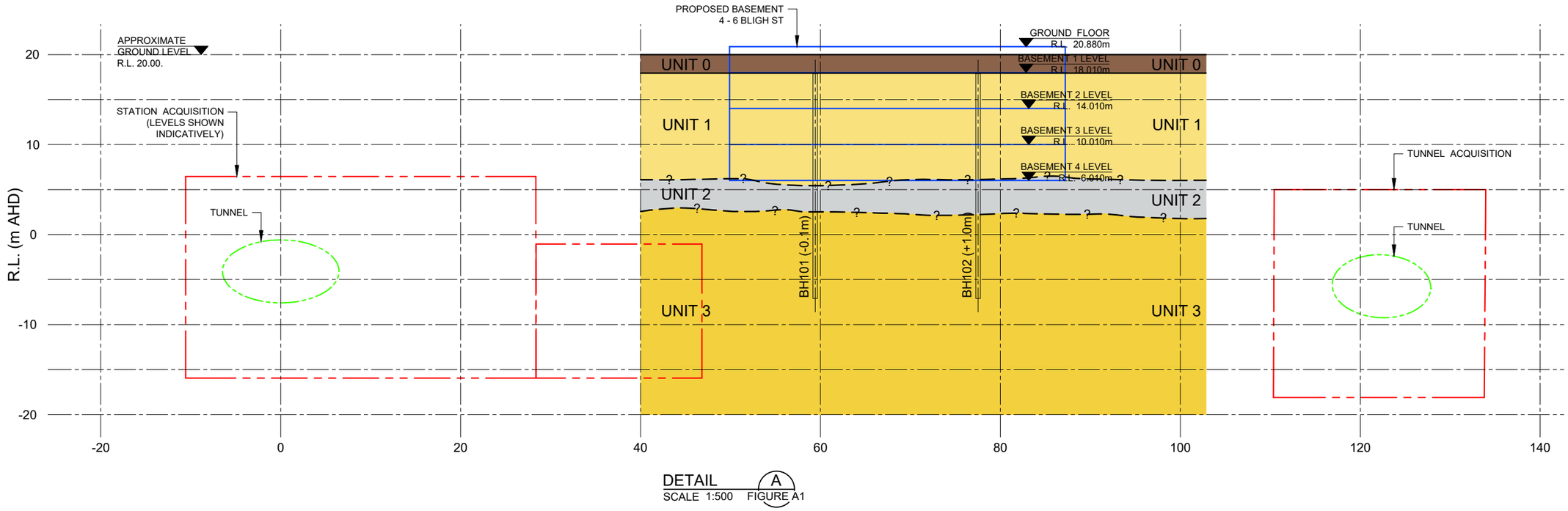
CLIENT: RECAP MANAGEMENT

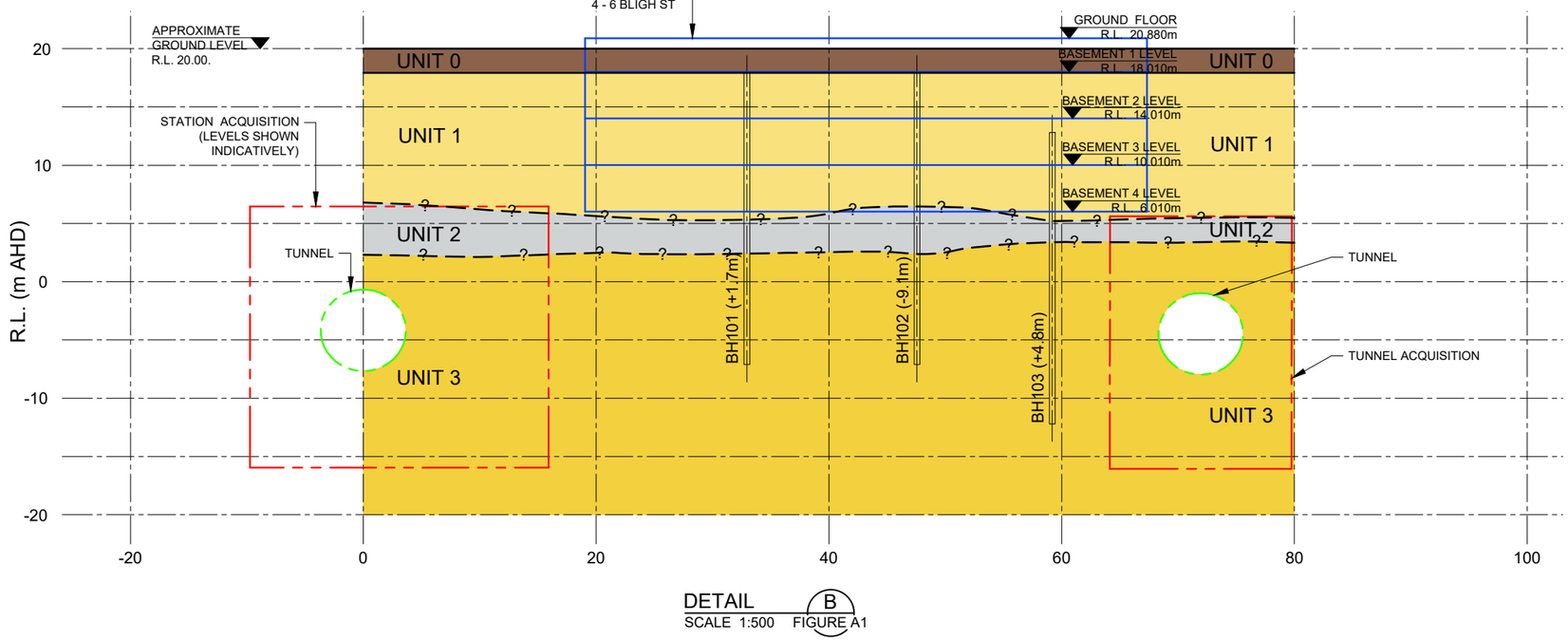
TITLE: 4 - 6 BLIGH ST
SITE GENERAL ARRANGEMENT

PROJECT No: 754-SYDGE205019
DRG No: FIGURE A1
REV: A

SAVE DATE: 16-11-2018 11:13AM FILE NAME: \\TT\SYD\PS1\DATA\1 PROJECTS\4. SYD-GEOTECH\NICS\2017\SYDGE205019 - 4-6 BLIGH STREET\12. CAD\205019-SK-001.DWG



DETAIL A
SCALE 1:500 FIGURE A1



DETAIL B
SCALE 1:500 FIGURE A1

LEGEND

- UNIT 0 - UNOBSERVED GROUND, LIKELY FILL, RESIDUAL SOIL TO SANDSTONE (CLASS V TO II)
- UNIT 1 - MODERATELY WEATHERED TO FRESH CLASS II AND CLASS I SANDSTONE
- UNIT 2 - CLASS III SHALE
- UNIT 3 - FRESH CLASS II AND CLASS I SANDSTONE
- —?— —?— INFERRED GEOLOGICAL BOUNDARY

REVISION No.	DESCRIPTION	DRN.	ENG.	CHK.	APP.	DATE.
A	FOR INFORMATION	RL	LC	AB	AB	16.11.18

SCALE: 5 0 5 15 25
Scale (metres) 1:500
(DO NOT SCALE FROM DRAWING)

DRAWN:	R. LINDREA
ENGINEER:	L. CHO
CHECKED:	A. BROADBENT
APPROVED:	A. BROADBENT
DATE:	15.11.18
SCALE:	AS SHOWN
ORIGINAL SIZE:	A3

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CLIENT: RECAP MANAGEMENT

TITLE: 4 - 6 BLIGH ST
GEOTECHNICAL CROSS SECTIONS

PROJECT No: 754-SYDGE205019
DRG No: FIGURE A2
REV: A

SAVE DATE: 16-11-2018 11:13AM FILE NAME: \\TTS779FS1\DATA1\ PROJECTS\4. SYD-GEOTECH\NCS\2017\SYDGE205019 - 4-6 BLIGH STREET\12. CAD\205019-SK-001.DWG

APPENDIX C: BOREHOLE LOGS, CORE PHOTOGRAPHS AND SOIL AND ROCK LOGGING EXPLANATION SHEETS

Rock Description Explanation Sheet (1 of 2)

The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726:2017.

DEFINITIONS: Rock material, defect, structure and rock mass are defined as follows:

Rock material	In engineering terms rock material is any naturally occurring aggregate of minerals and/or organic materials that cannot be disaggregated by hand in air or water without prior soaking. Rock material is intact rock that is bounded by defects. Material which can be disaggregated or remoulded should be described as a soil.
Defect	Discontinuity, fracture, break or void in the material or materials across which there is little or no tensile strength.
Structure	Nature and configuration of the different defects within the rock mass and their relationship with each other.
Rock mass	It is the entirety of the system formed by all of the rock material and all of the defects. That is, it is a body of material which is not effectively homogeneous.

MATERIAL DESCRIPTIVE TERMS:

Rock name	Simple rock names are used rather than precise geological classification.
Particle size	Grain size terms for sandstone are:
Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mm to 0.6mm
Fine grained	Mainly 0.06mm (just visible) to 0.2mm
Fabric	When grains show an alignment, a preferred orientation or a layering (e.g. bedding or lamination for sedimentary rocks, and foliation or cleavage for metamorphic rocks) the terms used are:
Massive	No layering or penetrative fabric.
Indistinct	Layering or fabric just visible. Little effect on strength properties.
Distinct	Layering or fabric is easily visible. Rock may break more easily parallel to the fabric.

CLASSIFICATION OF MATERIAL WEATHERING

Term	Abbreviation	Definition
Residual Soil	**RS**	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible. Soil has not been significantly transported.
Extremely Weathered	**XW**	Material is weathered to such an extent that it has soil properties, i.e. it either disaggregates or can be remoulded in water. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered[1]	**HW**	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to the deposition of weathering products in pores.
Moderately Weathered[1]	**MW**	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is no longer recognisable. Little or no change of strength from fresh rock.
Slightly Weathered	**SW**	Rock is partially discoloured with staining or bleaching adjacent to defects, but shows little or no change of strength from fresh rock.
Fresh	**FR**	Rock shows no sign of decomposition of individual minerals or colour changes.

Notes on Weathering:

1. The term 'Distinctly Weathered' (DW) may be used where it is not practicable (or it is judged that there is no advantage in making such a distinction) to distinguish between 'Highly Weathered' and 'Moderately Weathered'. 'Distinctly Weathered' is defined as follows: 'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'.
2. Where physical and chemical changes of the rock material are caused by hot gases or liquids at depth (process called alteration) the term 'altered' may be substituted for 'weathering' to give the abbreviations XA, HA, MA, SA and DA.

ROCK MATERIAL STRENGTH TERMS

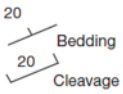
Term (Abbreviation)	Guide to Strength: Point Load Strength Index, $I_{s(50)}$ (MPa)	Guide to Strength: Field Assessment
Very Low (VL)	0.03 - 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; too hard to cut a triaxial sample by hand; pieces up to 30mm thick can be broken by finger pressure.
Low (L)	0.1 - 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a pick point; has a dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium (M)	0.3 to 1.0	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High (H)	1 to 3	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High (VH)	3 to 10	Hand specimen breaks after more than one blow; rock rings under hammer.
Extremely High (EH)	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes on Rock Material Strength:

1. Material with strength less than 'Very Low' should be described using soil characteristics.
2. The method of measuring the $I_{S(50)}$ should be in accordance with AS 4133.4.2.
3. The rock strength should be determined perpendicular to any anisotropy in the rock. High strength anisotropic rocks may readily break parallel to the planar anisotropy.
4. Although AS1726:2017 provides a basis for rock strength terms based on Unconfined Compressive Strength (UCS), the ratio between UCS and $I_{S(50)}$ may vary from less than 10 to over 30 depending on the rock type and overall strength. The UCS/$I_{S(50)}$ strength ratio should be determined for each rock material.
5. The rock strength classification using $I_{S(50)}$ above should be considered indicative only. The rock strength classified in accordance with AS1726:2017 may be higher or lower if UCS results are available.

Rock Description Explanation Sheet (2 of 2)

COMMON ROCK DEFECT TYPES

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering (e.g. bedding) or a planar anisotropy in the rock material (e.g. cleavage). May be open or closed.			
Joint	A surface or crack with no apparent shear displacement and across which the rock has little or no tensile strength, but which is not parallel or sub-parallel to layering or to planar anisotropy in the rock material. May be open or closed.			
Sheared Zone/Seam (Note 3)	Zone of rock material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.			
Crushed Seam (Note 3)	Seam of soil material with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock material which may be more weathered than the host rock. The seam has soil properties.			
Infilled Seam	Seam of soil material usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams up to 1mm thick may be described as veneer or coating on a joint surface.			
Extremely Weathered Seam	Seam of soil material, often with gradational boundaries. Formed by weathering of the rock material in place.			

Notes on Defects:

1. Usually borehole logs show the true dip of defects, and face sketches and sections show the apparent dip.
2. Partings and joints are not usually shown on the graphic log unless considered significant.
3. Sheared zones/seams, sheared surfaces and crushed seams are generally faults in geological terms.

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: The assessment of defect shape is partly influenced by the scale of the observation.

DEFECT ROUGHNESS TERMS

Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
Smooth	Smooth to touch. Few or no surface irregularities.
Polished	Shiny smooth surface.
Slickensided	Grooved or striated surface, usually polished.

DEFECT COATING TERMS

Clean	No visible coating.
Stained	No visible coating but surfaces are discoloured.
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy.
Coating	A visible coating up to 1mm thick. Thicker soil material should be described using appropriate defect terms (e g. infilled seam). Thicker rock strength material should be described as a vein.

DIMENSION OF DEFECTS

Spacing, length, openness and thickness

The spacing, length, aperture (openness), and seam thickness should generally be described directly in millimetres or metres.

Block Shape

Where it is considered significant, block shape (e.g. tabular, prismatic, columnar) should be described using the terms in Table 23 of AS 1726:2017.

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Engineering Log - Borehole

Borehole ID.	**BH101**
sheet:	1 of 5
project no.	**754-SYDGE205019**
date started:	**01 Nov 2018**
date completed:	**03 Nov 2018**
logged by:	**YA**
checked by:	**AJB**

client: ***Recap Management***

principal:

project: ***4-6 Bligh Street***

location: ***4-6 Bligh Street, Sydney, NSW***

position: E: 334,465.60; N: 6,251,284.97 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
								CONCRETE SLAB: angular, no voids, 20-40mm aggregate, separate at two layers 150mm rubber.				**CONCRETE**
								BALLAST: 70-80mm coarse aggregate, angular, well compacted.				**BALLAST**
								SANDSTONE: ironstains.				**BEDROCK**
				17	1.0			Borehole BH101 continued as cored hole				
				16	2.0							
				15	3.0							
				14	4.0							
				13	5.0							
				12	6.0							
				11	7.0							
				10								

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- DT diatube

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	2 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					start coring at 0.63m						
					NO CORE: 0.21 m						
		17	1.0		**SANDSTONE**: medium grained, pale grey and orange-brown, 5°-10° distinctly bedded, ironstains, moist, massive.	MW		a=0.41 d=0.35	86%		SM, 0°, PL, VR, SN, iron oxide
		16	2.0		2.46 to 2.85 m: vertical joint, 2-3mm wide, filled with iron oxide			a=1.13 d=1.36			PT, 15°, PL, RO, CN, iron oxide
		15	3.0					a=1.01 d=0.85	100%		JT, 90°, UN, RO, SN, iron oxide PT, 0°, PL, RO, CO - Clay, iron oxide
		14	4.0		4.40 to 4.60 m: becomes grey, brown, hairline to 1mm cracks, moist, 5°-10° to bedding	SW		a=1.21 d=0.88 a=0.95 d=1.26	100%		PT, 5°, PL, RO, CN SZ, 0°, PL, RO, CO - Clay
		13	5.0					a=0.49 d=0.87			PT, 5°, PL, RO, CN PT, 5°, PL, RO, CN PT, 0°, UN, RO, CN
		12	6.0		6.40 to 6.75 m: hairline to 1mm cracks, moist, 0° bedding 6.50 to 6.60 m: shale, moist			a=1.11 d=0.74	100%		PT, 5°, PL, SO, SN, black PT, 2°, PL, SO, SN
		11	7.0					a=1.03 d=1.19	100%		PT, 2°, PL, SO, SN, black PT, 0°, PL, SO, SN
		10									

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

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Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	3 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
		9	9.0		**SANDSTONE**: medium grained, pale grey and orange-brown, 5°-10° distinctly bedded, ironstains, moist, massive. *(continued)* 8.05 to 8.15 m: hairline cracks 8.25 to 8.32 m: shale layer and having cracks, moist 8.65 to 8.68 m: cracks	SW		a=1.13 d=1.17	100%		PT, 2°, PL, RO, SN PT, 0°, PL, SO, SN CS, 5°, CU, SO, SN PT, 2°, PL, RO, CN PT, 5°, PL, RO, CN SM, 5°, PL, RO, CN	
		8	10.0		**SANDSTONE**: medium grained, orange, red brown, dry, indistinctly bedded.			a=1.60 d=0.92 a=1.32 d=1.22	100%		PT, 2°, PL, RO, CN CS, 5°, PL, RO, CO - Clay PT, 2°, CU, RO, CN PT, 1°, PL, RO, CN	Defects are: PT, 0°, PL, RO, CN, unless otherwise described
		7	11.0					a=1.34 d=1.95			PT, 5°, PL, RO, CN PT, 2°, CU, RO, CO - Clay	
		6	12.0					a=1.83 d=1.36	100%		PT, 2°, PL, RO, CN PT, 0°, CU, RO, CN	
		5	13.0		**SANDSTONE**: medium to coarse grained, yellow brown, indistinctly bedded, high quartz content.			a=2.61 d=1.22				
		4	14.0		**SHALE**: fine to medium grained, pale grey, moist, sheared zone (fault). 13.33 to 13.39 m: clay seam, extremely weathered, very low strength **SANDSTONE**: medium grained, dark grey and grey, indistinctly bedded with irregular shale inclusions.	XW SW			100%		JT, 90°, IR, RO, CN PT, 5°, CU, RO, CN SZ, IR, RO, CN	Defects are: CS, 0°, PL, RO, CO unless otherwise described
		3	15.0		**BRECCIATED SHALE**: fine grained, grey, indistinctly bedded, moderately weathered, medium strength. **SANDSTONE**: medium grained, grey brown, indistinctly bedded, slightly weathered, medium to high strength. **SHALE**: fine grained, grey to dark grey, indistinctly bedded, slightly weathered, medium to high strength.			a=2.47 d=0.63	100%		PT, 5°, ST, SO, CN CS, CN CS, 10°, UN, RO, CO - Clay	
		2						a=0.84 d=0.82	100%			

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

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Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	4 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial; O = diametral VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		1	17.0		**SANDSTONE**: fine to coarse grained, pale grey to grey, 5°-10° distinctly bedded, common shale laminae throughout. *(continued)*	SW		a=0.68 d=0.63	100%		PT, 0°, PL, RO, VN - Clay PT, 0°, PL, RO, CO - Clay
						FR		a=1.24 d=1.01			
		0	18.0		17.65 m: 3mm thick clay band (shale) 17.90 m: 10mm thick clay bands, shale occassional clay bands between 18.2-18.4m			a=0.88 d=0.86	100%		PT, 0°, PL, RO, CO - Clay
		-1	19.0		18.60 m: trace of clay bands, and trace of basaltic feature, 2mm size 19.00 m: 20-40mm clay coating on surface only			a=0.73 d=0.20	100%		PT, 1°, CU, RO, CO - Clay PT, 5°, CU, RO, CO - Clay PT, 2°, PL, RO, CN
		-2	20.0					a=0.77 d=1.04			
		-3	21.0		21.00 to 21.40 m: hairline cracks			a=1.44 d=0.84	100%		PT, 2°, CU, RO, SN
		-4	22.0					a=1.63 d=1.22	100%		PT, 2°, PL, RO, CN PT, 0°, PL, SO, CN
		-5	23.0		22.60 to 23.15 m: hairline cracks			a=1.15 d=0.85	100%		PT, 0°, PL, SO, SN
		-6									

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
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Engineering Log - Cored Borehole

Borehole ID.	**BH101**
sheet:	5 of 5
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					SANDSTONE: fine to coarse grained, pale grey to grey, 5°-10° distinctly bedded, common shale laminae throughout. *(continued)*	FR		a=1.30 d=0.93	100%		
		-7	25.0		25.05 to 25.50 m: hairline to 1mm, shale laminae			a=0.64 d=0.57	100%		
		-8	26.0					a=1.19 d=0.88			PT, 2°, PL, SO, SN
					26.50 to 26.65 m: hairline shale laminae						PT, 2°, CU, SO, SN
		-9	27.0						100%		
								a=1.10 d=0.98			
		-10	28.0					a=1.18 d=0.82			
		-11	29.0						100%		PT, 2°, PL, RO, CN
								a=0.84 d=0.84			Defects are: PT, 0°, PL, RO, CN, unless otherwise described
					Borehole BH101 terminated at 29.30 m						
		-12	30.0								
		-13	31.0								
		-14									

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

BH101 0.63 - 5.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

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client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH101

project no: 754-SYDGE205019 | fig no: **FIGURE 1** | rev:

BH101 5.00 - 10.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

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A TETRA TECH COMPANY

client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH101**
project no: 754-SYDGE205019	fig no: **FIGURE 2** rev:

BH101 10.00 - 15.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

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client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH101**
project no: 754-SYDGE205019	fig no: **FIGURE 3** rev:

BH101 15.00 - 20.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

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client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH101

project no: 754-SYDGE205019 | fig no: **FIGURE 4** | rev:

BH101 20.00 - 25.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

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client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH101

project no: 754-SYDGE205019 | fig no: **FIGURE 5** | rev:

BH101 25.00 - 29.30 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

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client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH101**
project no:	754-SYDGE205019
fig no:	**FIGURE 6**
rev:	

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Piezometer Installation Log

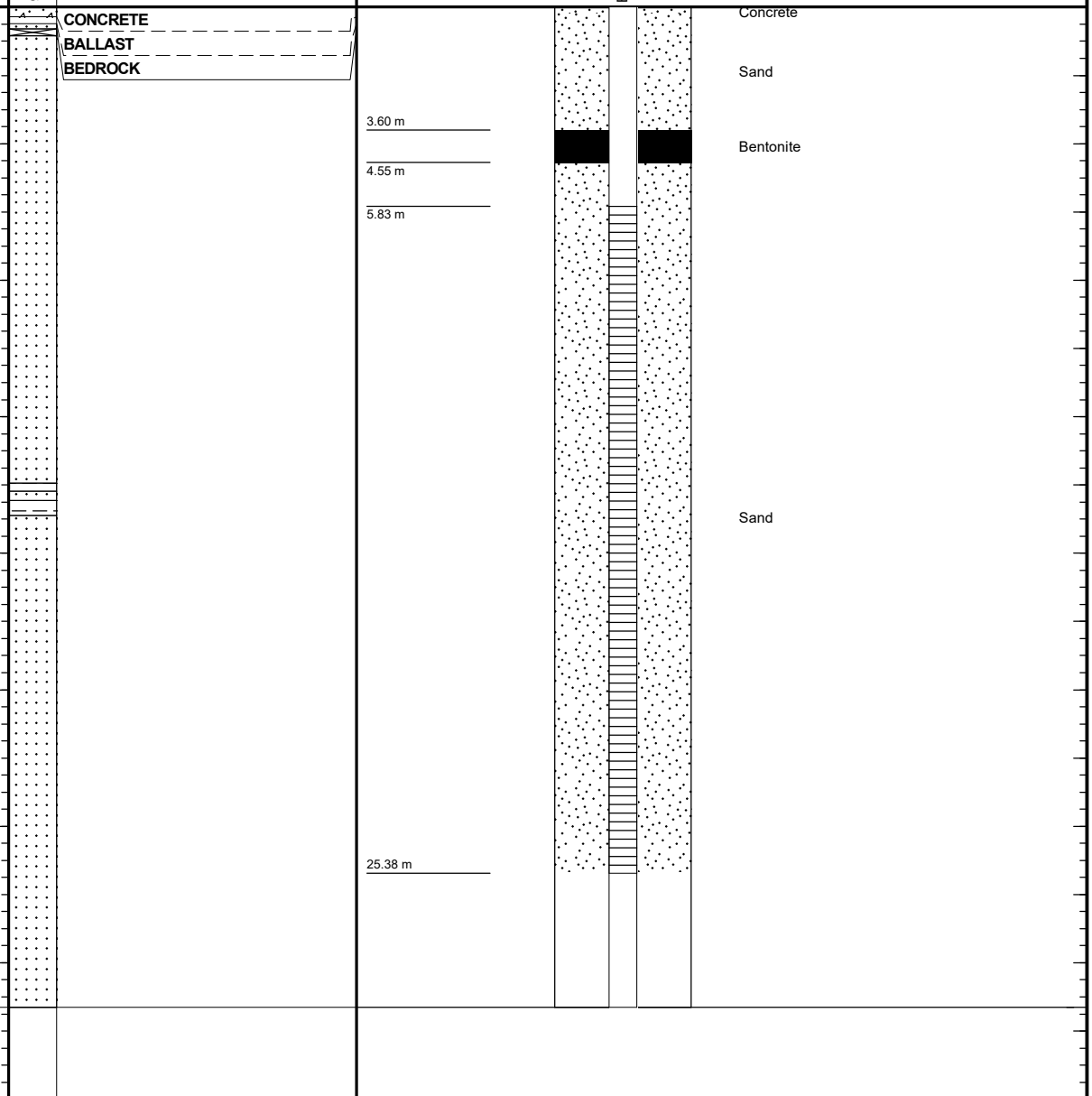
Hole ID.	**BH101**
sheet:	1 of 1
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**01 Nov 2018**
principal:	
date completed:	**03 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,465.60; N: 6,251,284.97 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

equipment type: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance** | **piezometer construction details**

method & support | water | RL (m) | depth (m) | graphic log | material name



bore construction license:
drilling company:
driller:
driller's permit no.:

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method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 — water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH101	standpipe piezo.		29.30 m			-11.40		

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Engineering Log - Borehole

Borehole ID.	**BH102**
sheet:	1 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter : 215 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
DT								**CONCRETE**: 5-20mm coarse aggregate, angular, no voids.				**BASEMENT SLAB**
								CONCRETE: 20-40mm coarse aggregate, angular, no voids.				**BASE COURSE**
								BALLAST: 60-90mm coarse aggregate, angular, well compacted.				**BALLAST**
				17	1.0			**SANDSTONE**: medium grained, pale grey, distinct, iron stains, visible, fresh, very high strength.				**BEDROCK**
								Borehole BH102 continued as cored hole				
				16	2.0							
				15	3.0							
				14	4.0							
				13	5.0							
				12	6.0							
				11	7.0							
				10								

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- DT diatube

* bit shown by suffix
e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Cored Borehole

Borehole ID.	**BH102**
sheet:	2 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : 215 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					start coring at 0.65m						SM, 0°, IR, SO, CO PT, 0°, PL, RO, CN
		17	1.0		**SANDSTONE**: medium grained, pale pinkish grey, indistinctly bedded, red iron staining. 0.99 m: trace pyrite, some quartz grains upto 15mm, glassy	SW		a=0.67 d=0.92	100%		
								a=1.00 d=0.49			PT, 5 - 10°, PL, RO, CN PT, 5°, PL, RO, CN
		16	2.0						100%		
					2.35 to 3.32 m: interbedded grey and red bands, bedding angle 10°-15°, very closely spaced			a=0.38 d=0.86			PT, 10°, PL, RO, CN
		15	3.0								
					3.32 to 4.50 m: interbedded grey shale laminae			a=0.90 d=0.97			PT, 5°, PL, RO, CN
		14	4.0						100%		
								a=0.89 d=1.44			PT, 2°, PL, RO, CN SM, 0°, PL, SO, VN, 5 mm, clay infill
					4.55 to 5.05 m: occasional shale laminae						
		13	5.0								PT, 0°, PL, RO, CN
								a=0.99 d=0.92	100%		PT, 2°, PL, RO, CN
		12	6.0								
								a=0.84 d=0.58			PT, 2°, PL, RO, VN, 2 mm, clay infill
		11	7.0		6.88 to 7.40 m: shale laminae, black	MW			100%		CS, 0°, CU, SO, CO, black PT, 0°, PL, RO, CO, black
								a=0.90 d=0.86			PT, 0°, PL, RO, CO, black PT, 0°, PL, RO, CO, black
						SW					PT, 0°, PL, SO, VN, clay infill
		10							100%		PT, 0°, PL, RO, CN, black

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH102**
sheet:	3 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) surface elevation: 17.90 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : 215 mm vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
		9	9.0		**SANDSTONE**: medium grained, pale grey, 0°, planar isotropic, indistinctly bedded, alternative clay bands visible.	SW		a=1.14 d=1.20	100%		PT, 5°, PL, SO, CO, black SM, 0°, PL, SO, VN, 2 mm, clay infill
								a=1.66 d=1.23			
		8	10.0		**SANDSTONE**: medium grained, reddish-brown, becoming massive.	FR			100%		PT, 0°, PL, RO, CO
								a=1.52 d=1.42			
		7	11.0								
								a=0.70 d=1.44	100%		PT, 0°, PL, RO, CO, black PT, 2°, CU, RO, CN SM, 0°, PL, SO, VN, 2 mm, clay infill SM, 0°, PL, SO, VN, 5 mm, clay infill SM, 0°, IR, RO, CO PT, 10°, PL, SO, CN, dark grey
		6	12.0		**SANDSTONE**: fine to medium grained, pale grey, distinctly bedded. 11.74 to 12.68 m: occasional thin shale beds 12.30 to 12.36 m: shale bed	MW					
					NO CORE: 0.06 m	SW		a=1.34 d=1.12			
		5	13.0		**SANDSTONE**: fine to medium grained, pale grey, distinctly bedded.				95%		
								a=1.54 d=1.39			
		4	14.0		**SHALE**: fine grained, pale grey, indistinctly bedded, inclusions of basaltic fill. 13.89 to 14.00 m: brecciated shale 14.18 to 14.30 m: brecciated shale	DW			100%		JT, 20°, PL, SO, VN
								a=0.38 d=0.27			JT, 20°, UN - IR, SL, CO PT, 2°, CU, RO, CN JT, 10°, IR, SO, CN JT, 15°, CU, SO, CN
		3	15.0						100%		PT, 0°, PL, SO, CN PT, 0°, PL, SO, CN
					15.25 to 15.55 m: intrebedded, shale bands up to 2mm thick				100%		PT, 0°, PL, SO, CO - Clay PT, 2°, PL, SO, CO - Clay
					SANDSTONE: medium grained, pale grey, trace of basaltic inclusions.	FR		a=0.35 d=0.86			PT, 20°, PL, RO, CN
		2									

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

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core recovered (graphic symbols indicate material)
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core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
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XW extremely weathered
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DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

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L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH102**
sheet:	4 of 4
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**29 Oct 2018**
principal:	
date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter : 215 mm | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
		1	17.0		**SANDSTONE**: medium grained, pale grey, trace of basaltic inclusions. *(continued)*	FR		a=0.42 d=0.60	100%		PT, 0°, PL, SO, CN	Defects are: PT, 0°, PL, RO, CN, unless otherwise described
					16.73 to 17.55 m: alternative shale laminae, easily broken parallel to bedding				100%		PT, 0°, PL, SO, CN	
		0	18.0		17.85 m: 10mm, dark grey, shale laminae			a=1.13 d=1.10			PT, 2°, UN, RO, CN	
					18.28 to 18.40 m: 3-10mm, dark grey, shale band			a=1.05 d=0.45				
		-1	19.0		18.60 to 18.66 m: dark grey ckay layer				97%		SZ, 0°, UN, RO, VN, clay infill PT, 5°, CU, RO, VN - Clay SM, 0°, PL, RO, VN - Clay	
					NO CORE: 0.05 m 19.25 m: clay infill	FR						
		-2	20.0		**SANDSTONE**: medium grained, pale grey, trace of shale laminae. 19.30 m: becoming massive, occasional shale laminae			a=1.27 d=1.28	100%		PT, 0°, CU, RO, CN	
		-3	21.0					a=1.26 d=1.61			PT, 0°, PL, RO, SN, black	
		-4	22.0					a=1.45 d=1.17	100%			
		-5	23.0		Borehole BH102 terminated at 22.38 m			a=0.90 d=0.85				
		-6										

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: CORED 754-SYDGE205019.GPJ <<DrawingFile>> 15/11/2018 16:45

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

BH102 0.65 - 5.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH102**

project no: 754-SYDGE205019 | fig no: **FIGURE 1** | rev:

BH102 5.00 - 10.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH102

project no: 754-SYDGE205019 | fig no: **FIGURE 2** | rev:

BH102 10.00 - 15.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH BH102**

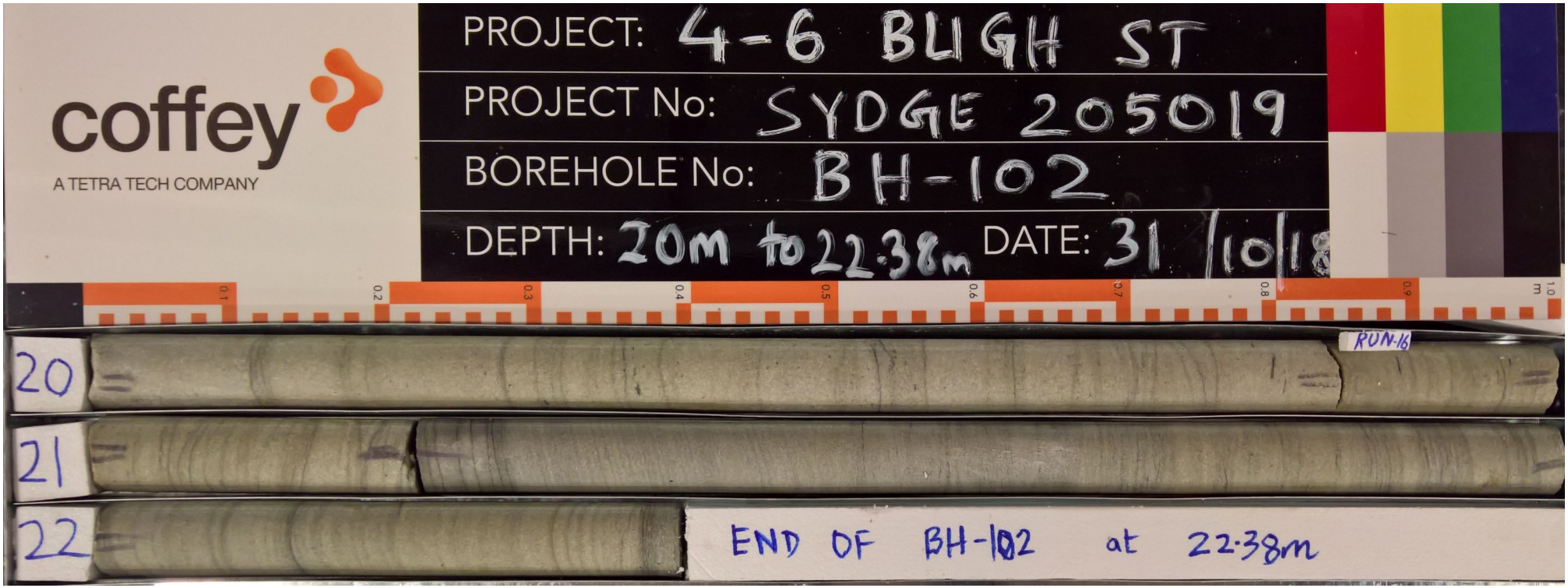
project no: 754-SYDGE205019 | fig no: **FIGURE 3** | rev:

BH102 15.00 - 20.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client:	Recap Management
project:	4-6 Bligh Street 4-6 Bligh Street, Sydney, NSW
title:	**CORE PHOTOGRAPH** **BH102**
project no:	754-SYDGE205019
fig no:	**FIGURE 4**
rev:	



BH102 20.00 - 22.38 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH102

project no: 754-SYDGE205019 | fig no: **FIGURE 5** | rev:

coffey
A TETRA TECH COMPANY

Piezometer Installation Log

		Hole ID.	**BH102**
		sheet:	1 of 1
		project no.	**754-SYDGE205019**
client:	**Recap Management**	date started:	**29 Oct 2018**
principal:		date completed:	**31 Oct 2018**
project:	**4-6 Bligh Street**	logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**	checked by:	**AJB**

position: E: 334,477.59; N: 6,251,298.59 (MGA94) | surface elevation: 17.90 m (AHD) | angle from horizontal: 90°

equipment type: , Track mounted | drilling fluid: | hole diameter : 215 mm

drilling information | **material substance** | **piezometer construction details**

method & support	water	RL (m)	depth (m)	graphic log	material name
DT		16			BASEMENT SLAB (0.15 m)
					BASE COURSE (0.88 m)
			4		BALLAST (1.38 m)
		12			BEDROCK
			8		
		8			
			12		
		4			
			16		
		0			
			20		
		-4			(22.38 m)

BH102

bore construction license:
drilling company:
driller:
driller's permit no.:

Concrete
Bentonite
Sand

method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 — water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH102	standpipe			22.38 m			-4.48	

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Engineering Log - Borehole

Borehole ID.	**BH103**
sheet:	1 of 3
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**04 Nov 2018**
principal:	
date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) | surface elevation: 12.80 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description (SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components)	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
								CONCRETE BASEMENT SLAB: 5-20mm aggregate, angular to sub-rounded, 2-5% voids, 6mm rebar used?? (mesh??).				**CONCRETE**
								CONCRETE: 10-20mm aggregate, 2% voids, (no mesh).				**BALLAST**
								BALLAST: 50-80mm coarse, ballast, angular, medium to dense compacted.				**BEDROCK**
				12	1.0			**SANDSTONE**.				
								Borehole BH103 continued as cored hole				
				11	2.0							
				10	3.0							
				9	4.0							
				8	5.0							
				7	6.0							
				6	7.0							
				5								

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method
- AD auger drilling*
- AS auger screwing*
- HA hand auger
- W washbore
- DT diatube

* bit shown by suffix e.g. AD/T
- B blank bit
- T TC bit
- V V bit

support
- M mud
- C casing
- N nil

penetration
1 2 3 — no resistance ranging to refusal

water
- 10-Oct-12 water level on date shown
- water inflow
- water outflow

samples & field tests
- B bulk disturbed sample
- D disturbed sample
- E environmental sample
- SS split spoon sample
- U## undisturbed sample ##mm diameter
- HP hand penetrometer (kPa)
- N standard penetration test (SPT)
- N* SPT - sample recovered
- Nc SPT with solid cone
- VS vane shear; peak/remouded (kPa)
- R refusal
- HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
- D dry
- M moist
- W wet
- Wp plastic limit
- Wl liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

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Engineering Log - Cored Borehole

Borehole ID.	**BH103**
sheet:	2 of 3
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**04 Nov 2018**
principal:	
date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) surface elevation: 12.80 m (AHD) angle from horizontal: 90°

drill model: , Track mounted drilling fluid: hole diameter : vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular / general
					start coring at 0.79m						
		12	1.0		**SANDSTONE**: fine to medium grained, pale grey, indistinctly bedded, dry. 1.20 to 1.32 m: laminated shale, hairline to 2mm, extremely closely laminated	SW		a=1.08 d=0.92	100%		PT, 3°, PL, RO, CN PT, 0°, PL, SO, CN PT, 20°, PL, RO, CN
		11	2.0					a=0.89 d=0.90			PT, 5°, PL, RO, CN
		10	3.0		2.80 to 3.70 m: becoming pale grey, massive, high quartz content			a=0.72 d=0.76	100%		PT, 2°, PL, SO, SN, black PT, 2°, PL, SO, SN, black PT, 2°, PL, SO, SN, black PT, 2°, PL, RO, CN CS, 0°, IR, RO, SN PT, 0°, IR, RO, CN
		9	4.0		3.70 to 5.64 m: pale reddish to brown			a=1.39 d=1.60	100%		PT, 1°, CU, RO, CN PT, 2°, UN, RO, CN PT, 1°, PL, RO, CN PT, 0°, IR, RO, SN, dark grey PT, 0°, PL, RO, CO - SN, clay PT, 2°, PL, RO, CN PT, 20°, PL, RO, CN PT, 20°, IR, RO, CN
		8	5.0					a=1.12 d=1.58			
		7	6.0		5.64 to 6.17 m: pale yellow grey, trace shale laminae and clay seams (up to 8mm thick)			a=1.25 d=1.31	100%		PT, 20°, IR, RO, CN CS, 10 - 30°, IR, RO, SN CS, 0 - 20°, PL - CU, RO, CO - Clay
		6	7.0		6.17 to 7.25 m: pale reddish to brown			a=0.74 d=1.21			
		5			7.25 to 7.70 m: pale yellow grey			a=1.47 d=0.36	100%		PT, 1°, PL, RO, CN PT, 0°, PL, RO, SN PT, 1°, PL, RO, SN PT, 0°, PL, SO, CN PT, 0°, PL, SO, CN

Defects are: PT, 0°, PL, RO, CN, unless otherwise described

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method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

coffey
A TETRA TECH COMPANY

Engineering Log - Cored Borehole

Borehole ID.	**BH103**
sheet:	3 of 3
project no.	**754-SYDGE205019**
client:	**Recap Management**
date started:	**04 Nov 2018**
principal:	
date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**
logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**
checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) | surface elevation: 12.80 m (AHD) | angle from horizontal: 90°

drill model: , Track mounted | drilling fluid: | hole diameter : | vane id.:

drilling information | **material substance** | **rock mass defects**

method & support	water	RL (m)	depth (m)	graphic log	material description **ROCK TYPE**: grain characterisics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 (X = axial; O = diametral) VL L M H VH EH	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm) 30 100 300 1000 3000	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other) particular	general
		4	9.0		**SANDSTONE**: fine to medium grained, pale grey, indistinctly bedded, dry. *(continued)*	FR		a=1.15 d=0.63	100%		PT, 20°, IR, RO, CN PT, 20°, CU, RO, CN	Defects are: PT, 0°, PL, RO, CN, unless otherwise described
						HW					PT, 0°, PL, SO, CO - Clay PT, 0°, PL, SO, CN PT, 20°, IR, RO, CO - Clay CS, 0 - 20°, IR, SO, CO - Clay	
					SHALE: fine grained, slightly weathered, medium to high strength.							
					BRECCIATED SHALE: slightly weathered, medium strength.			a=0.68 d=0.56	100%		PT, 10°, IR, VR, CN PT, 0°, CU, RO, CN	
		3	10.0		**SHALE**: fine grained, slightly weathered, medium to high strength.	FR					PT, 10°, IR, RO, CN PT, 5°, CU, RO, CN	
					SANDSTONE: medium to coarse grained, pale yellow grey, indistinct bedding.						PT, 5°, PL, RO, CN	
		2	11.0					a=1.11 d=1.27	100%			
								a=0.71 d=0.65				
		1	12.0		11.50 to 11.90 m: band of shale and shale laminae	SW						
						FR			100%			
		0	13.0					a=0.91 d=0.95			CS, 0°, UN, RO, SN, black	
					SANDSTONE: fine to coarse grained, pale grey, high quartz content, slightly weathered, medium to high strength.			a=2.14 d=0.32			PT, 0°, PL, RO, CO - Clay PT, 2°, CU, RO, CO - CL Clay	
		-1	14.0		**SANDSTONE**: medium to coarse grained, grey, indistinct bedding, fresh.				100%		PT, 2°, CU, RO, CO - Clay	
								a=1.57 d=1.92				
		-2	15.0						100%		PT, 0°, PL, RO, CO - Clay PT, 2°, PL, RO, CN	
		-3			Borehole BH103 terminated at 15.31 m							

method & support
AS auger screwing
AD auger drilling
CB claw or blade bit
W washbore
NMLC NMLC core (51.9 mm)
NQ wireline core (47.6mm)
HQ wireline core (63.5mm)
PQ wireline core (85.0mm)
SPT standard penetration test
DT diatube

water
10/10/12, water level on date shown
water inflow
complete drilling fluid loss
partial drilling fluid loss
25uL water pressure test result (lugeons) for depth interval shown

graphic log / core recovery
core recovered (graphic symbols indicate material)
no core recovered

core run & RQD
barrel withdrawn
RQD = Rock Quality Designation (%)

weathering & alteration*
RS residual soil
XW extremely weathered
HW highly weathered
DW distinctly weathered
MW moderately weathered
SW slightly weathered
FR fresh
*W replaced with A for alteration

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
PT parting
JT joint
SZ shear zone
SS shear surface
CO contact
CS crushed seam
SM seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR Irregular

roughness
SL slickensided
POL polished
SO smooth
RO rough
VR very rough

coating
CN clean
SN stain
VN veneer
CO coating

BH103 0.76 - 5.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH103

project no: 754-SYDGE205019 | fig no: **FIGURE 1** | rev:

BH103 5.00 - 10.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH103

project no: 754-SYDGE205019 | fig no: **FIGURE 2** | rev:

BH103 10.00 - 15.00 m

drawn	YA
approved	AJB
date	16/11/2018
scale	N.T.S.
original size	A4

coffey
A TETRA TECH COMPANY

client: Recap Management

project: 4-6 Bligh Street
4-6 Bligh Street, Sydney, NSW

title: **CORE PHOTOGRAPH**
BH103

project no: 754-SYDGE205019 | fig no: **FIGURE 3** | rev:

coffey
A TETRA TECH COMPANY

Piezometer Installation Log

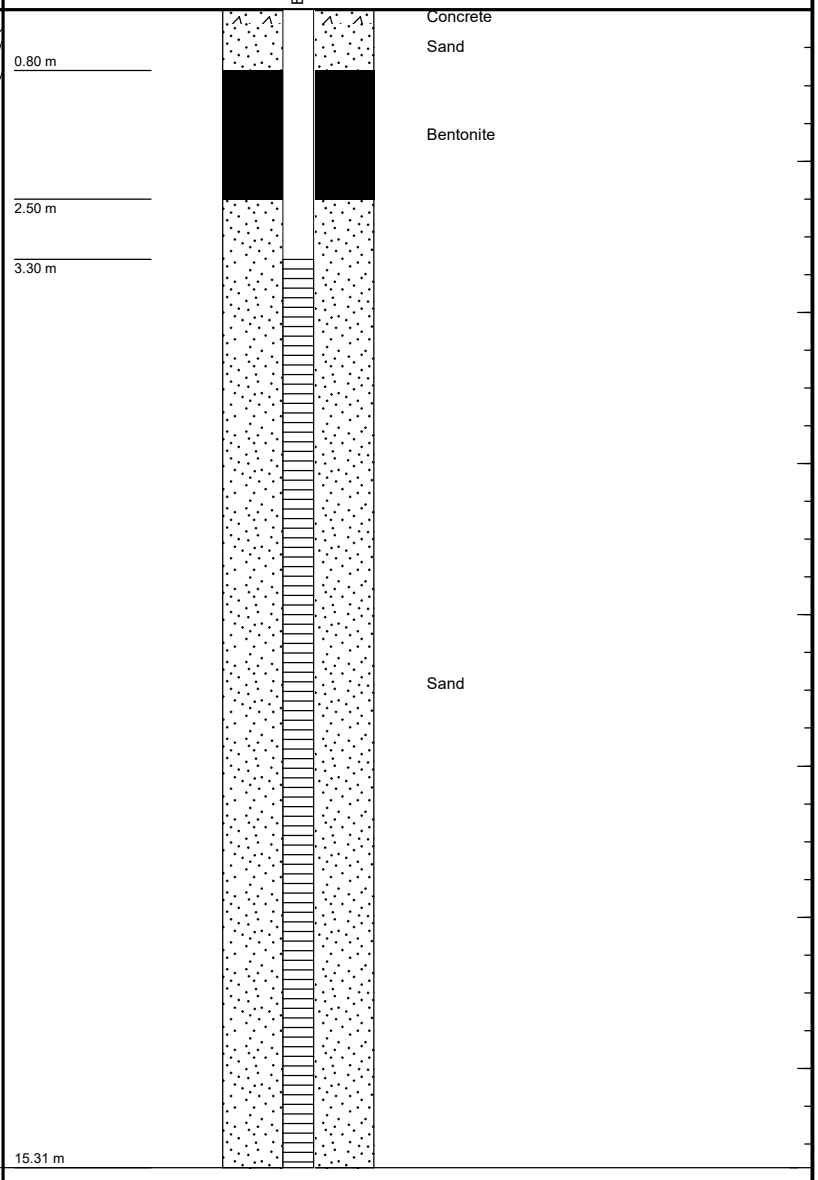
		Hole ID.	**BH103**
		sheet:	1 of 1
		project no.	**754-SYDGE205019**
client:	**Recap Management**	date started:	**04 Nov 2018**
principal:		date completed:	**06 Nov 2018**
project:	**4-6 Bligh Street**	logged by:	**YA**
location:	**4-6 Bligh Street, Sydney, NSW**	checked by:	**AJB**

position: E: 334,491.89; N: 6,251,287.55 (MGA94) | surface elevation: 12.80 m (AHD) | angle from horizontal: 90°

equipment type: , Track mounted | drilling fluid: | hole diameter :

drilling information | **material substance** | **piezometer construction details**

method & support	water	RL (m)	depth (m)	graphic log	material name
		12	1		**CONCRETE**
					BALLAST
					BEDROCK
		10	3		
		8	5		
		6	7		
		4	9		
		2	11		
		0	13		
		-2	15		



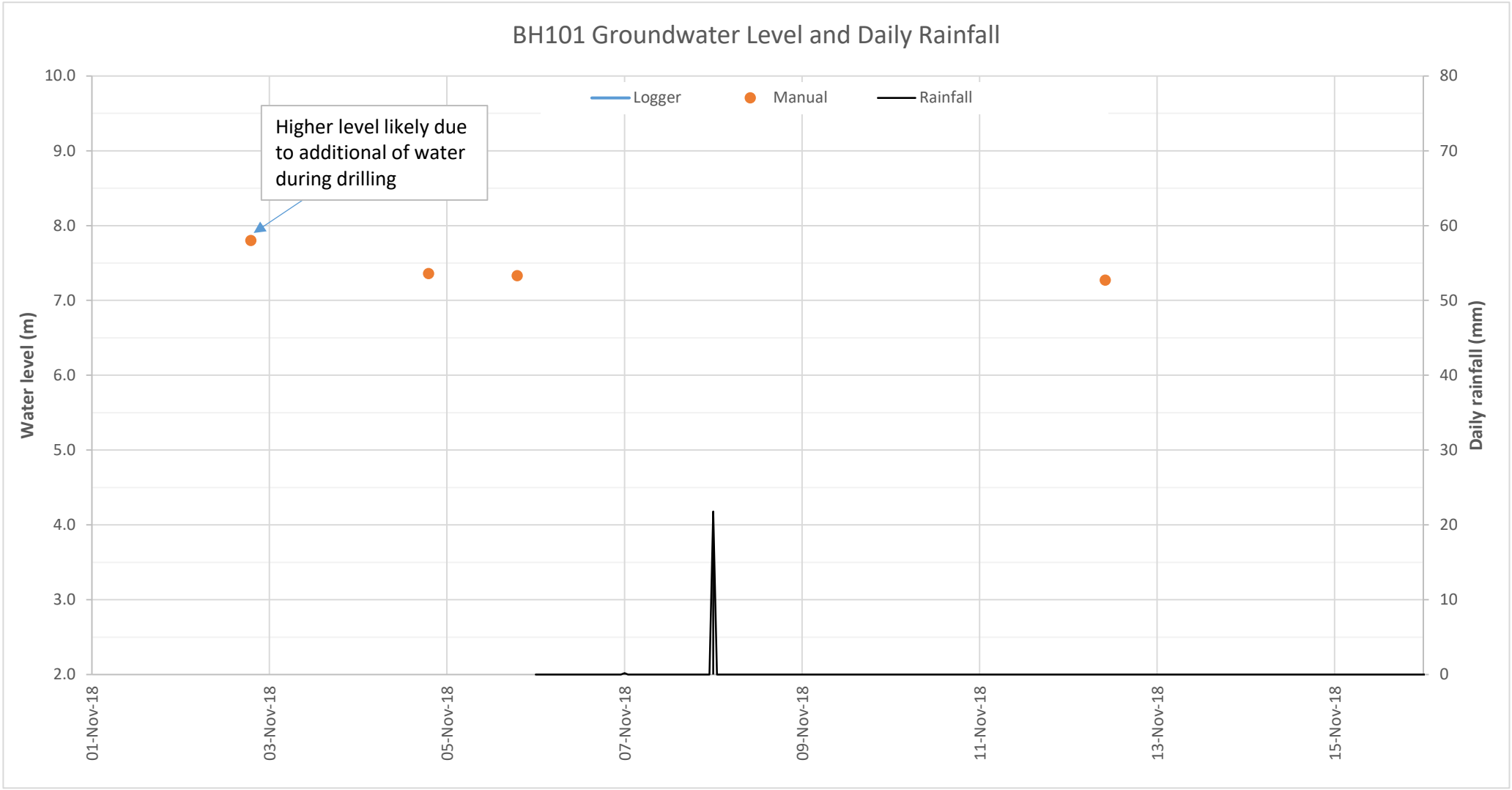
method & support
see engineering log for details

water
- 10-Oct-12, water level on date shown
- water inflow
- complete drilling fluid loss
- partial drilling fluid loss
- 25 — water pressure test result (lugeons) for depth interval shown

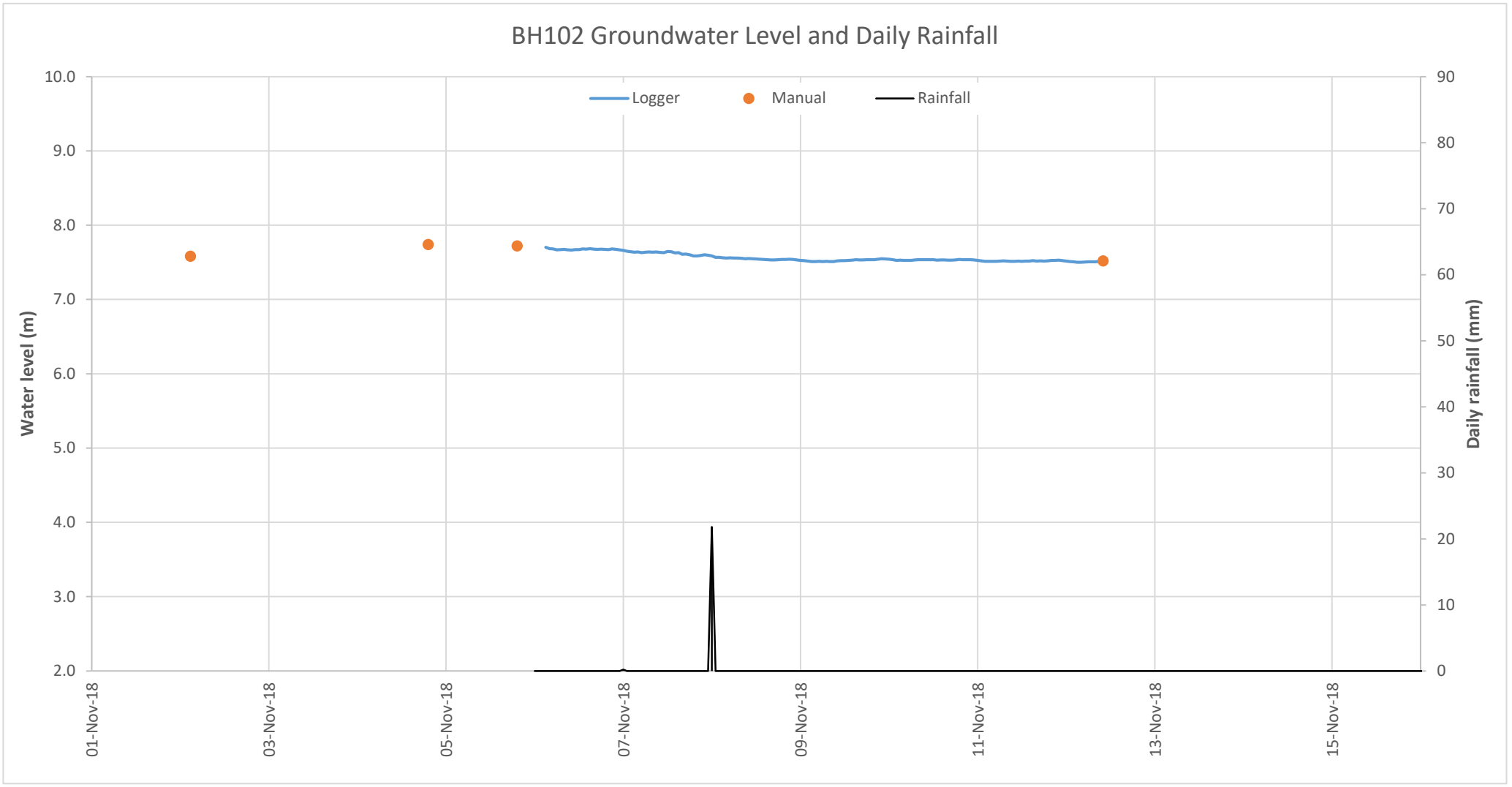
graphic log / core recovery
- core recovered (graphic symbols indicate material)
- no core recovered

ID	type	installation date	stickup (m)	tip depth (m)	water level (m)	Relative Levels (AHD) stickup	tip	water level
BH103	standpipe piezo.			15.31 m			-2.51	

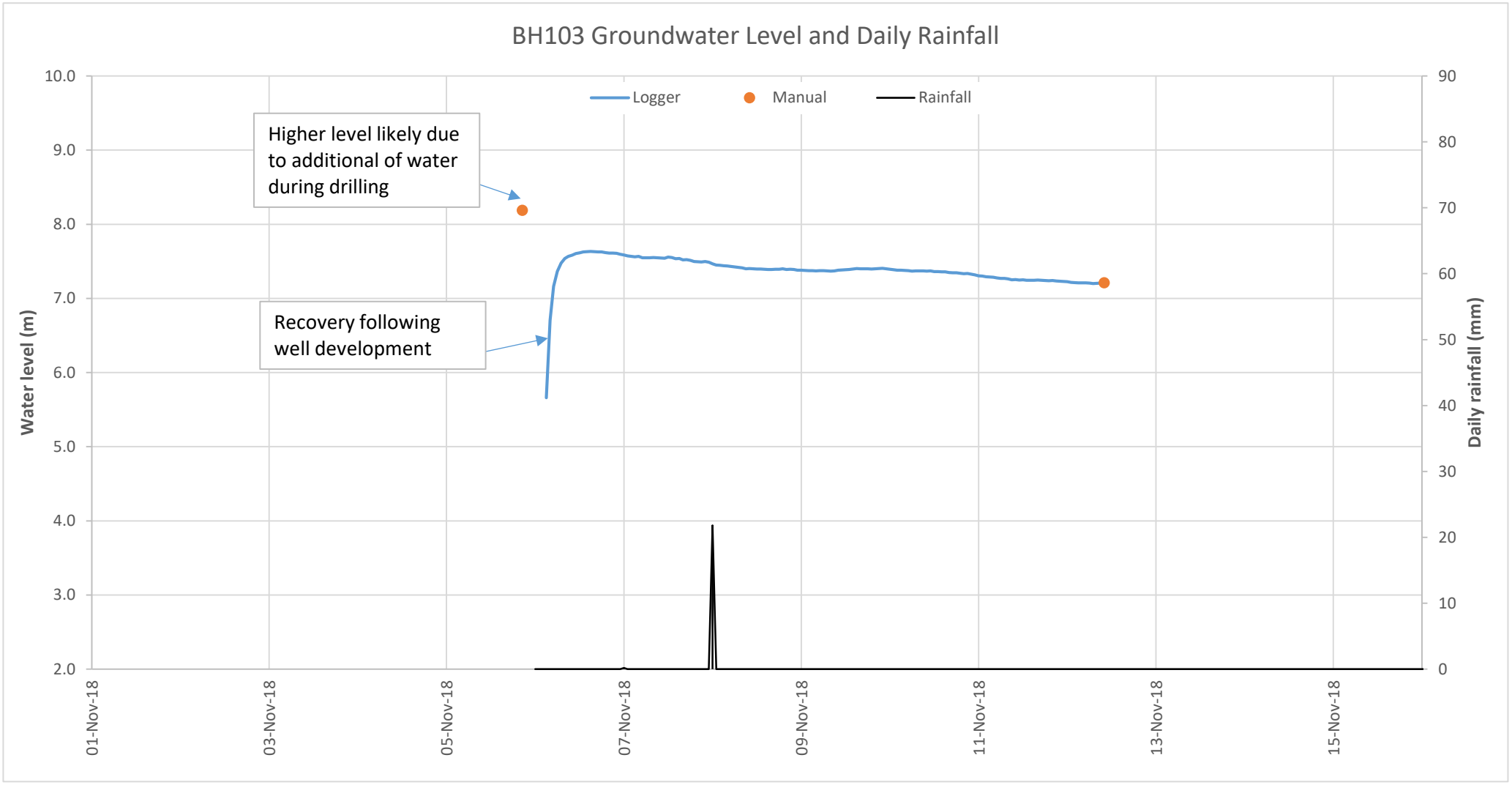
APPENDIX D: GROUNDWATER MONITORING GRAPHS



drawn	LC	coffey A TETRA TECH COMPANY	client:	One Investment
approved	RR		project:	GROUNDWATER MONITORING 4-6 Bligh Street, Sydney
date			title:	GROUNDWATER HYDROGRAPH FOR PIEZOMETER BH101
scale	N/A		project no: 754-SYDGE205019	figure no: FIGURE D1
original size	A4			



drawn	LC	coffey A TETRA TECH COMPANY	client:	One Investment
approved	RR		project:	GROUNDWATER MONITORING 4-6 Bligh Street, Sydney
date			title:	GROUNDWATER HYDROGRAPH FOR PIEZOMETER BH102
scale	N/A		project no: 754-SYDGE205019	figure no: FIGURE D2
original size	A4			



drawn	LC	coffey A TETRA TECH COMPANY	client:	One Investment
approved	RR		project:	GROUNDWATER MONITORING 4-6 Bligh Street, Sydney
date			title:	GROUNDWATER HYDROGRAPH FOR PIEZOMETER BH103
scale	N/A		project no: 754-SYDGE205019	figure no: FIGURE D3
original size	A4			

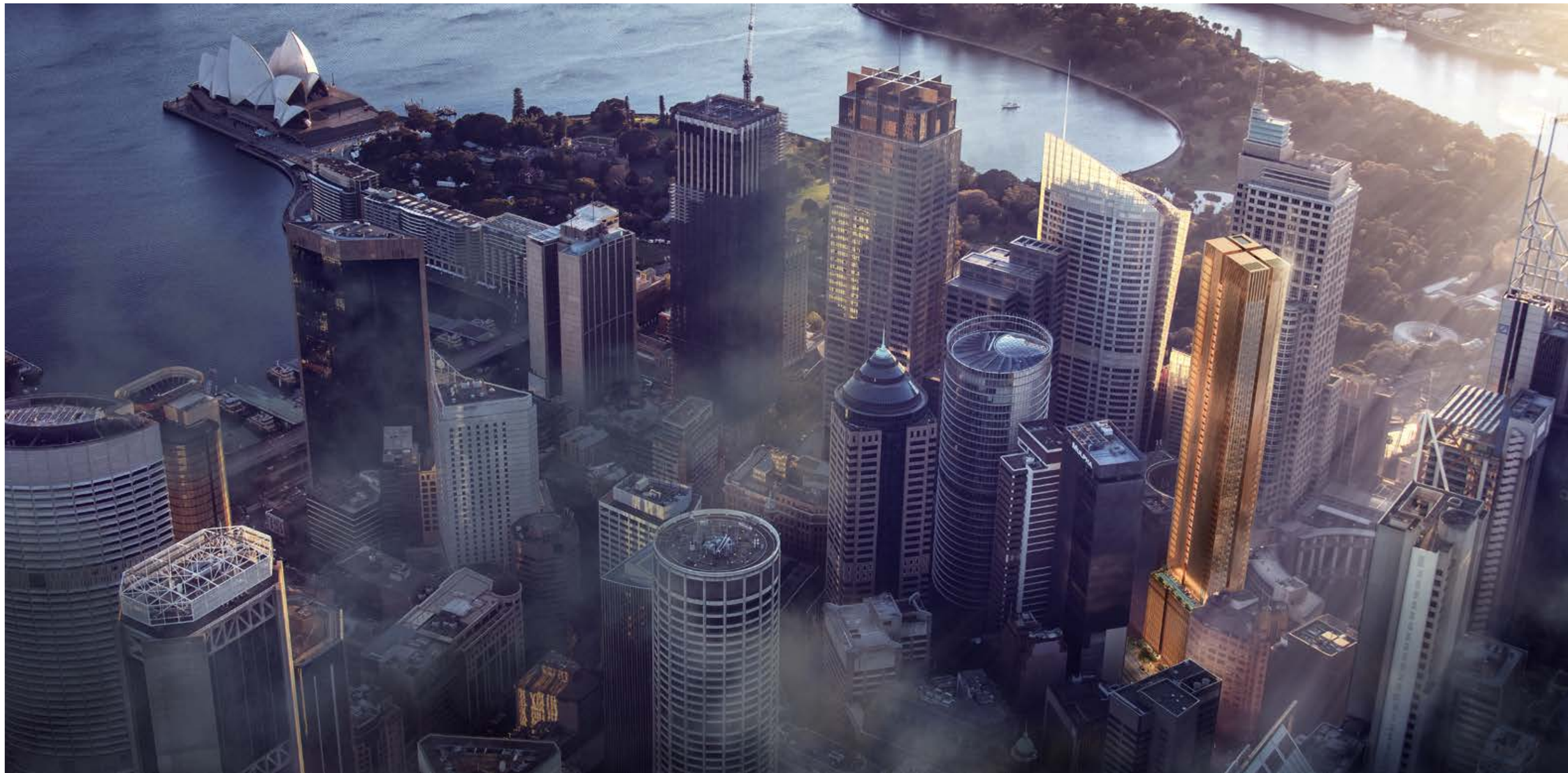
APPENDIX E: PROPOSED DEVELOPMENT DRAWINGS

W—B
WOODS BAGOT

25.10.22

SKETCHBOOK REPORT

4-6 Bligh Street
Holdmark



Contacts

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Tim Davies
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John Norman
John.Norman@woodsbagot.com

Woods Bagot acknowledges the Traditional Owners of the land, sky and waters. We pay our respects to Elders past, present, and to the future leaders of our community.

We honour the ongoing deep spiritual connection that the Traditional Owners have with this country. With respect, we tread gently to help reconcile and pave the way for a united and harmonious future for all people.

Image above:
4-6 Bligh St Hotel Lobby
Sydney, Australia
Cover image:
4-6 Bligh St Aerial
Sydney, Australia

Contents

01 Development Constraints

02 Additional Basements Study

01

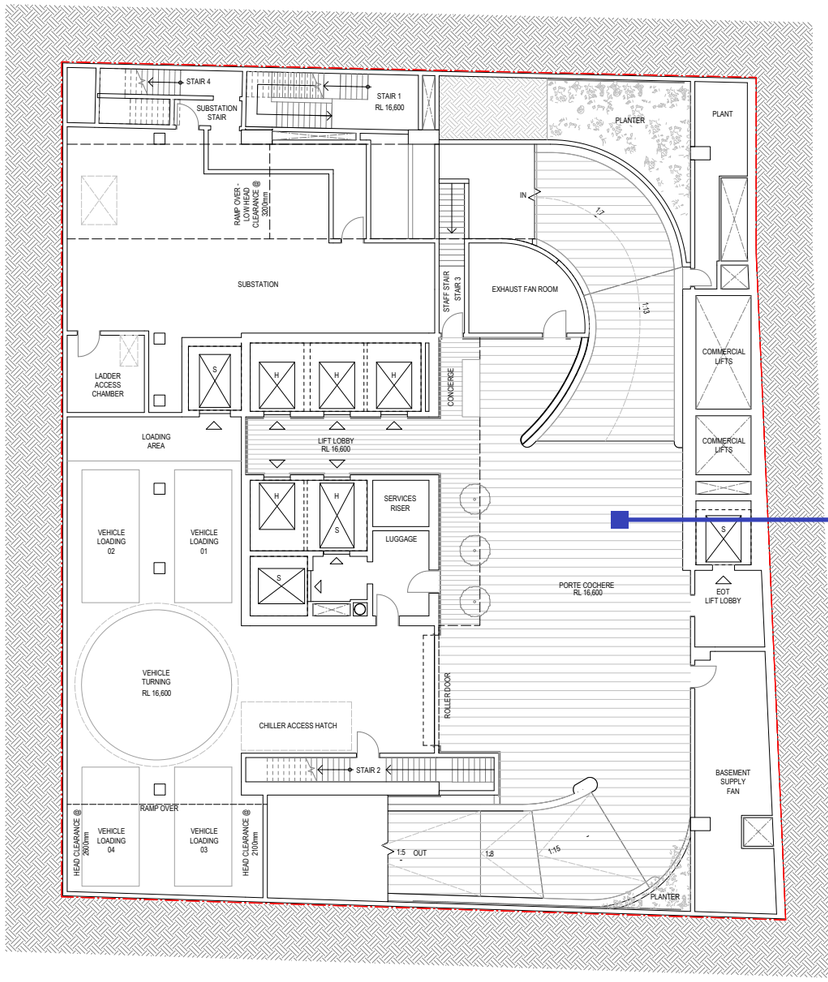
Development Constraints

Current Design Levels

Existing Excavation DA

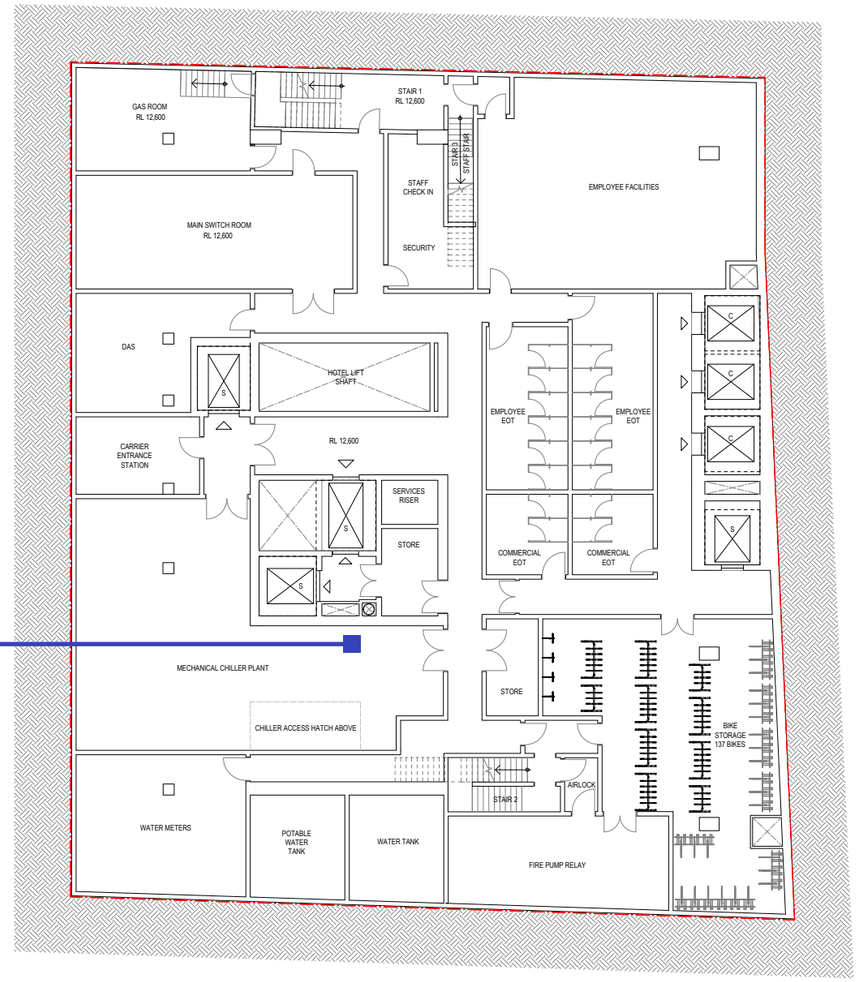
Sydney Metro Alignments

01.1 Current Design Levels



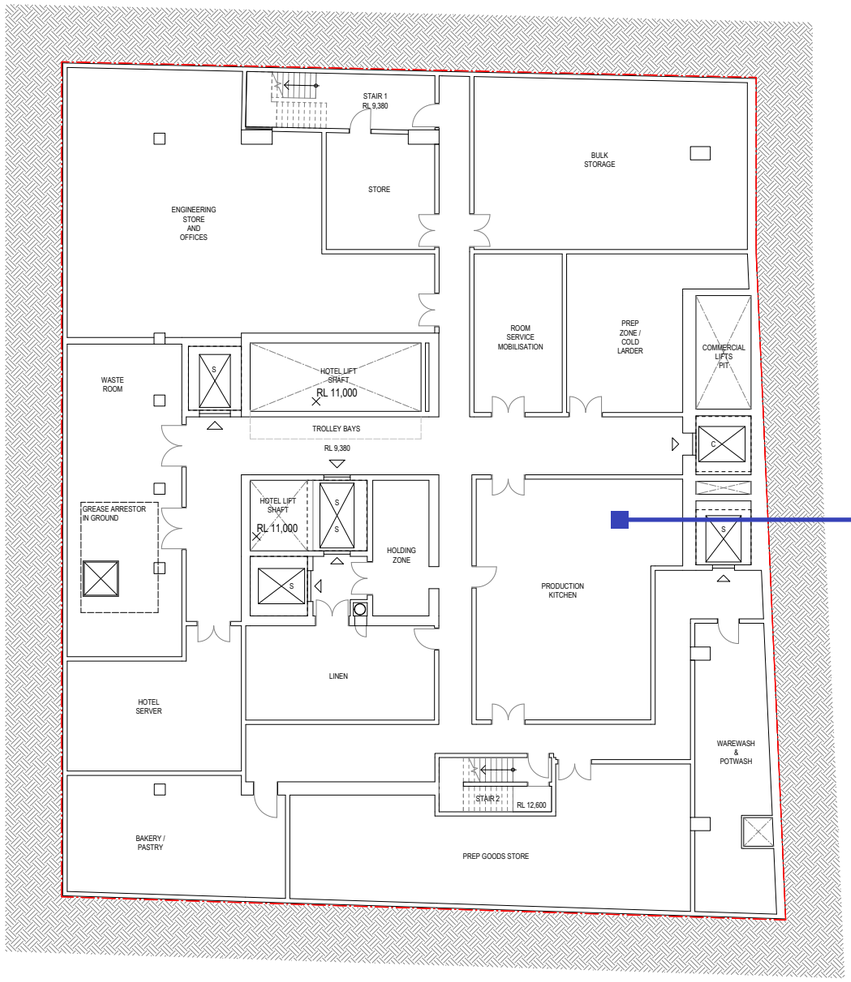
RL 16.6

RL 12.6



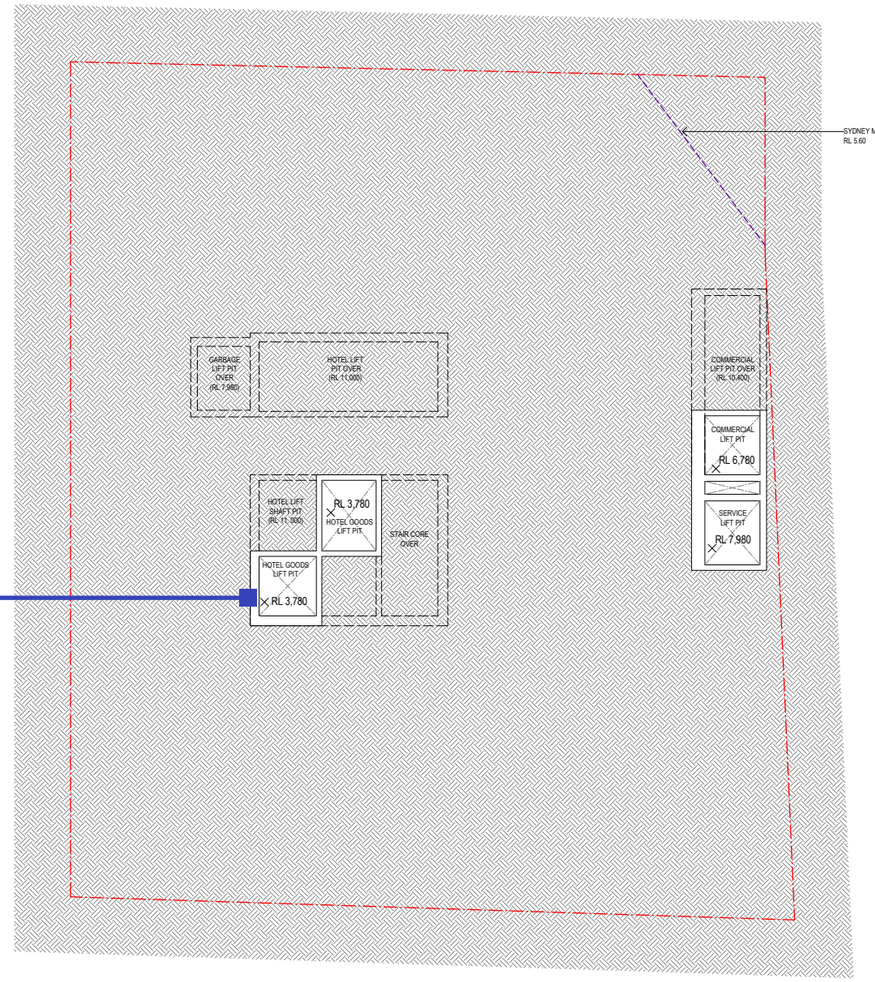
Basement Level 01 Floor Plan

Basement Level 02 Floor Plan



RL 9.38

RL 3.78



Basement Level 03 Floor Plan

Basement Level 04 Floor Plan

01.2 Existing Excavation DA

LEGEND

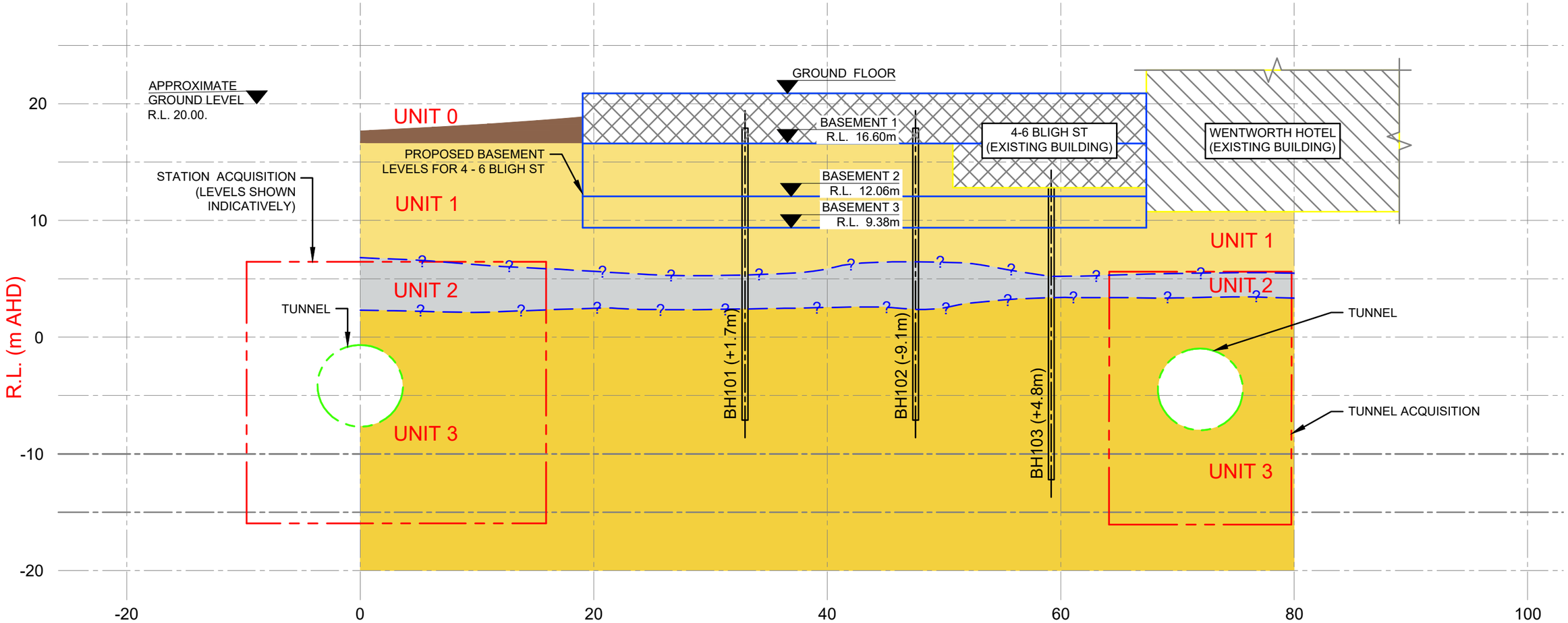
UNIT 0 - UNOBSERVED GROUND, LIKELY FILL, RESIDUAL SOIL TO SANDSTONE (CLASS V TO II)

UNIT 1 - MODERATELY WEATHERED TO FRESH CLASS II AND CLASS I SANDSTONE

UNIT 2 - CLASS III SHALE

UNIT 3 - FRESH CLASS II AND CLASS I SANDSTONE

INFERRED GEOLOGICAL BOUNDARY

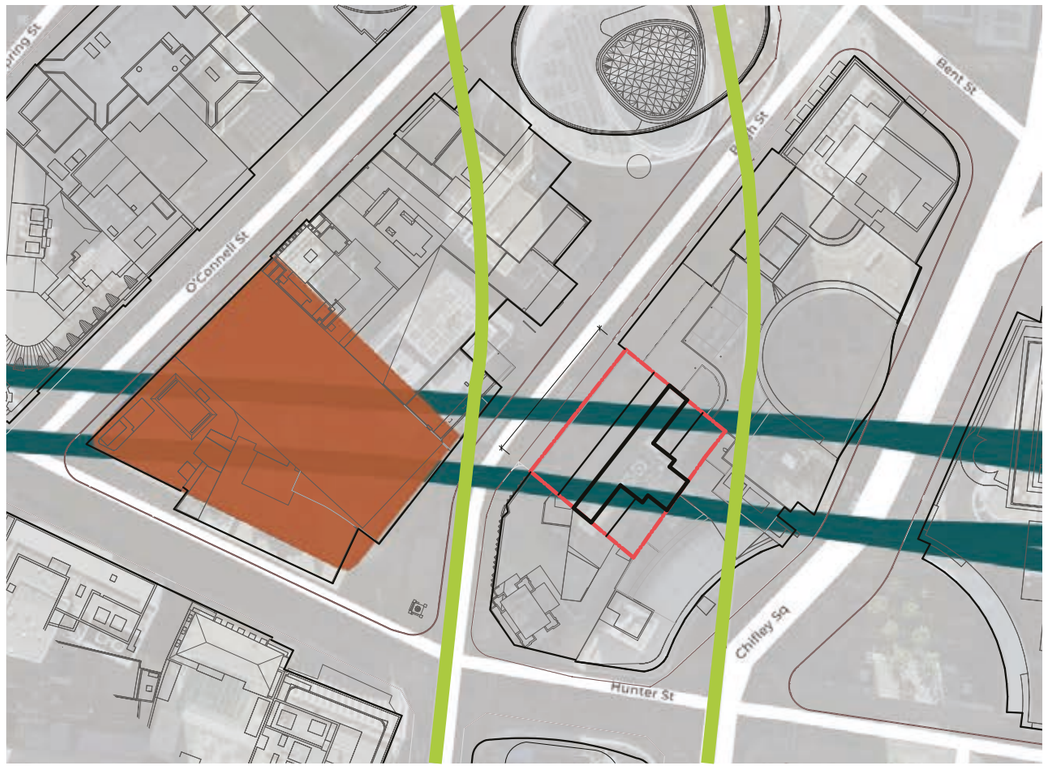


DETAIL A

SCALE 1:500 FIGURE A1

01.3 Sydney Metro Alignments

Metro Interactive Map

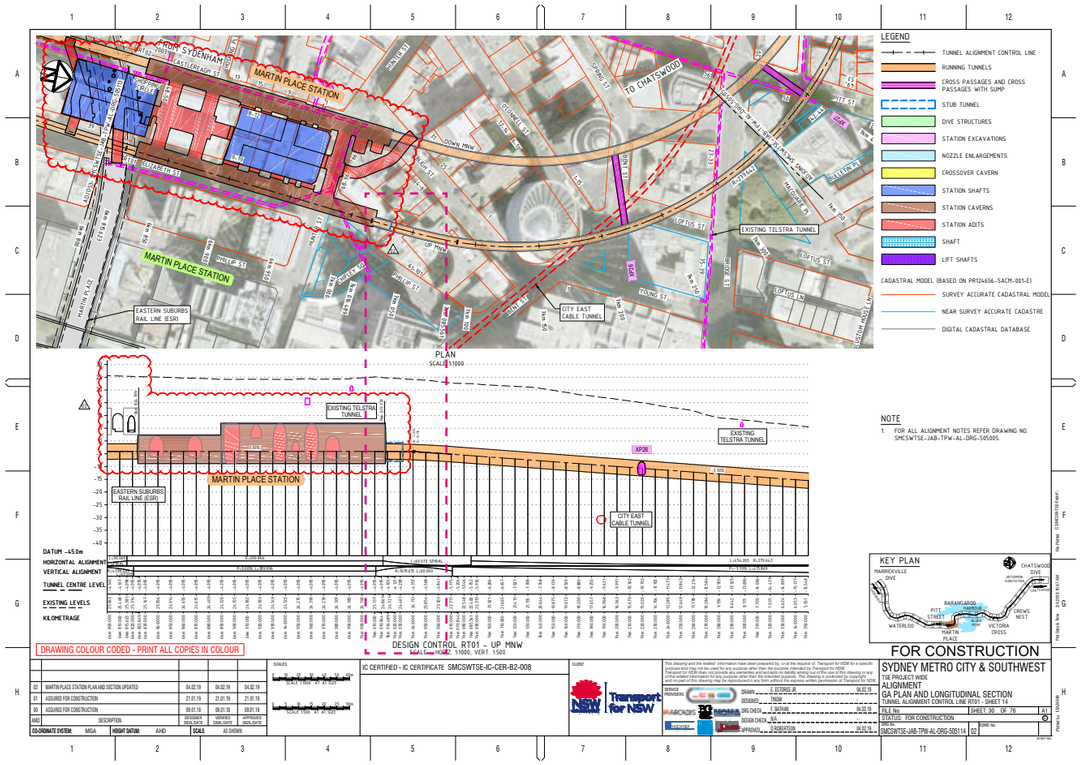


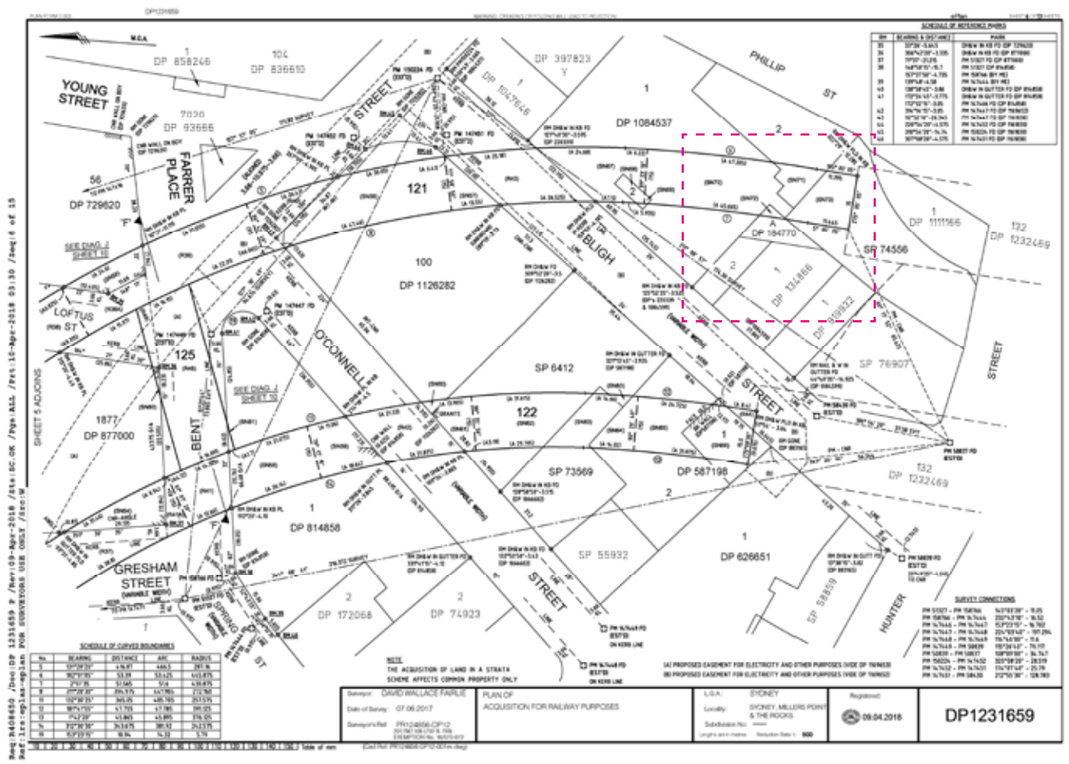
Overlay with site plan drawing

Sydney Metro West

Sydney Metro City & Southwest

Sydney Metro City & Southwest - Reference Drawings





Drawing Reference

Title: Tunnel Alignment Control Line RT01 - Sheet 14

Drawing No: SMCSWTSE-JAB-TPW-AL-DRG-505114

Date issued: 04.02.2019

Drawing Reference

Title: Plan Of Acquisition For Rail Purposes

Drawing No: DP12 the Rocks DP1231659.pdf - Page7

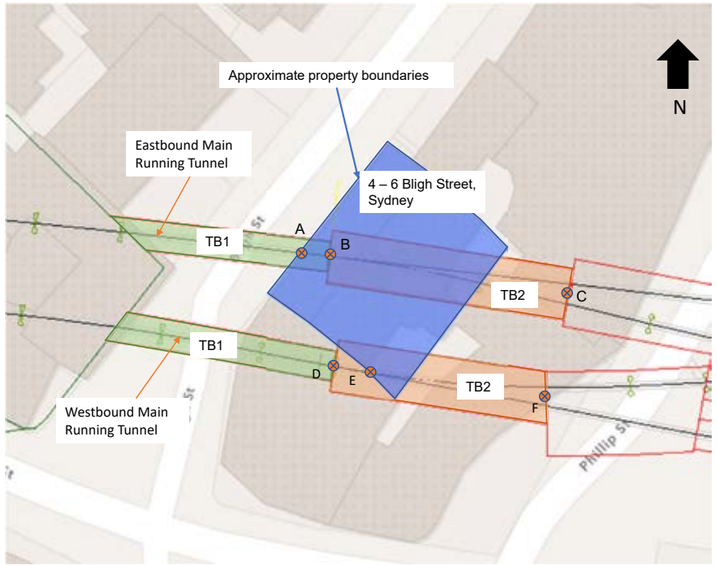
Date issued: 07.06.2017

Sydney Metro West - Reference Drawings

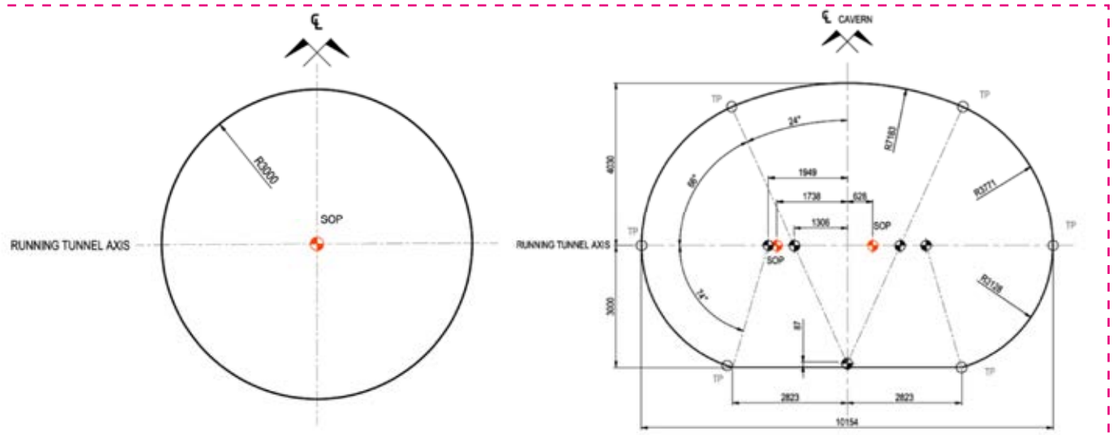
4 – 6 Bligh Street, Sydney
Overlay of SMW Alignment rev5.7

POINT	EASTING (MGA 56 2020)	NORTHING (MGA 56 2020)	RL (mAHD)
A	334461.4	6251293.1	-17.1
B	334464.3	6251292.9	-17.1
C	334511.8	6251286.5	-17.8
D	334465.6	6251271.3	-17.1
E	334466.6	6251271.1	-17.2
F	334507.7	6251265.6	-17.8

Note:
RLs are taken at tunnel centreline
Points A, B and C are on Eastbound Alignment (UP)
Points D, E and F are on Westbound Alignment (DOWN)



Indicative Cross Section for TB1 and TB2



Section for TB1 **Section for TB2**

Note:
SOP: Set Out Point at running tunnels axis

The dimensions are to the internal face of the tunnels.
The tunnel lining with a thickness of approximately 500 mm should be allowed.
The design is subject to revision at detail design stage.

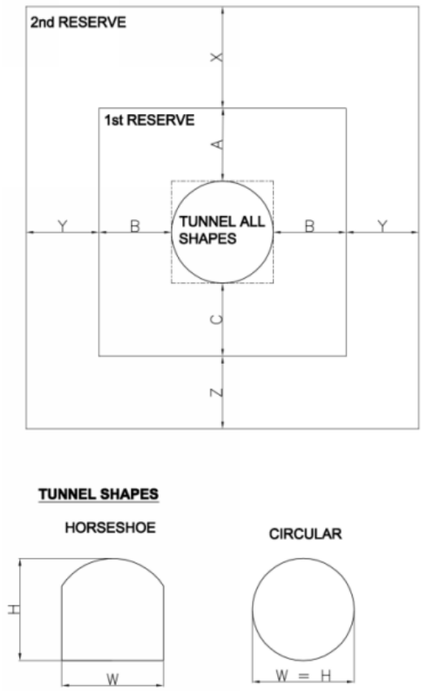
Drawing Reference

Title: 4-6 Bligh Street, Sydney Overlay of SMW Alignment rev5.7

Drawing No: 4-6 Bligh ST Sydney 221020.pptx

Date issued: 20.10.2022

Sydney Metro Guidelines



	First reserve dimensions (m)
Top (A)	The greater of the following: • 5 m from the crown of tunnel or cavern or • Support zone based on 1/3* tunnel width plus 1 metre (1/3*W+1) or • Extent of Sydney Metro substratum above crown
Side (B)	The greater of the following: • 5 m from side wall of tunnel or cavern or • Lateral extent of Sydney Metro substratum
Bottom (C)	The greater of the following: • 5 m below the invert of the tunnel or cavern or • Extent of Sydney Metro substratum below invert

	Second reserve dimensions (m)
Top (A+X)	The greater of the following: • 1.5 x (W+H) or • A + 25 or • Where 'W' and 'H' are width and height of the existing rail tunnel
Side (B+Y)	The greater of the following: • W or • B + 25
Bottom (C+Z)	C + 1.5 x (W_n + H_n) Where 'W_n' and 'H_n' are width and height of new tunnel under the existing metro tunnel or cavern

Note: all dimensions are taken from the excavated profile of tunnels and caverns

Figure 4.1 Protection reserves for metro tunnels and caverns

Drawing Reference

Title: Sydney Metro Underground Corridor Protection Technical Guidelines

Drawing No: Protection reserve diagram Fg.4.1 (Page 8)

Date issued: April 2021

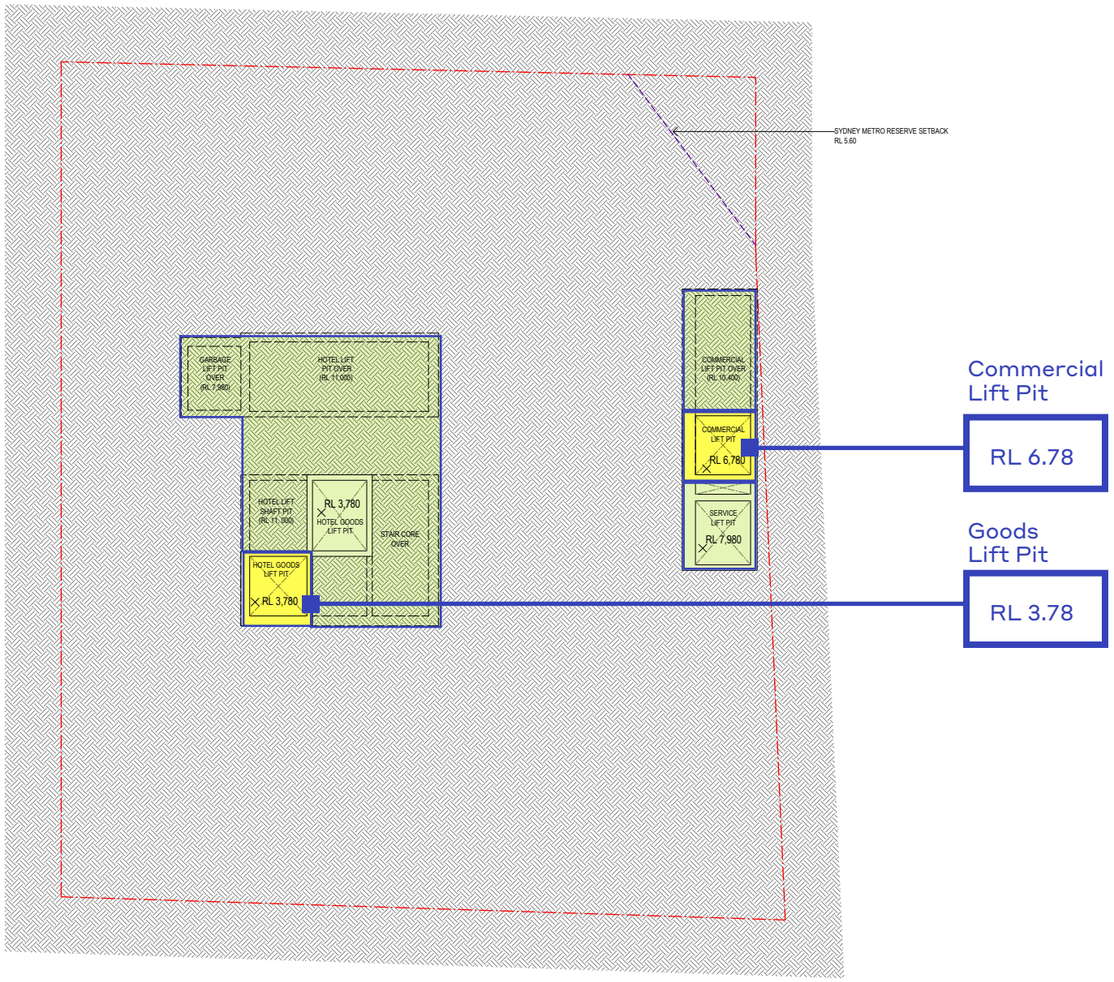
02

Additional Basements Study

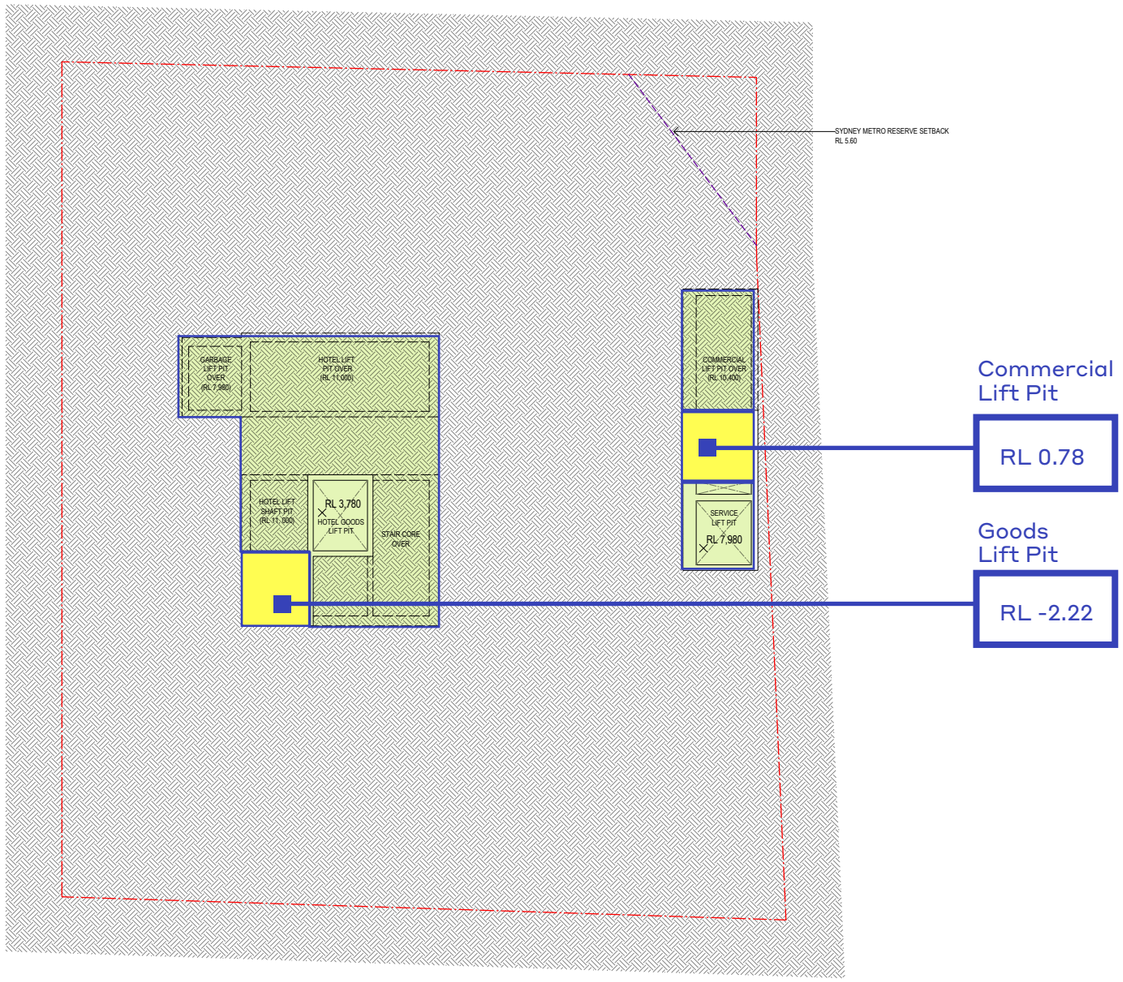
Lift Pit Strategy

Sydney Metro Tunnels Overlay

02.1 Lift Pit Strategy



Basement Level 04 Floor Plan - Current lift pit levels



Basement Level 04 Floor Plan - Proposed lift pit levels

02.2 Sydney Metro Tunnels Overlay

Legend

Sydney Metro West:

- Cavern
- Tunnel

City & Southwest Metro:

- Tunnel
- Acquisition Boundary
- Cores

Note:
Coordinates highlighted in **red** as per Sydney Metro West Alignment.
Refer to ***'Sydney Metro West - Reference Drawings'***

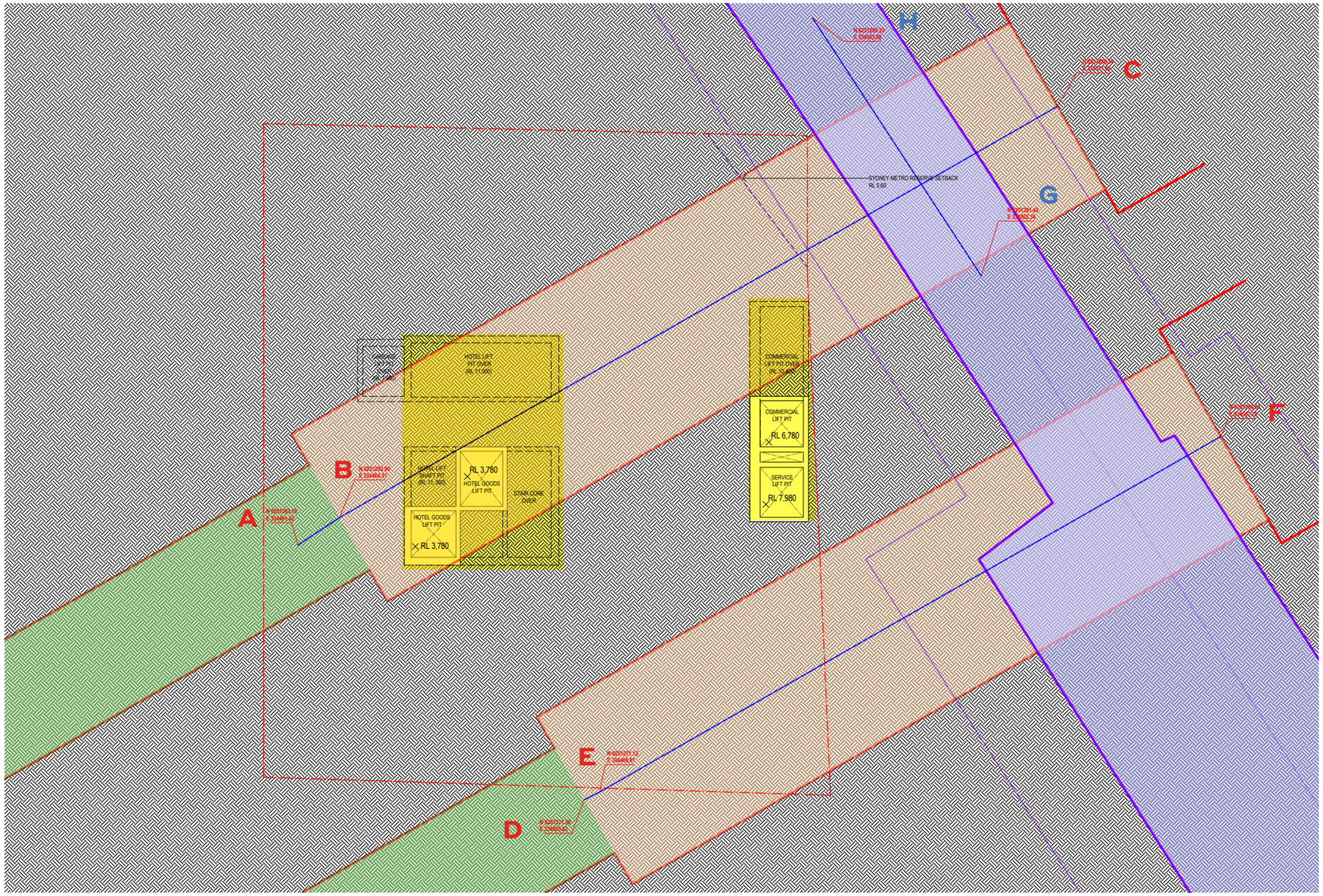
Centreline of Tunnels:

A) -17.1
B) -17.1
C) -17.8
D) -17.1
E) -17.2
F) -17.8

Coordinates highlighted in **blue** as per Tunnel Alignment Control Line RT01 - Sheet 14.
Refer to ***'Sydney Metro City & Southwest - Reference Drawings'***

Centreline of Tunnels:

G) -4.105
H) -4.357



Ground Floor Plan

Legend

Sydney Metro West:

- Cavern
- Tunnel

City & Southwest Metro:

- Tunnel
- Acquisition Boundary
- Cores

Note:
Coordinates highlighted in **red** as per Sydney Metro West Alignment.
Refer to ***'Sydney Metro West - Reference Drawings'***

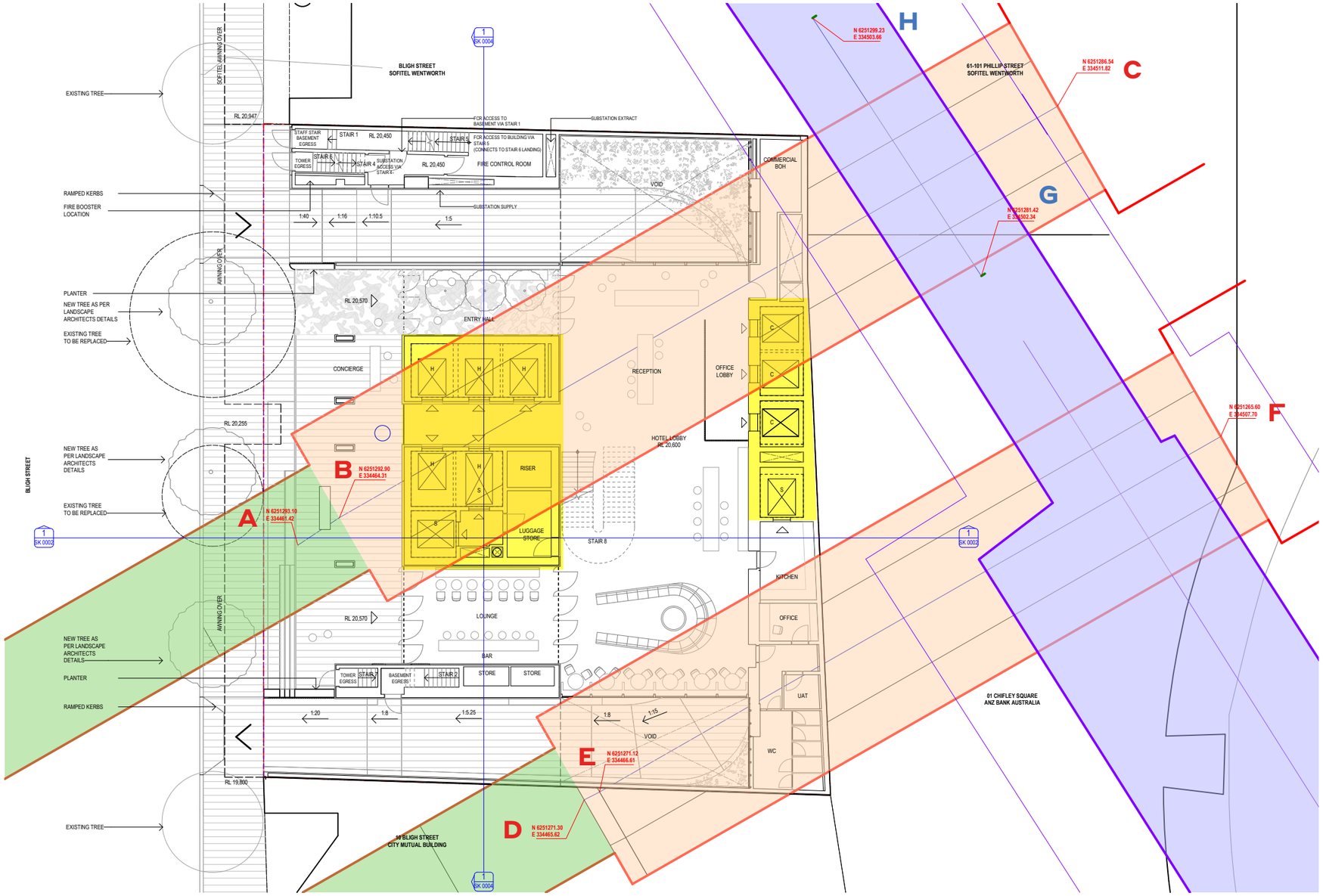
Centreline of Tunnels:

A) -17.1
B) -17.1
C) -17.8
D) -17.1
E) -17.2
F) -17.8

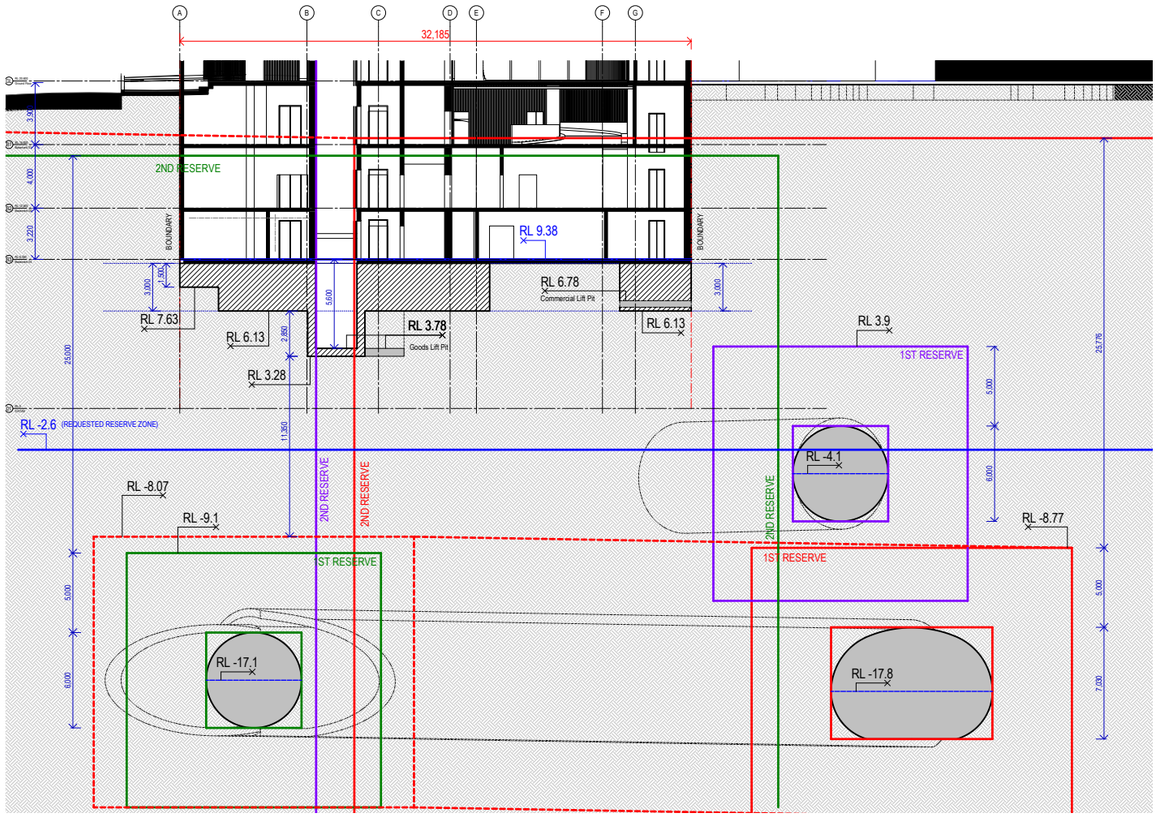
Coordinates highlighted in **blue** as per Tunnel Alignment Control Line RT01 - Sheet 14.
Refer to ***'Sydney Metro City & Southwest - Reference Drawings'***

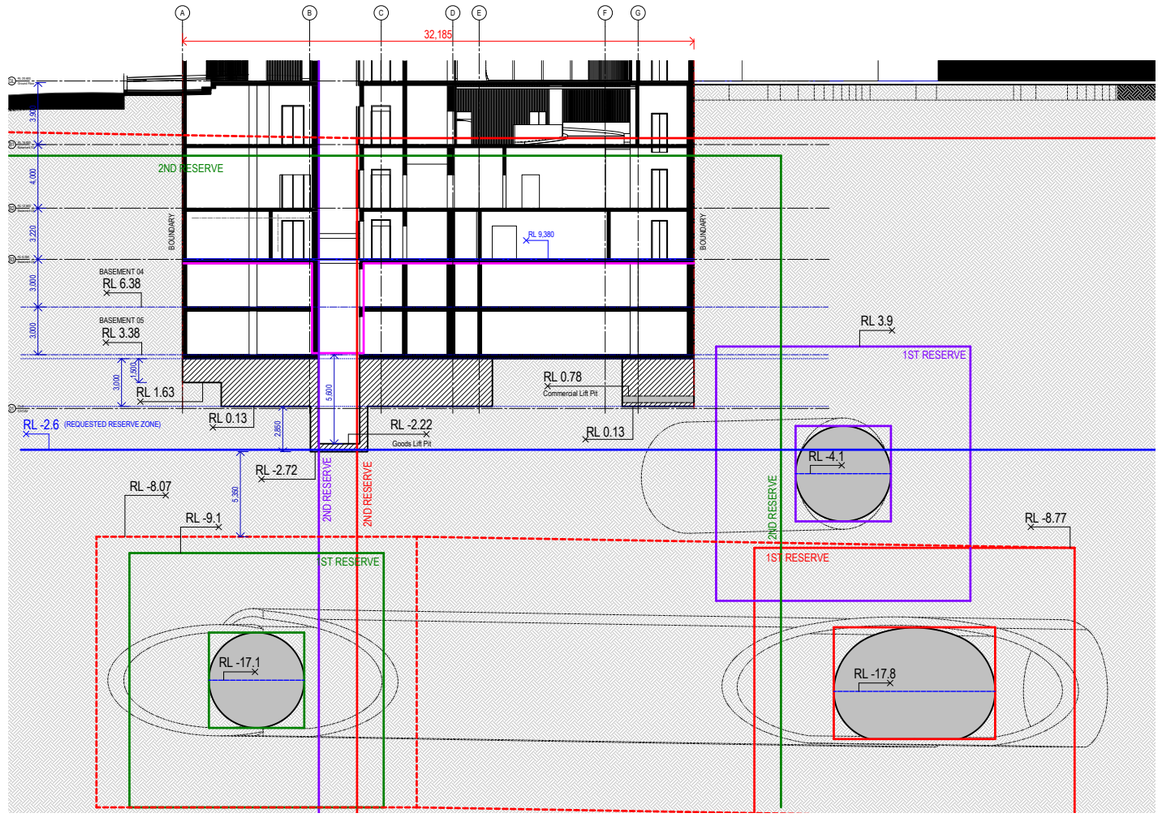
Centreline of Tunnels:

G) -4.105
H) -4.357



Cross Section - West / East





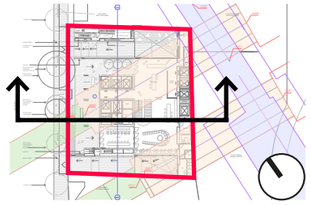
Cross Section - Current levels

Note: Tunnel centreline levels shown are relative to section line location.

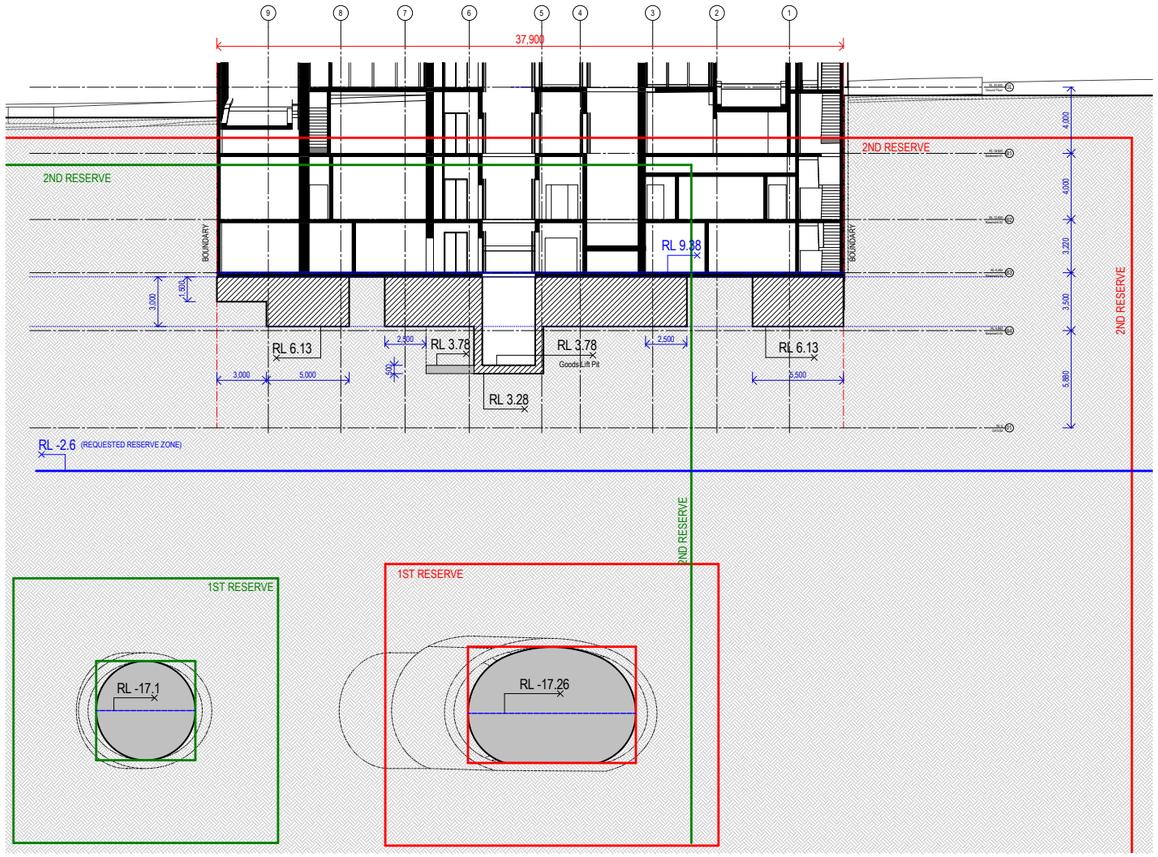
Cross Section - Proposed

Outline of current levels

RI 9.38 Approved Early Works DA

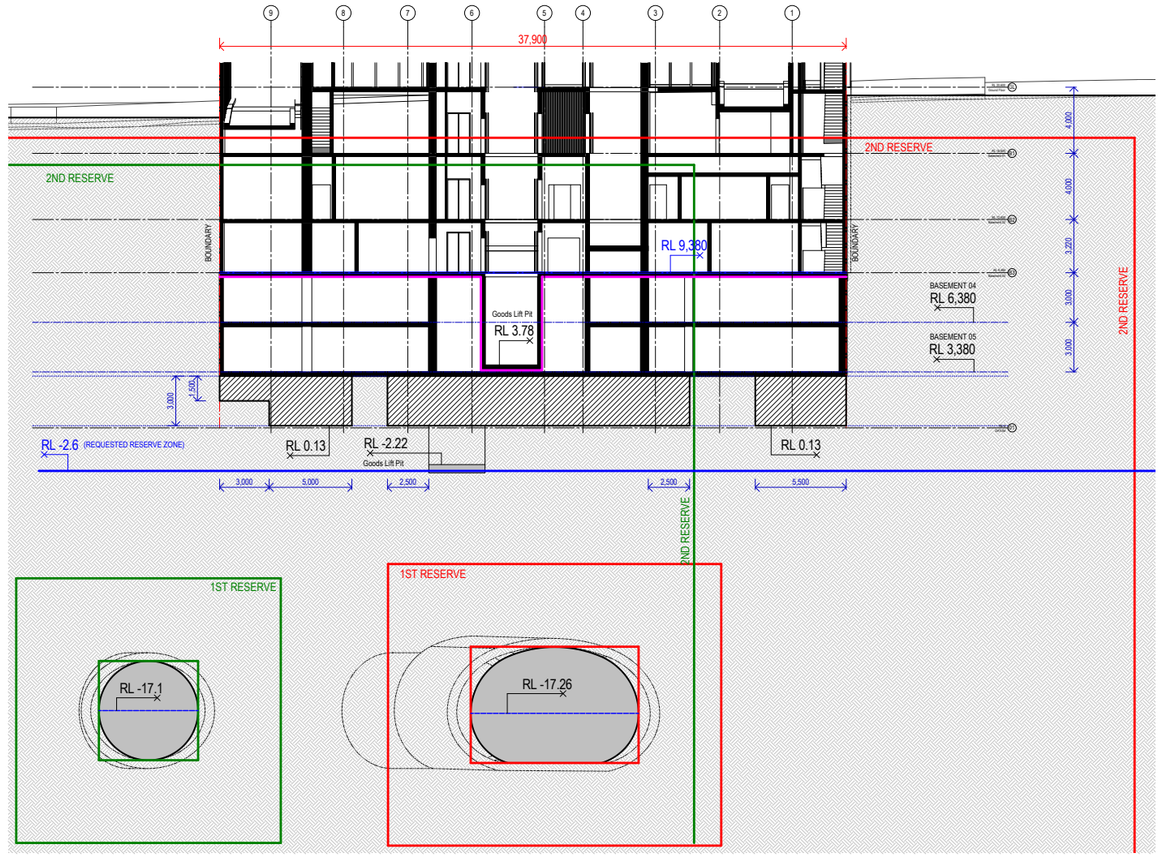


Long Section - North / South



Long Section - Current levels

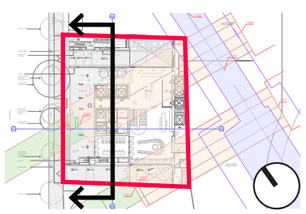
Note: Tunnel centreline levels shown are relative to section line location.



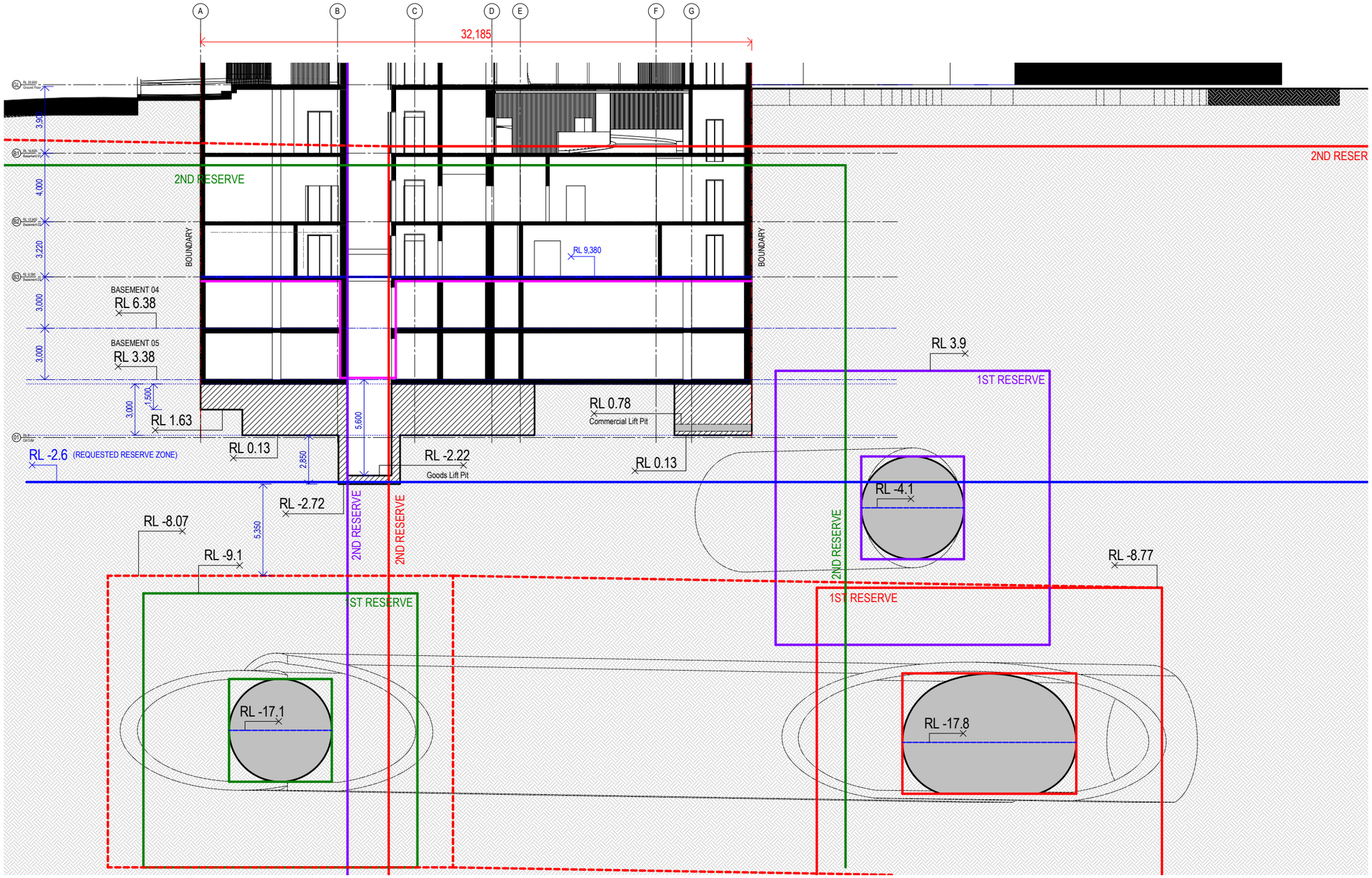
Long Section - Proposed

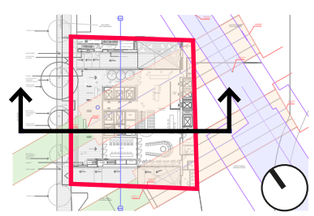
Outline of current levels

RI 9.38 Approved Early Works DA

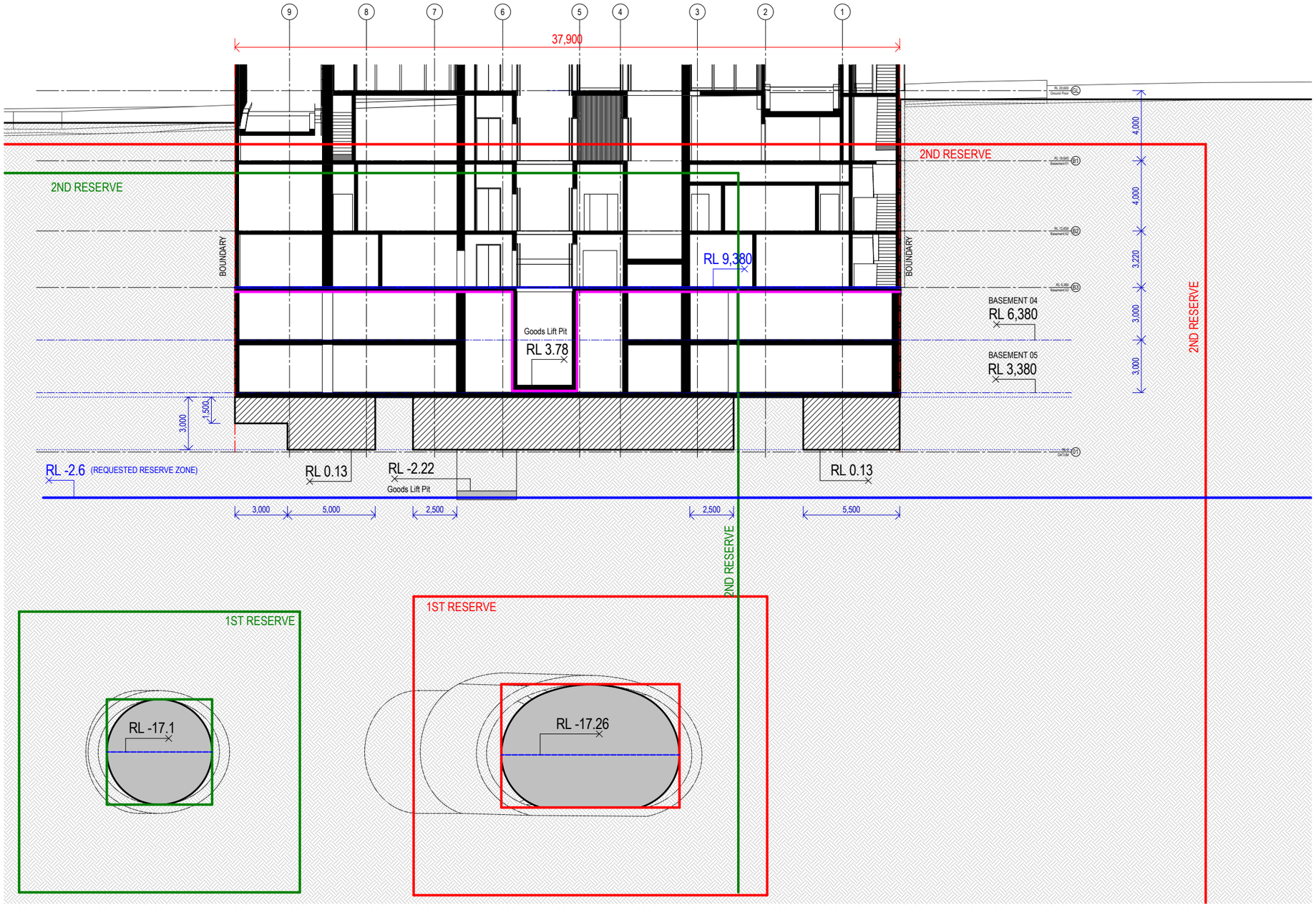


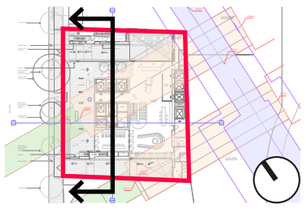
Cross Section - West / East [Proposed]

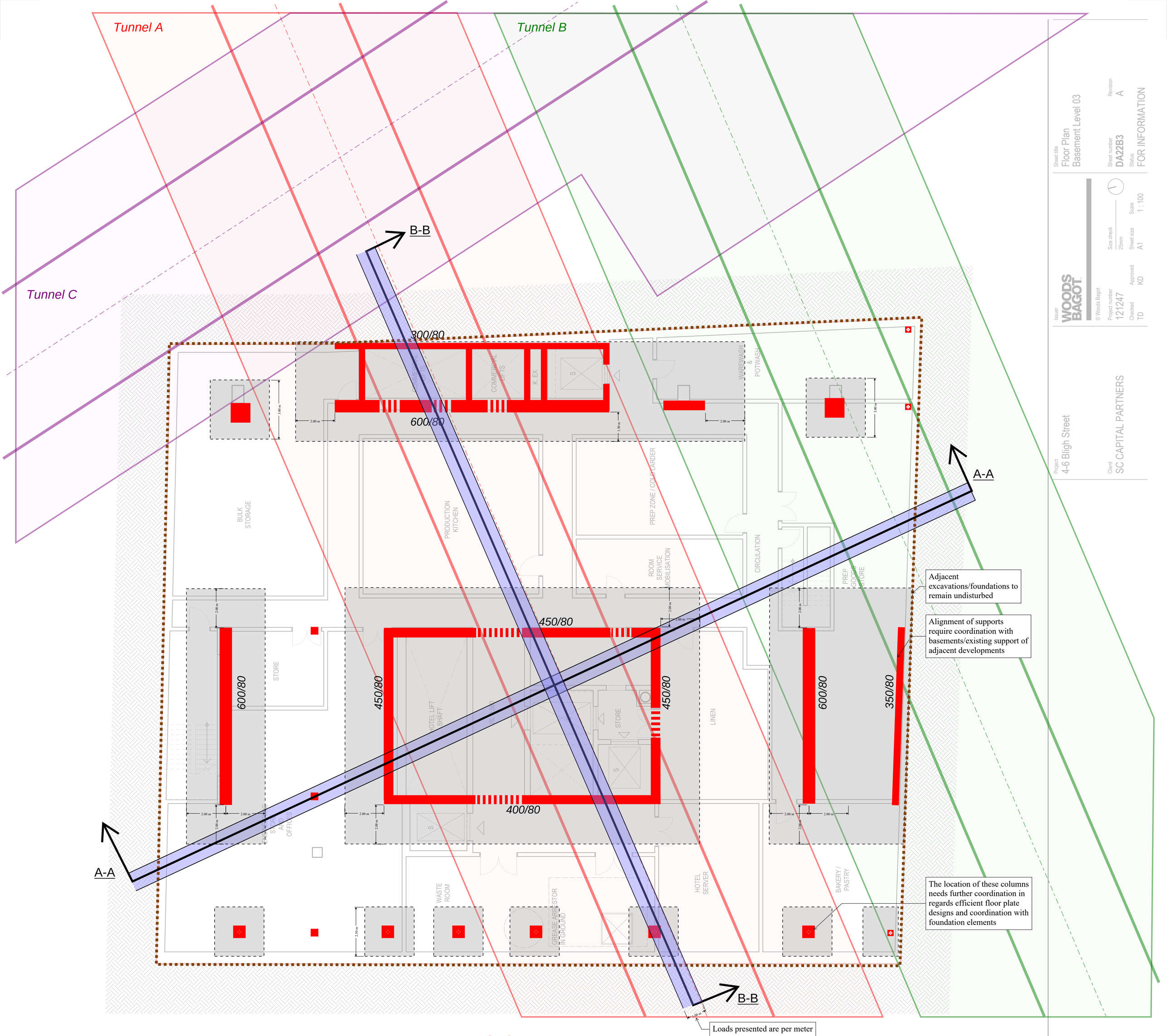




Long Section - North / South [Proposed]







*work in progress

NOTES:

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3) Primary foundation elements are shown in this sketch - secondary elements for support of smaller loads requires further work and coordination with the remainder of the floorplates - but should not have an appreciable impact on the tunnel stresses.

Sheet title: Floor Plan Basement Level 03
Sheet number: DA22B3
Revision: A
Status: FOR INFORMATION
Issuer: WOODS BAGOT
© Woods Bagot
Size check: 25mm
Sheet size: A1
Scale: 1 : 100
Project number: 121247
Approved: KD
Checked: TD
Project: 4-6 Bligh Street
Client: SC CAPITAL PARTNERS

Dimensions on site before commencing drawings. Do not scale drawings.

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Project	Project No	409096
4-6 BLIGH STREET	Scale	
Sketch Title: LEVEL B5 - FOUNDATIONS	Drawn: J.O. / Checked: J.O. / Approved: G.D.	
	Date	17/10/2022
Sketch Number: MMD-SK-005	Status	Rev B

Date generated: 8/2/2019 5:38:49 PM
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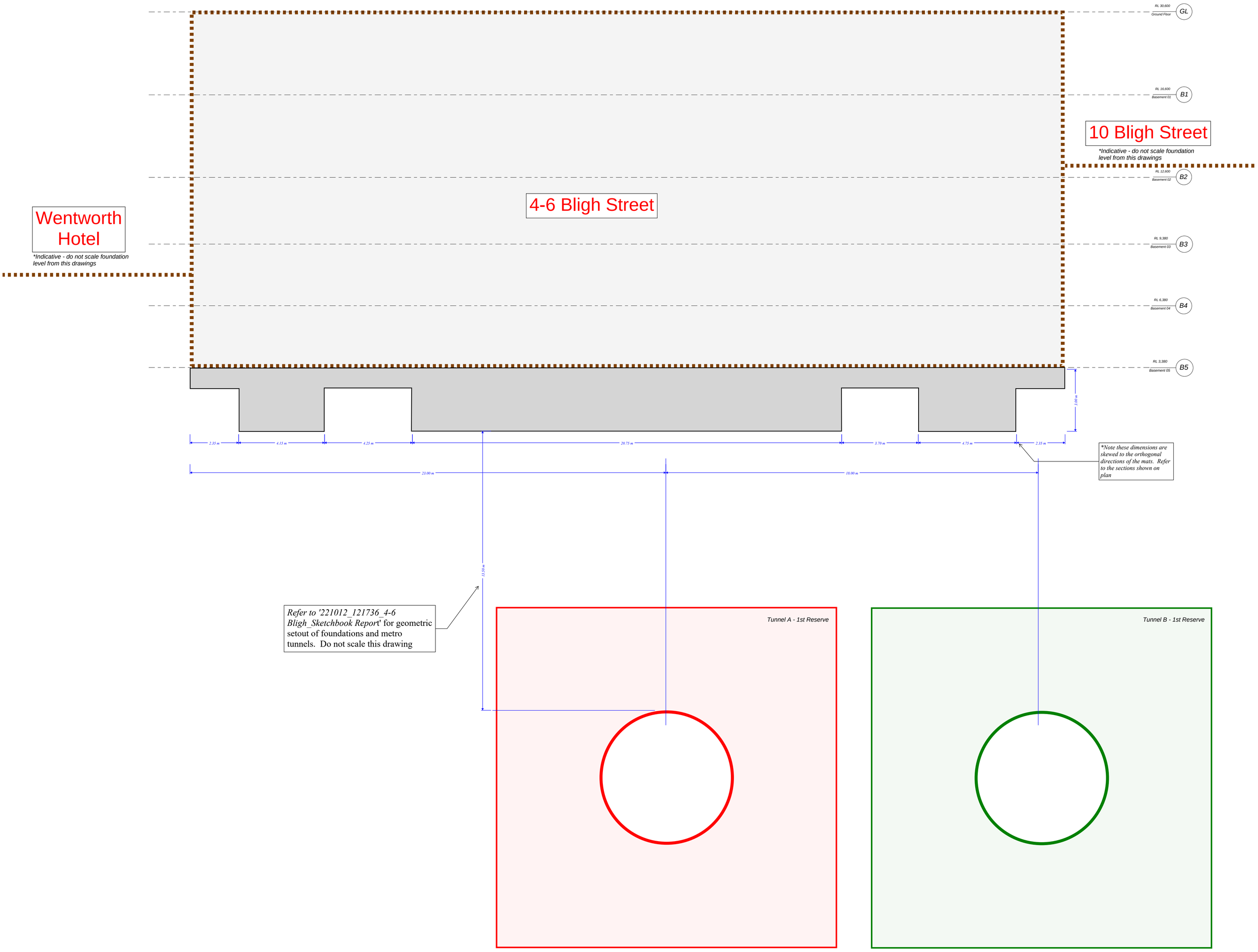
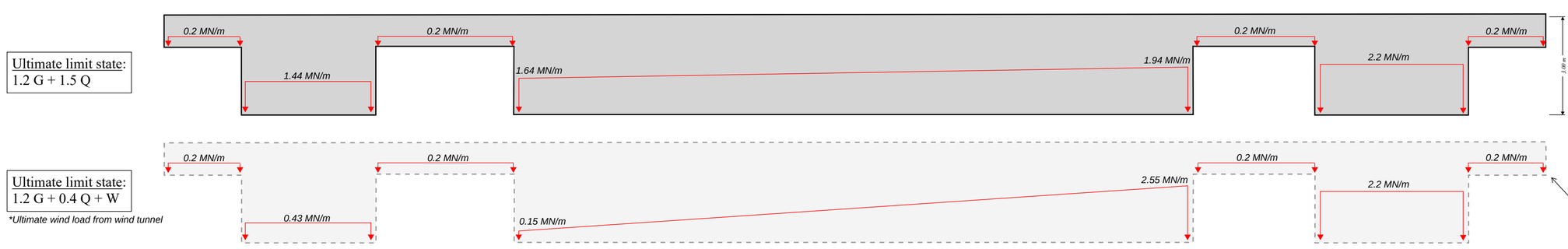


Section A-A

Ultimate Load Conditions



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Pro□ect 4-6 BLIGH STREET	Pro□ect No	409096	
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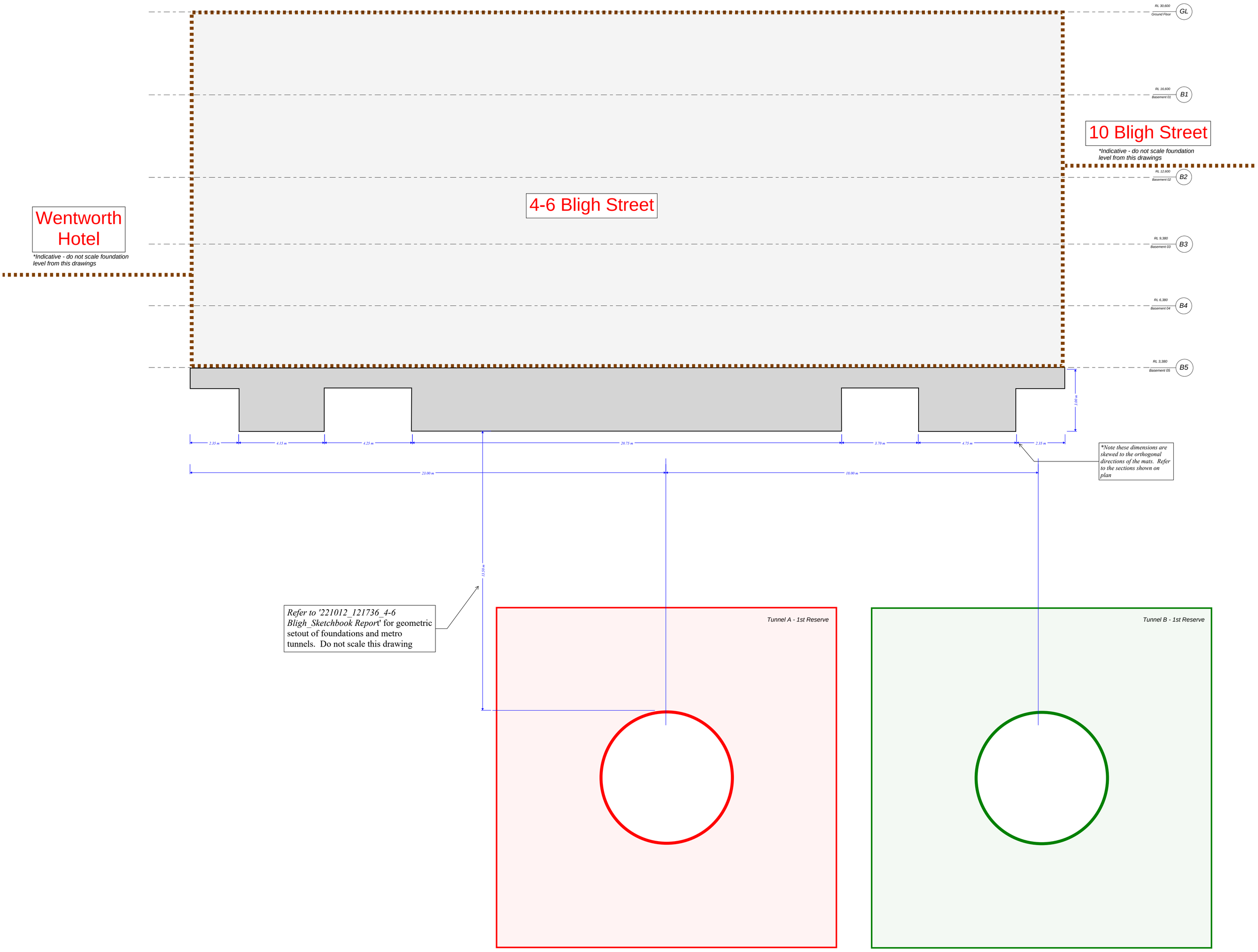
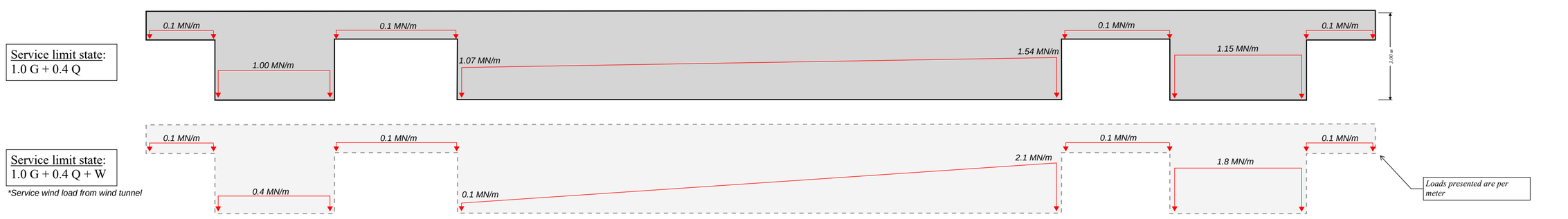
	Date	17/10/2022	
S□etc□ N□m□er MMD-SK-006	Stat□s	Re□ B	



Section A-A

Service Load Conditions



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Pro□ect 4-6 BLIGH STREET	Pro□ect No	409096	
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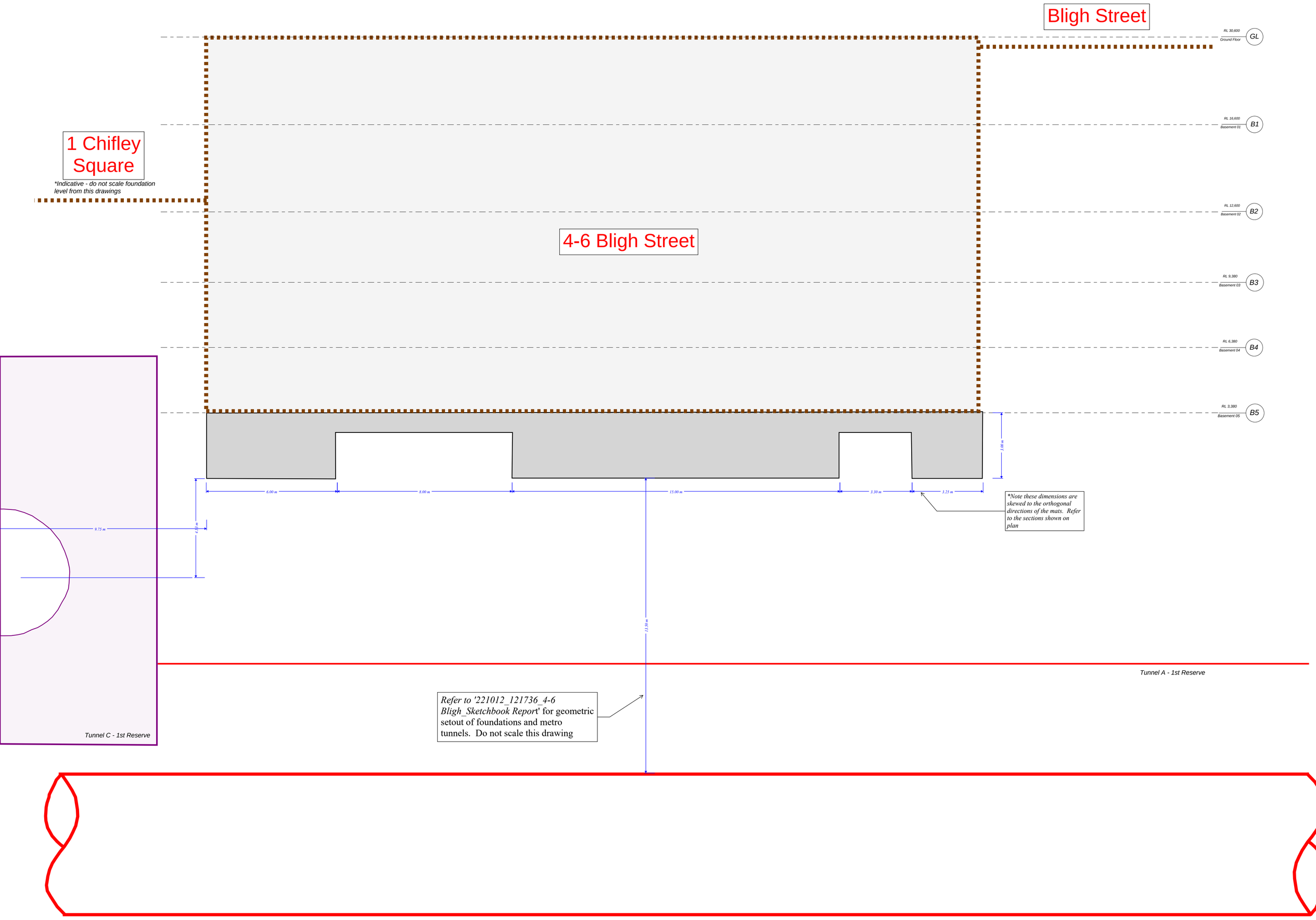
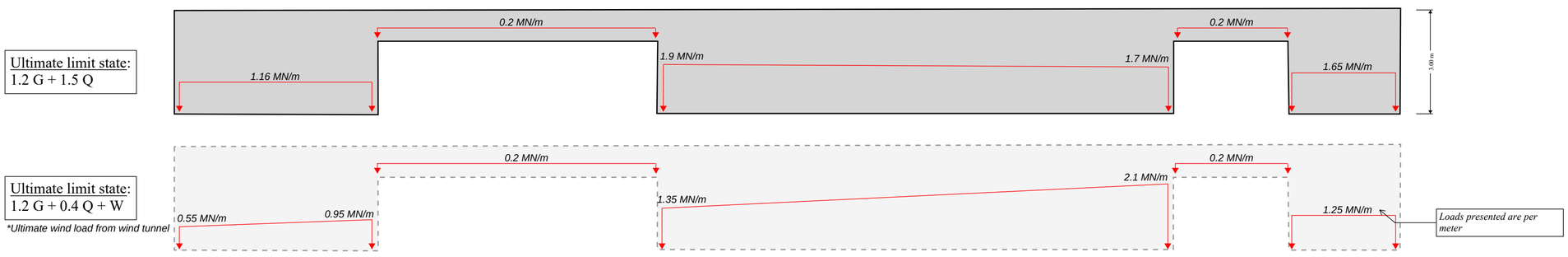


Section B-B

Ultimate Load Conditions



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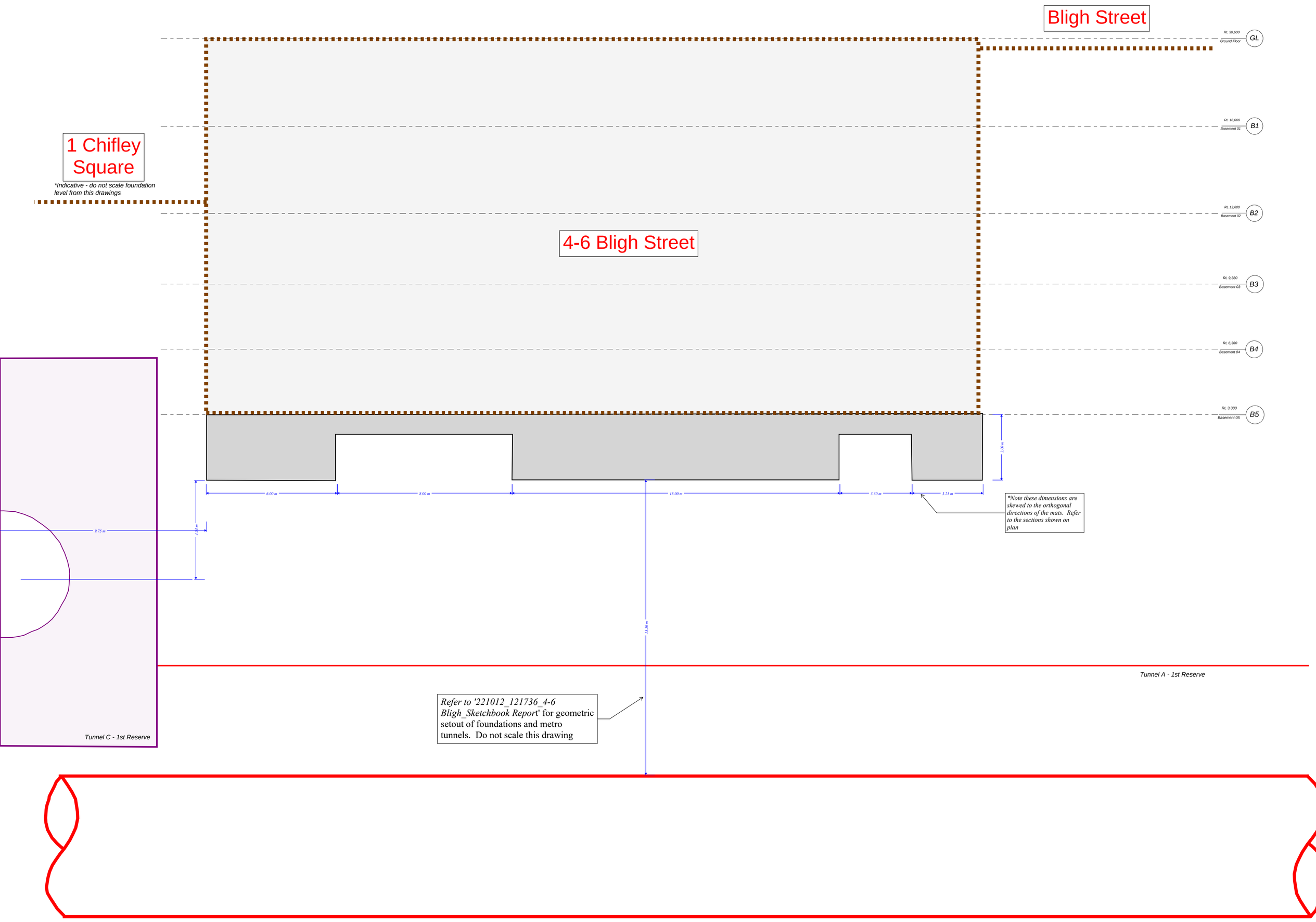
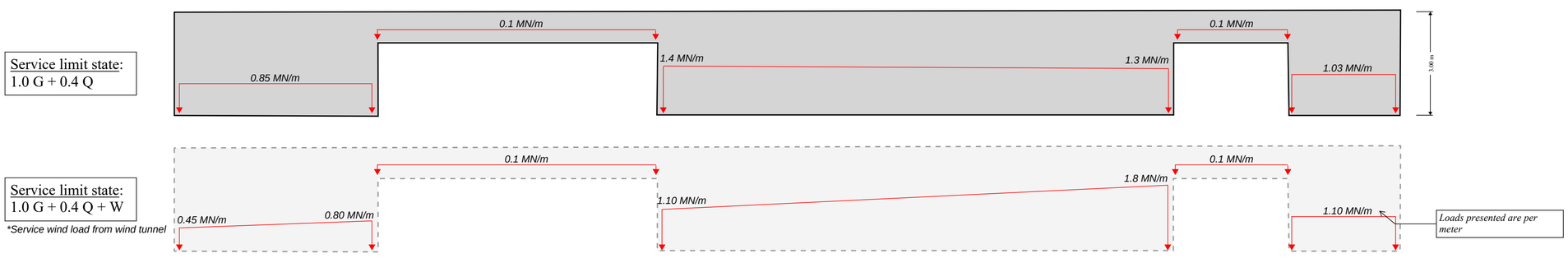


Section B-B

Service Load Conditions



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Pro□ect 4-6 BLIGH STREET	Pro□ect No	409096	
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	Date	17/10/2022	
S□etc□ N□m□er MMD-SK-009	Stat□s	Re□ B	

APPENDIX F: TRANSPORT FOR NSW ACQUISITION SURVEY PLANS

SURVEYING AND SPATIAL INFORMATION REGULATION 2012 : CLAUSE 35(1)(b) & 61(2) AND 62									
MARK	MGA EASTING	MGA NORTHING	CLASS	ORDER	AHD	CLASS	ORDER	METHOD	ORIGIN
PM 100	334 423.645	6 251 549.464	B	2	7.716	LB	L2	SCIMS	SCIMS
PM 147416	334 462.791	6 251 547.632	B	2	9.697	LC	L3	SCIMS	SCIMS
PM 147444	334 371.192	6 251 428.312	C	3				SCIMS	SCIMS
PM 147446	334 451.847	6 251 445.620	B	2				SCIMS	SCIMS
PM 147447	334 459.333	6 251 430.691	C	3				SCIMS	SCIMS
PM 147448	334 322.135	6 251 288.927	C	3				SCIMS	SCIMS
PM 147449	334 332.664	6 251 284.070	C	3				SCIMS	SCIMS
PM 147451	334 511.633	6 251 384.645	C	3				SCIMS	SCIMS
PM 147452	334 508.999	6 251 410.293	C	3				SCIMS	SCIMS
PM 147455	334 200.811	6 251 595.273	C	3				SCIMS	SCIMS
PM 147456	334 202.492	6 251 615.397	B	2				SCIMS	SCIMS
PM 147466	334 325.404	6 251 571.902	C	3				SCIMS	SCIMS
PM 147467	334 248.266	6 251 632.182	C	3				SCIMS	SCIMS
PM 147468	334 331.145	6 251 618.041	C	3				SCIMS	SCIMS
PM 147471	334 362.403	6 251 534.194	B	2				SCIMS	SCIMS
PM 147472	334 270.907	6 251 570.747	C	3				SCIMS	SCIMS
PM 150213	334 185.720	6 251 556.340	C	3				SCIMS	SCIMS
PM 150214	334 185.255	6 251 614.629	C	3				SCIMS	SCIMS
PM 150216	334 196.102	6 251 661.635	B	2				SCIMS	SCIMS
PM 150224	334 527.275	6 251 388.409	B	2				SCIMS	SCIMS
PM 150300	334 333.296	6 251 533.021	C	3				SCIMS	SCIMS
PM 150301	334 200.563	6 251 561.101	B	2	8.662	LC	L3	SCIMS	SCIMS
PM 150372	333 844.132	6 251 673.500	C	4	22.643	B	2	SCIMS	SCIMS
PM 150420	334 112.944	6 251 536.135	B	2	15.745	B	2	SCIMS	SCIMS
PM 158770	333 842	6 251 642	U	U				SCIMS	SCIMS
PM 158771	333 835	6 251 641	U	U				SCIMS	SCIMS
PM 158772	333 814	6 251646	U	U				SCIMS	SCIMS
PM 158776	334 384	6 251438	U	U				SCIMS	SCIMS
PM 40090	334 229.772	6 251 521.334	B	2				SCIMS	SCIMS
PM 50837	334 437.117	6 251 239.250	B	2	19.167	LC	L3	SCIMS	SCIMS
PM 50839	334 404.106	6 251 250.082	C	3				SCIMS	SCIMS
PM 51327	334 378.014	6 251 447.373	B	2	9.141	LB	L2	SCIMS	SCIMS
PM 58430	334 441.644	6 251 276.555	C	3				SCIMS	SCIMS
PM 69548	334 340.452	6 251 615.264	C	3				SCIMS	SCIMS
PM 69549	334 326.198	6 251 579.503	B	2				SCIMS	SCIMS
PM 77482	334 437.851	6 251 614.227	C	3				SCIMS	SCIMS
PM 81009	334 330.007	6 251 516.241	C	3	5.22	LC	L3	SCIMS	SCIMS
PM 81011	334 321.052	6 251 531.154	C	3	4.447	LC	L3	SCIMS	SCIMS
PM 81012	334 368.186	6 251 519.999	C	3				SCIMS	SCIMS
SSM 31234	333 870.463	6 251 543.094	B	2	23.444	LB	L2	SCIMS	SCIMS
SSM 46691	333 763.761	6 251 789.361	B	2	19.462	LB	L2	SCIMS	SCIMS
SSM 71425	333 993.177	6 251 524.419	B	2	26.736	LC	L3	SCIMS	SCIMS

COMBINED SCALE FACTOR = 0.999933 ZONE 56

SOURCE: M.G.A. CO-ORDINATES AND SCALE FACTOR ADOPTED FROM SCIMS ON THE 7th JUNE 2017

TOTAL AREAS

LOT 120	1.477ha
LOT 121	9283m²
LOT 122	7672m²
LOT 123	90.3m²
LOT 124	451.4m²
LOT 125	747.90m²

SURVEY CONNECTIONS

SSM 46691–PM 50837	129°14'52" – 869.558 (MGA GRND) "X"–"Y"
	129°14'52" – 869.558 (SURVEY)
SSM 46691–SSM 31234	156°34'26" – 268.407 (MGA GRND)
	156°34'28" – 268.402 (SURVEY)
SSM 31234–SSM 71425	98°39'11" – 124.135 (MGA GRND)
	98°39'10" – 124.142 (SURVEY)
SSM 71425–PM 150420	84°24'46" – 120.347 (MGA GRND)
	84°24'39" – 120.344 (SURVEY)
PM 150420–PM 150301	74°05'45" – 91.112 (MGA GRND)
	74°06'03" – 91.106 (SURVEY)
PM 150301–PM 150216	357°27'33" – 100.640 (MGA GRND)
	357°27'19" – 100.635 (SURVEY)
PM 40090–PM 150301	323°42'09" – 49.344 (MGA GRND)
	323°41'51" – 49.348 (SURVEY)
PM 40090–PM 147471	84°27'43" – 133.262 (MGA GRND)
	84°27'42" – 133.252 (SURVEY)
PM 147471–PM 147416	82°22'32" – 101.290 (MGA GRND)
	82°22'15" – 101.292 (SURVEY)
PM 147171–PM 51327	169°48'24" – 88.219 (MGA GRND)
	169°48'15" – 88.212 (SURVEY)
PM 147416–PM 150224	157°57'09" – 171.797 (MGA GRND)
	157°57'05" – 171.800 (SURVEY)
PM 51327–PM 150224	111°33'22" – 160.497 (MGA GRND)
	111°33'22" – 160.500 (SURVEY)
PM 51327–PM 50837	164°08'47" – 216.366 (MGA GRND)
	164°08'41" – 216.372 (SURVEY)
PM 150224–PM50837	211°09'02" – 174.302 (MGA GRND)
	211°08'57" – 174.300 (SURVEY)
SSM 46691–PM150372	145°15'06" – 141.017 (MGA GRND)
	145°15'05" – 141.016 (SURVEY)
PM 150372–SSM31234	168°35'04" – 133.047 (MGA GRND)
	168°35'09" – 133.044 (SURVEY)
SSM 46691–PM150216	106°27'31" – 450.843 (MGA GRND)
	106°27'36" – 450.835 (SURVEY)

LOTS 120, 121 AND 122 ARE SUB-STRATUM LOTS LIMITED IN HEIGHT AND DEPTH BY STEPPED HORIZONTAL PLANES AS SHOWN ON LONGITUDINAL SECTIONS ON SHEET 11 OF THIS PLAN. NO LOT BOUNDARIES HAVE BEEN MARKED.

LOT 123 IS A SUB-STRATUM LOT LIMITED IN HEIGHT BY A HORIZONTAL PLANE AT RL -12.20 AHD AND LIMITED IN DEPTH BY A HORIZONTAL PLANE AT RL -32.75 AHD. NO LOT BOUNDARIES HAVE BEEN MARKED.

LOT 124 IS A SUB-STRATUM LOT LIMITED IN HEIGHT BY A HORIZONTAL PLANE AT RL -5.85 AHD AND LIMITED IN DEPTH BY A HORIZONTAL PLANE AT RL -26.75 AHD. NO LOT BOUNDARIES HAVE BEEN MARKED.

LOT 125 IS A SUB-STRATUM LOT LIMITED IN HEIGHT BY A HORIZONTAL PLANE AT RL -0.10 AHD AND LIMITED IN DEPTH BY A HORIZONTAL PLANE AT RL -20.10 AHD. NO LOT BOUNDARIES HAVE BEEN MARKED.

SEE SHEET 11 FOR SECTIONS A-A & B-B
SEE SHEET 12 FOR SECTIONS C-C, D-D, E-E & F-F
SEE SHEET 13 FOR STRATUM NOTE TABLE

THE ACQUISITION OF LAND IN A STRATA SCHEME AFFECTS COMMON PROPERTY ONLY

IT IS INTENDED TO ACQUIRE LOTS 120-125 INCLUSIVE

Surveyor: DAVID WALLACE FAIRLIE
Date of Survey: 07.06.2017
Surveyor's Ref: PR124856-DP12
2017M7100 (792 & 799)
EXEMPTION No. 16/070-072

PLAN OF
ACQUISITION FOR RAILWAY PURPOSES

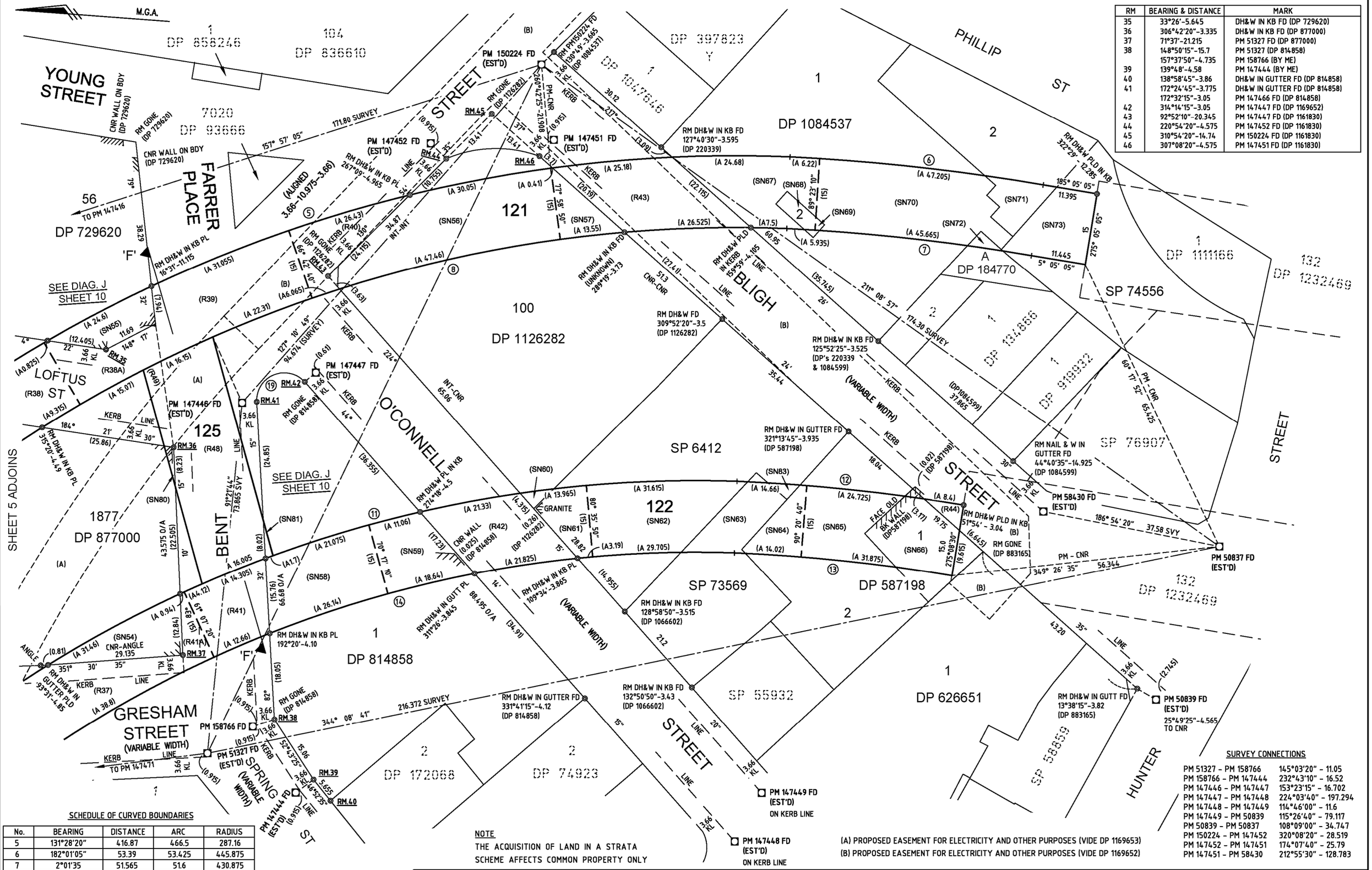
L.G.A.: SYDNEY
Locality: SYDNEY, MILLERS POINT & THE ROCKS
Subdivision No: ——
Lengths are in metres. Reduction Ratio 1: 2500

Registered: 09.04.2018

DP1231659

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm

(Cad Ref: PR124856-DP12-001m.dwg)



SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
35	33°26'-5.645	DH&W IN KB FD (DP 729620)
36	306°42'20"-3.335	DH&W IN KB FD (DP 877000)
37	71°37'-21.215	PM 51327 FD (DP 877000)
38	148°50'15"-15.7	PM 51327 (DP 814858)
	157°37'50"-4.735	PM 158766 (BY ME)
39	139°48'-4.58	PM 147444 (BY ME)
40	138°58'45"-3.86	DH&W IN GUTTER FD (DP 814858)
41	172°24'45"-3.775	DH&W IN GUTTER FD (DP 814858)
	172°32'15"-3.05	PM 147466 FD (DP 814858)
42	314°14'15"-3.05	PM 147447 FD (DP 1169652)
43	92°52'10"-20.345	PM 147447 FD (DP 1161830)
44	220°54'20"-4.575	PM 147452 FD (DP 1161830)
45	310°54'20"-14.74	PM 150224 FD (DP 1161830)
46	307°08'20"-4.575	PM 147451 FD (DP 1161830)

SCHEDULE OF CURVED BOUNDARIES

No.	BEARING	DISTANCE	ARC	RADIUS
5	131°28'20"	416.87	466.5	287.16
6	182°01'05"	53.39	53.425	445.875
7	2°01'35	51.565	51.6	430.875
8	311°28'30"	394.975	441.965	272.160
11	132°30'25"	365.05	405.705	257.575
12	181°41'55"	47.755	47.785	391.125
13	1°42'20"	45.865	45.895	376.125
14	312°30'30"	343.675	381.92	242.575
19	153°23'15"	10.94	14.32	5.79

SURVEY CONNECTIONS

PM 51327 – PM 158766	145°03'20" – 11.05
PM 158766 – PM 147444	232°43'10" – 16.52
PM 147446 – PM 147447	153°23'15" – 16.702
PM 147447 – PM 147448	224°03'40" – 197.294
PM 147448 – PM 147449	114°46'00" – 11.6
PM 147449 – PM 50839	115°26'40" – 79.117
PM 50839 – PM 50837	108°09'00" – 34.747
PM 150224 – PM 147452	320°08'20" – 28.519
PM 147452 – PM 147451	174°07'40" – 25.79
PM 147451 – PM 58430	212°55'30" – 128.783

NOTE
THE ACQUISITION OF LAND IN A STRATA SCHEME AFFECTS COMMON PROPERTY ONLY

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm

(Cad Ref: PR124856-DP12-001m.dwg)

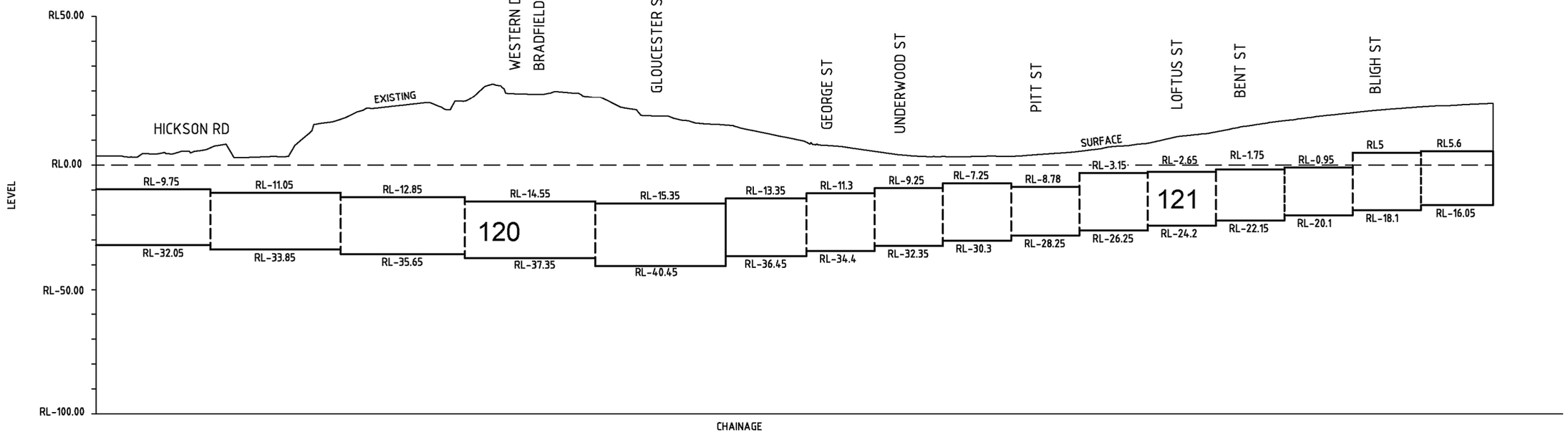
Surveyor: DAVID WALLACE FAIRLIE
Date of Survey: 07.06.2017
Surveyor's Ref: PR124856-DP12
2017M7100 (792 & 799)
EXEMPTION No. 16/070-072

PLAN OF
ACQUISITION FOR RAILWAY PURPOSES

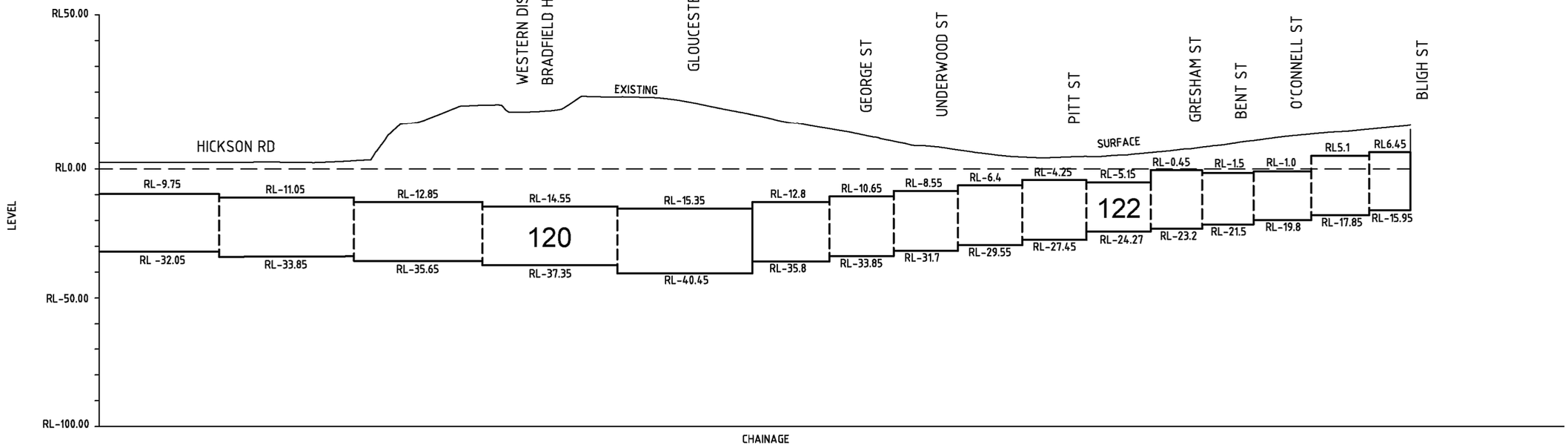
L.G.A.: SYDNEY
Locality: SYDNEY, MILLERS POINT & THE ROCKS
Subdivision No: —
Lengths are in metres. Reduction Ratio 1: 500

Registered: 09.04.2018

DP1231659



LONGITUDINAL SECTION ' A'-'A'

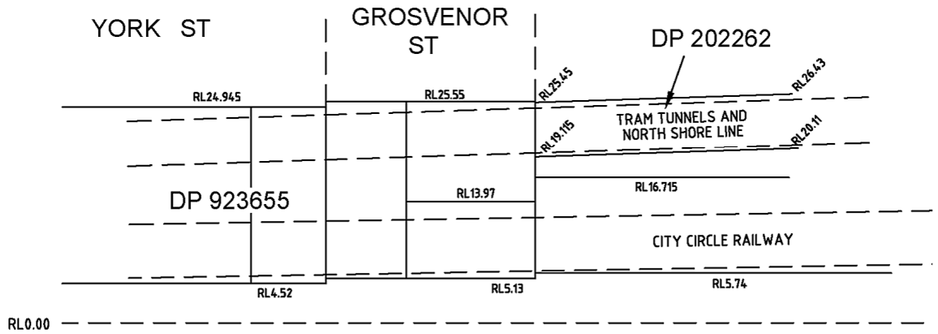


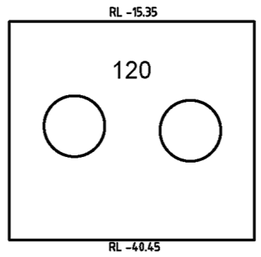
LONGITUDINAL SECTION 'B'-'B'

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 07.06.2017 Surveyor's Ref: PR124856-DP12 2017M7100 (792 & 799) EXEMPTION No. 16/070-072	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: SYDNEY Locality: SYDNEY, MILLERS POINT & THE ROCKS Subdivision No: —— Lengths are in metres. Reduction Ratio 1: **N.T.S.**	Registered: 09.04.2018	DP1231659

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm

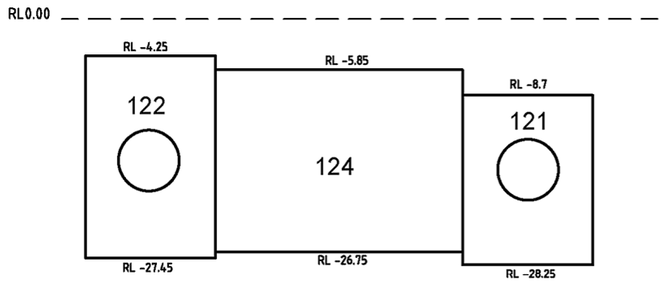
(Cad Ref: PR124856-DP12-001m.dwg)





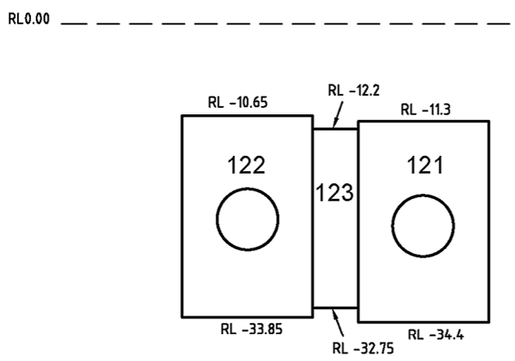
SECTION 'C'-'C'

NOT TO SCALE



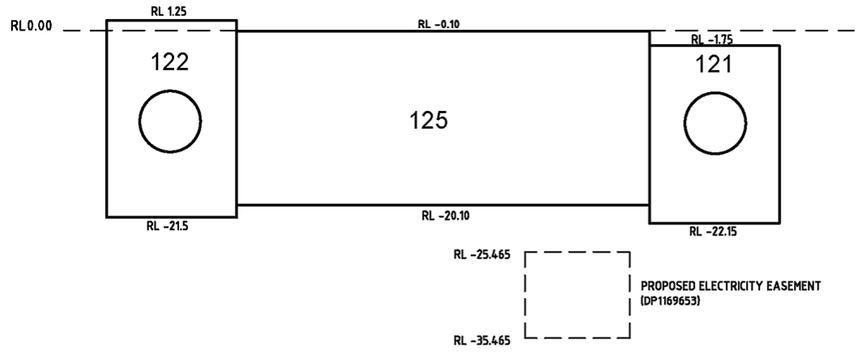
SECTION 'E'-'E'

SCALE 1:500



SECTION 'D'-'D'

SCALE 1:500



SECTION 'F'-'F'

SCALE 1:500

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 07.06.2017 Surveyor's Ref: PR124856-DP12 2017M7100 (792 & 799) EXEMPTION No. 16/070-072	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: SYDNEY Locality: SYDNEY, MILLERS POINT & THE ROCKS Subdivision No: — Lengths are in metres. Reduction Ratio 1: N.T.S.	Registered: 09.04.2018	DP1231659

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm

(Cad Ref: PR124856-DP12-001m.dwg)

TABLE OF AFFECTATIONS AND STRATUM LIMITS

AFFECTED PROPERTY	EXTENT OF ACQUISITION					
LOT & DP	PLAN NOTATION	*APPROX. GROUND SURFACE LEVEL (RL)*	UPPER STRATUM LIMIT	LOWER STRATUM LIMIT	PART AREA (approx.) (m^2)	TOTAL AREA (approx.) (m^2)
	ACQUISITION LOT 120					
LOT 2 DP 869022	(SN1)	*RL 3*	RL -9.75	RL -32.05	13	
LOT 10 DP 1065410	(SN2)	*RL 3*	RL -9.75	RL -32.05	7	
LOT 11 DP 1065410	(SN3)	*RL 3*	RL -9.75	RL -32.05	90	2036
	(SN4)	*RL 3*	RL-11.05	RL -33.85	1870	
	(SN7)	*RL 16*	RL-11.05	RL -33.85	76	
LOT 5 DP 873158	(SN6)	*RL 3*	RL -11.05	RL -33.85	24	
LOT 12 DP 1065410	(SN5)	*RL 4*	RL-11.05	RL -33.85	197	432
	(SN8)	*RL 16*	RL-11.05	RL -33.85	35	
	(SN9)	*RL 17*	RL -12.85	RL -35.65	78	
	(SN9A)	*RL 16*	RL -12.85	RL -35.65	122	
CP SP77663	(SN10)	*RL 20*	RL -12.85	RL -35.65	372	402
	(SN75)	*RL 16*	RL-11.05	RL -33.85	30	
CP SP56911	(SN74)	*RL 16*	RL-11.05	RL -33.85	9	
CP SP61643	(SN11)	*RL 22*	RL -12.85	RL -35.65	404	
LOT 4 DP 1158807	(SN12)	*RL 27*	RL -15.35	RL -40.45	144	
LOT 1 DP1052779	(SN13)	*RL 27*	RL -15.35	RL -40.45	276	
LOT 401 DP 1175658	(SN14)	*RL 27*	RL -15.35	RL -40.45	11	
LOT 3 DP 1053387	(SN15)	*RL 20*	RL -15.35	RL -40.45	1076	
LOT 1 DP 771884	(SN16)	*RL 17*	RL -15.35	RL -40.45	56	
	ACQUISITION LOT 121					
LOT 1 DP 771884	(SN17)	*RL 13*	RL -13.35	RL -36.45	879	1113
	(SN19)	*RL 9*	RL -11.3	RL -34.4	234	
LOT 2 DP 771884	(SN21)	*RL 8*	RL -11.3	RL -34.4	8	
LOT 21 DP 1063401	(SN27)	*RL 7*	RL -11.3	RL -34.4	219	378
	(SN28)	*RL 6*	RL -9.25	RL -32.35	159	
LOT 1 DP 75111	(SN29)	*RL 7*	RL -11.3	RL -34.4	2	37
	(SN30)	*RL 6*	RL -9.25	RL -32.35	35	
LOT 1 DP 1213767	(SN31)	*RL 4*	RL -9.25	RL -32.35	248	
LOT 1 DP 787946	(SN32)	*RL 4*	RL -9.25	RL -32.35	249	
LOT A DP 104160	(SN36)	*RL 4*	RL -9.25	RL -32.35	44	338
	(SN40)	*RL 4*	RL -7.25	RL -30.3	294	
LOT B DP 104160	(SN41)	*RL 3*	RL -7.25	RL -30.3	10	
LOT 7 DP 110046	(SN42)	*RL 3*	RL -7.25	RL -30.3	5	
LOT 1 DP 513109	(SN43)	*RL 4*	RL -7.25	RL -30.3	398	
LOT 1 DP 62581	(SN44)	*RL 5*	RL -8.78	RL -28.25	245	253
	(SN48)	*RL 6*	RL -8.78	RL -26.25	8	
LOT 1 DP 909754	(SN45)	*RL 5*	RL -8.78	RL -28.25	110	
CP SP 68748	(SN46)	*RL 5*	RL -8.78	RL -28.25	252	292
	(SN47)	*RL 6*	RL -3.15	RL -26.25	42	
LOT 7048 DP 93668	(SN50)	*RL 6*	RL -3.15	RL -26.25	193	
LOT 1 SEC 48 DP 758942	(SN51)	*RL 7*	RL -3.15	RL -26.25	95	
LOT 1877 DP 877000	(SN52)	*RL 8*	RL -3.15	RL -26.25	3	499
	(SN53)	*RL 11*	RL -2.65	RL -24.2	496	
LOT 56 DP 729620	(SN55)	*RL 15*	RL -1.75	RL -22.15	138	
LOT 100 DP 1126282	(SN56)	*RL 19*	RL -0.95	RL -20.1	618	722
	(SN57)	*RL 20*	RL 5	RL -18.1	104	
LOT 1 DP 1084537	(SN67)	*RL 22*	RL 5	RL -18.1	302	857
	(SN70)	*RL 23*	RL -5.6	RL -16.05	555	
LOT 2 DP 1084537	(SN68)	*RL 22*	RL 5	RL -18.1	32	133
	(SN69)	*RL 22*	RL 5.6	RL -16.05	3	
	(SN71)	*RL 24*	RL 5.6	RL -16.05	98	
LOT A DP 184770	(SN72)	*RL 23*	RL 5.6	RL -16.05	13	
CP SP 74556	(SN73)	*RL 24*	RL 5.6	RL -16.05	199	
	ACQUISITION LOT 122					
LOT 1 DP 771884	(SN18)	*RL 14*	RL -12.8	RL -35.8	883	1173
	(SN20)	*RL 10*	RL -10.65	RL -33.85	290	
LOT 1 DP 75111	(SN22)	*RL 8*	RL -10.65	RL -33.85	90	322
	(SN25)	*RL 7*	RL -8.55	RL -31.7	232	
LOT 1 DP 70970	(SN23)	*RL 8*	RL -10.65	RL -33.85	26	128
	(SN24)	*RL 7*	RL -8.55	RL -31.7	102	
LOT 1 DP 1213767	(SN26)	*RL 6*	RL -8.55	RL -31.7	220	

AFFECTED PROPERTY	EXTENT OF ACQUISITION					
LOT & DP	PLAN NOTATION	*APPROX. GROUND SURFACE LEVEL (RL)*	UPPER STRATUM LIMIT	LOWER STRATUM LIMIT	PART AREA (approx.) (m^2)	TOTAL AREA (approx.) (m^2)
	ACQUISITION LOT 122					
LOT 1 DP 787946	(SN33)	*RL 5*	RL -8.55	RL -31.7	26	46
	(SN34)	*RL 4*	RL -6.4	RL -29.55	20	
LOT 50 DP 1038651	(SN37)	*RL 5*	RL -6.4	RL -29.55	8	
LOT A DP 104160	(SN35)	*RL 4*	RL -6.4	RL -29.55	1	
LOT 51 DP 1038651	(SN38)	*RL 4*	RL -6.4	RL -29.55	512	710
	(SN39)	*RL 5*	RL -4.25	RL -27.45	198	
LOT 1 DP62940	(SN82)	*RL 5*	RL -4.25	RL -27.45	4	
LOT 1 DP 222751	(SN49)	*RL 7*	RL -5.15	RL -24.27	248	
LOT 1877 DP 877000	(SN54)	*RL 10*	RL -0.45	RL -23.2	192	
LOT 1 DP 814858	(SN58)	*RL 13*	RL -1.50	RL -21.5	367	590
	(SN59)	*RL 14*	RL -1.00	RL -19.8	223	
LOT 100 DP 1126282	(SN60)	*RL 15*	RL 0.2	RL -19.8	13	
CP SP 6412	(SN61)	*RL 15*	RL 0.2	RL -19.8	116	521
	(SN62)	*RL 16*	RL 5.1	RL -17.85	394	
	(SN83)	*RL 18*	RL 5.1	RL -17.85	11	
CP SP 73569	(SN63)	*RL 17*	RL 5.1	RL -17.85	161	
LOT 2 DP587198	(SN64)	*RL 17*	RL 5.1	RL -17.85	109	358
	(SN65)	*RL 18*	RL 6.45	RL -15.95	249	
LOT 1 DP587198	(SN66)	*RL 19*	RL 6.45	RL -15.95	215	
	ACQUISITION LOT 123					
LOT 1 DP 771884	(SN76)	*RL 10*	RL -12.2	RL -32.75	50	52
LOT 2 DP 771884	(SN77)	*RL 9*	RL -12.2	RL -32.75	2	
	ACQUISITION LOT 124					
LOT 51 DP 1038651	(SN78)	*RL 4*	RL -5.85	RL -26.75	11	20
LOT 1 DP 62581	(SN79)	*RL 4*	RL -8.78	RL -26.75	9	
	ACQUISITION LOT 125					
LOT 1877 DP 877000	(SN80)	*RL 14*	RL -0.10	RL -20.10	8	15
LOT 1 DP 814858	(SN81)	*RL 13*	RL -1.50	RL -20.1	7	

ROAD OWNERSHIP TABLE

AFFECTED ROAD	FEE SIMPLE
HIGH STREET	CT 1318-29, GOV'T GAZETTE 25/01/1923 FOL 346-347
HICKSON ROAD	GOV'T GAZETTE 25/01/1923 FOL 346-347 CT 4454-65, CT 1318-29, CT 473-144, CT 462-35
GAS LANE	CT 4454-65
KENT STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920 CT 2050-103, CT 4454-65
BRADFIELD HIGHWAY	GOV'T GAZETTE 9/12/1927 FOL 5670, GOV'T GAZETTE 19/02/1932 FOL 680 GOV'T GAZETTE 15/05/1970 FOL 1773 & 1774, CT 1/52538, CT 1/57574, CT 834-241
GROSVENOR STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
GLOUCESTER STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
HARRINGTON STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
GEORGE STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
UNDERWOOD STREET	O/S LAND, PART ALLOT 2 SEC 47 GRANT DATED 1/5/1804 SERIAL 3 PAGE 128 O/S LAND, PART ALLOT 1 SEC 47 GRANT DATED 27/5/1823 SERIAL 14 PAGE 175 CT 10132-41, CT 5139-138
DALLEY STREET	O/S LAND, PART ALLOT 1 SEC 47 GRANT DATED 27/5/1823 SERIAL 14 PAGE 175, CT 6931-98
QUEENS COURT	O/S LAND, PART ALLOT 1 SEC 47 GRANT DATED 27/5/1823 SERIAL 14 PAGE 175
PITT STREET	O/S LAND, PART ALLOT 15 SEC 47 GRANT DATED 1/1/1810 SERIAL 14 PAGE 175 O/S LAND, PART ALLOT 15A SEC 47 GRANT DATED 17/4/1851 SERIAL 53 PAGE 149
MACQUARIE PLACE	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
BRIDGE STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
GRESHAM STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
LOFTUS STREET	CROWN ROAD (FORMERLY PT SEC 49)
BENT STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920
O'CONNELL STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920, CT 4732-28
BLIGH STREET	GOV'T GAZ 31/12/1834 SYDNEY CORPORATION ACT 1932 FOL 920, CT 1040-134

AFFECTED ROAD	EXTENT OF ACQUISITION				
	PLAN NOTATION	UPPER STRATUM LIMIT	LOWER STRATUM LIMIT	PART AREA (approx.) (m^2)	TOTAL AREA (approx.) (m^2)
	ACQUISITION LOT 120				
HICKSON ROAD	(R1)	RL -9.75	RL -32.05	2445	3222
	(R3)	RL -11.05	RL -33.85	777	
HIGH STREET	(R2)	RL -9.75	RL -32.05	8	
GAS LANE	(R4)	RL -12.85	RL -35.65	228	
KENT STREET	(R5)	RL -12.85	RL -35.65	1421	
CLARENCE STREET	(R6)	RL -12.85	RL -35.65	363	739
	(R7)	RL -14.55	RL -37.35	109	
	(R8)	RL -14.55	RL -37.35	267	
BRADFIELD HIGHWAY	(R9)	RL -14.55	RL -37.35	749	2284
	(R10)	RL -14.55	RL -37.35	152	
	(R11)	RL -14.55	RL -37.35	219	
	(R12)	RL -14.55	RL -37.35	333	
	(R13)	RL -14.55	RL -37.35	559	
	(R14)	RL -14.55	RL -37.35	272	
YORK STREET	(R15)	RL -14.55	RL -37.35	495	
GROSVENOR STREET	(R16)	RL -15.35	RL -40.45	530	
GLOUCESTER STREET	(R17)	RL -15.35	RL -40.45	414	
HARRINGTON STREET	(R18)	RL -15.35	RL -40.45	539	
	ACQUISITION LOT 121				
HARRINGTON STREET	(R19)	RL -13.35	RL -36.45	112	
GEORGE STREET	(R22)	RL -11.3	RL -34.4	362	
UNDERWOOD STREET	(R23)	RL -9.25	RL -32.35	90	
QUEENS COURT	(R27)	RL -7.25	RL -30.3	40	
PITT STREET	(R28)	RL -7.25	RL -30.3	78	295
	(R29)	RL -8.7	RL -28.25	217	
MACQUARIE PLACE	(R33)	RL -3.15	RL -26.25	83	
BRIDGE STREET	(R34)	RL -3.15	RL -26.25	398	457
	(R35)	RL -2.65	RL -24.2	59	
LOFTUS STREET	(R38)	RL -2.65	RL -24.2	271	467
	(R38A)	RL -1.75	RL -22.15	196	
BENT STREET	(R39)	RL -1.75	RL -22.15	491	697
	(R40)	RL -0.95	RL -20.1	206	
BLIGH STREET	(R43)	RL 5.0	RL -18.1	387	
	ACQUISITION LOT 122				
HARRINGTON STREET	(R20)	RL -12.8	RL -35.8	2	
GEORGE STREET	(R21)	RL -10.65	RL -33.85	345	
DALLEY STREET	(R25)	RL -8.55	RL -31.7	120	330
	(R26)	RL 6.4	RL -29.55	210	
UNDERWOOD STREET	(R24)	RL -8.55	RL -31.7	51	
PITT STREET	(R30)	RL -4.25	RL -27.45	177	
BRIDGE STREET	(R31)	RL -4.25	RL -27.45	371	503
	(R32)	RL -5.15	RL -24.27	132	
GRESHAM STREET	(R36)	RL -5.15	RL -24.27	370	719
	(R37)	RL -0.45	RL -23.2	349	
BENT STREET	(R41A)	RL -0.45	RL -23.2	60	293
	(R41)	RL 1.25	RL -21.5	233	
O'CONNELL STREET	(R42)	RL 0.2	RL -19.8	324	
BLIGH STREET	(R44)	RL 6.45	RL -15.95	23	
	ACQUISITION LOT 123				
GEORGE STREET	(R45)	RL -12.2	RL -32.75	38	
	ACQUISITION LOT 124				
PITT STREET	(R47)	RL -5.85	RL -26.75	431	
	ACQUISITION LOT 125				
BENT STREET	(R49)	RL -0.10	RL -20.10	51	733
	(R48)	RL -0.10	RL -20.10	682	

Surveyor: DAVID WALLACE FAIRLIE
Date of Survey: 07.06.2017
Surveyor's Ref: PR124856-DP12
2017M7100 (792 & 799)
EXEMPTION No. 16/070-072

PLAN OF
ACQUISITION FOR RAILWAY PURPOSES

L.G.A.: SYDNEY
Locality: SYDNEY, MILLERS POINT & THE ROCKS
Subdivision No: ——
Lengths are in metres. Reduction Ratio 1: **N.T.S.**

Registered: 09.04.2018

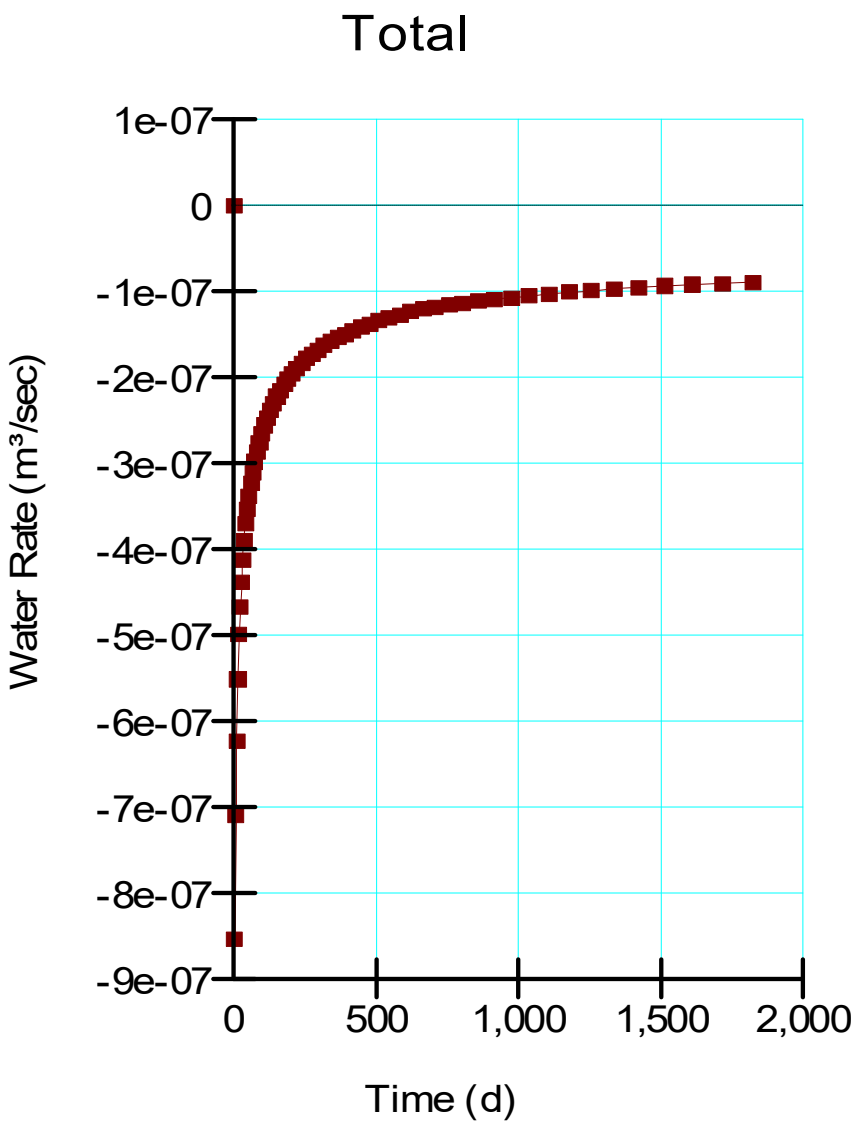
DP1231659

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm

(Cad Ref: PR124856-DP12-001m.dwg)

APPENDIX G: GROUNDWATER INFLOW ASSESSMENT

SEEPW - Total groundwater inflow rate (Plane Strain - Transient Analysis)



Excavation Dimension:

W = 32 m L = 37 m

Total Basement Inflow = Water rate (m^3/sec) x (W + L)

= $8.5*10^{-7}$ x (32+67)

= 6 x 10^{-5} m^3/sec

Groundwater Inflow Assessment

PARAMETERS

no flow level	-20	m AHD
design gwl	7.5	m AHD
k	5.0E-07	m/s

Theim-Dupuit equation for steady-state inflow

$$Q = \frac{\pi k(H^2 - h^2)}{\ln(\frac{R}{r})}$$

Note:
Case 1 and Case 2 are separate inflow cases and are not to be added together

CASE 1 - inflow to basement level 4

BEL	6	m AHD
L	37	m
W	32	m
r (equiv)	19.4	m
R - Radius of influence	250	m
H	27.5	m
h	26	m
Inflow	4.9E-05	m3/s
	0.05	L/s
	4.26	m3/day
	1.6	ML/yr

CASE 2 - inflow to lift core

BEL	3.8	m AHD
L	3.3	m
W	2.8	m
r (equiv)	1.7	m
R - Radius of influence	100	m
H	27.5	m
h	23.8	m
Inflow	7.3E-05	m3/s
	0.07	L/s
	6.34	m3/day
	2.3	ML/yr