Engineering Impact Assessment Development Adjacent to Sydney Metro Underground Corridor

Project: 601 Pacific Highway, St Leonards NSW 2065

Application number: SSD-85848713

Applicant: Stockland Development Pty Limited

Date / Version: 24 March 2026 – Rev 1

Distribution: Sydney Metro

Statement of Purpose: This report has been prepared in response to SEARS Item 9 – Transport and demonstrates compliance with performance requirements in the Sydney Metro Underground Corridor Protection Technical Guidelines - July 2025, ensuring no unacceptable adverse effects on existing or future Metro infrastructure across planning, design, construction and operation.

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1 Executive Summary

This Engineering Impact Assessment Report has been prepared to assess the potential effects and risks to the existing Sydney Metro Infrastructure associated with the proposed development located at 601 Pacific Highway, St Leonards NSW (Lot 71 in DP 749690). .

The site currently contains an existing 14-storey commercial building with a 4-level basement. Two Metro tunnels, RT01 (easternmost) and RT02 (westernmost), run directly beneath the site. The proposed development is a 52-storey mixed-use residential building with a 6-level basement, which will involve excavation up to an additional 12 m below the existing basement level.

Stockland has commissioned the following team of specialist consultants to prepare this report:

- Architect – Bates Smart
- Acoustic Engineer – E-Lab
- Building Structural Engineer – BG&E
- Geotechnical Engineer – Douglas Partners
- Registered Surveyor – LTS
- Tunnel Structural Engineer – SYSTRA
- Utility and Services Locator – Veris.

The results indicate compliance with tunnel and track movement criteria, confirm no piling or foundations in the First Reserve, and provide a monitoring plan for the duration of the works. The contamination risk is low and hazardous building materials will be safely removed during demolition. A construction methodology, detailed monitoring plan and risk register are provided to demonstrate protection measures of Sydney Metro assets and enable approvals from Sydney Metro.

Based on the included findings, the proposed development is considered geotechnically and structurally viable, posing no significant risk to the Sydney Metro infrastructure.

2 Background and Introduction

Stockland Development (Stockland) submitted an EOI for an SSDA and concurrent rezoning proposal on 17th January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19th February 2025, the HDA recommended to the Minister that the applicant's project be declared SSD, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).
A request for SEARs was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This Metro Engineering Impact Assessment has been prepared and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).
The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.
- Demolition of the existing 14 storey commercial office building that is currently on the site.
- Site excavation, remediation and other preparatory works.
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m^2), comprising:
  - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
  - A contribution of 5% of the residential GFA toward Affordable Housing.
  - Retail and commercial land uses at the ground and podium levels.
  - Internal and external residential amenities provided throughout the building.
  - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
  - Vehicular access to the basement via Atchison Street.
  - Landscaping and Public Domain works.
  - Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

Relevant SEARs

This Metro Engineering Impact Assessment has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out below.

SEARS	Location in Report
9. Transport • *Undertake detailed consultation with Sydney Metro regarding the Sydney Metro Corridor Protection Zone.* • *A Geotechnical report detailing the excavation of the site and support structures and consider proximity to the Sydney Metro corridor. The geotechnical report shall be prepared in accordance with Technical Direction GTD2020/001.* • *Sydney Metro Underground Corridor Protection Technical Guideline – July 2025 (Version 3 – Dated 1 August 2025)*	Section 3 to 9 of this report

3 Project Description & Context

3.1 Site Location & Context

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844m2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400m (walking distance) from the Crows Nest Metro station.

Two Metro tunnels, RT01 (easternmost) and RT02 (westernmost), run directly beneath the site within Lot 50 of DP1231638. Refer to Registered Survey drawing in report Appendix C – Registered Survey Plans for extent and proximity.

A site aerial and location plan is provided at **Figure 1** below:



Figure 1 – Subject Site

Source: Urbis

3.2 Sydney Metro Consultation

A consultation meeting was held 27 November 2025 via Microsoft Teams. Attendees included representatives from Sydney Metro Corridor Protection, WSP, Stockland, BG&E, Douglas & Partners and SYSTRA.

Outcomes and actions included:

- Existing document request (shared post meeting).
- Agreement that the project qualifies for a Medium Risk Level based on the excavation depth and proximity to the first reserve, as per Table 6.1 of the Sydney Metro Underground Corridor Protection Technical Guideline – July 2025.
- Proposal from the project team to proceed with a consultative approach with an aim to facilitate proposed timeframes.
- Independent Assessment Report is not required as per the Guidelines however, however this will be assessed by Sydney Metro based on the findings submitted.

A further pre-lodgement meeting has been offered by the project team (date TBC by Sydney Metro) to update the Sydney Metro team on the latest findings captured within this report.

3.3 Metro Assets & Protection Reserves

The detailed extent of the Metro infrastructure and protection reserves relative to the development can be referred to in Appendices A, B and C.

The proposal maintains a minimum of 2.05m clearance from the building raft structure to the Metro First Reserve, as can be seen from the extract below:

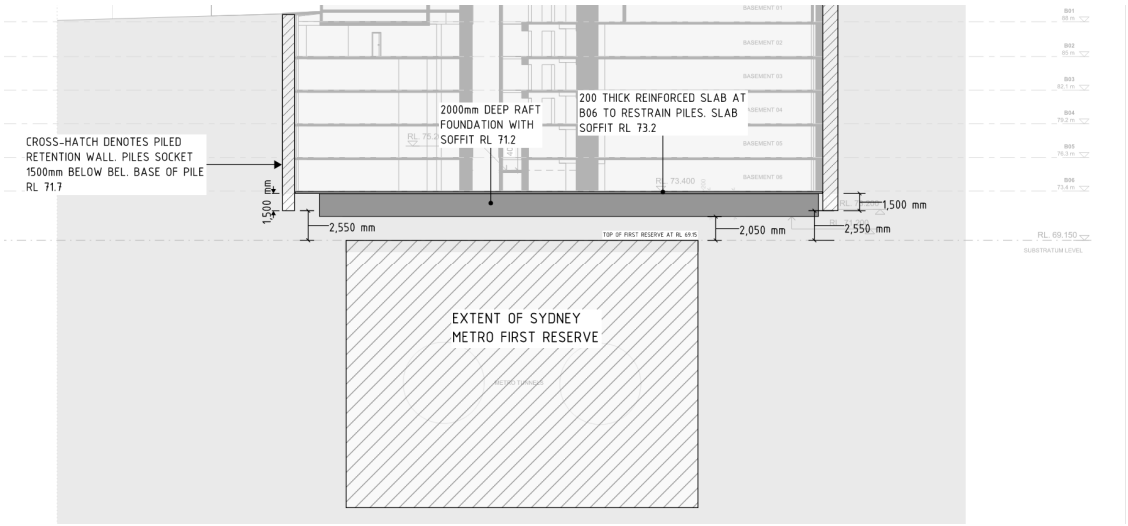


Figure 2: Section extract from Structural Drawings.

4 Site Investigations

4.1 Geotechnical Investigations Summary

A total of six boreholes (BH1–BH6) were drilled across the site, with locations shown on LTS Lockley Drawing 52414 001BH. These boreholes define the site's subsurface profile and protection reserve geometry as required by Guideline Section 7.1.1.

These results developed a refined geological and rock-mass model incorporating bedding, jointing and a potential weak sandstone band, assessed the groundwater regime, and established in-situ stress conditions to inform the detailed numerical analysis.

Refer to Appendix D - Geotechnical Impact Assessment report for further detail.

4.2 Contamination Investigations Summary

Site investigations conducted by Douglas Partners have been detailed in the Preliminary Site Investigation due diligence report and the Detailed Site Investigation report. Furthermore, a Remedial Action Plan has been prepared for the site (refer Appendix G – Contamination Reports).

The testing confirms no significant soil or groundwater contamination at the site, and no contaminant source likely to impact Sydney Metro infrastructure. All soil samples tested were below adopted Site Assessment Criteria, and no asbestos was detected in any soil samples.

A diesel underground storage tank (UST) exists beneath the lowest basement, but no petroleum or vapour impacts were detected, and the UST will be fully removed and validated under the RAP.

Groundwater showed slightly elevated metals, considered regional background, not site derived contamination, and all results were below human health criteria with groundwater to be managed via a Dewatering Management Plan.

Hazardous building materials (asbestos, SMF, PCB light fittings, lead paint) are confined to the existing structures and will be removed during demolition, with no pathway to Metro assets. With all fill and the UST being removed as part of the basement excavation the contamination risk to Sydney Metro tunnels is assessed as low.

4.3 Services Investigations Summary

A Before You Dig Australia (BYDA) investigation has been undertaken to identify the location of existing services. An initial subsurface utility and services investigation has also been completed by Veris and has been included with the BYDA report in Appendix I.

5 Engineering Impact Assessment (EIA)

5.1 Scope & Staging

Douglas Partners and SYSTRA have assessed construction staging by modelling demolition, bulk excavation and building load application in stages, allowing calculation of the ground and tunnel displacements at each stage of construction.

5.2 Geotechnical Modelling

The numerical modelling undertaken by Douglas Partners (refer Appendix D – Geotechnical Impact Assessment) used a 3D finite element analysis (FLAC3D) to assess the impact of the proposed development on the underlying Sydney Metro RT01 and RT02 tunnels. The model incorporated site specific geology from six boreholes, rock mass parameters derived from UCS/GSI correlations, and staged construction including demolition, bulk excavation, raft and pad footing loading.

Two modelling cases were analysed: a Serviceability Case using typical Sydney rock mass modulus and stress conditions, and a Sensitivity Case using lower bound rock mass modulus, higher insitu stress, and a potential weak sandstone seam at tunnel level. Tunnels were modelled as elastic structural liners installed after 90% stress relief to replicate TBM behaviour. Various final building load combinations were applied to assess the full range of serviceability effects.

Results show that in the Serviceability Case, maximum tunnel liner settlement is 7.1 mm, and angular distortion is 0.3 mm/m, both within Sydney Metro criteria. Track level movements remain below 4 mm, comfortably satisfying the 8 mm limit. Stress changes within the rock mass remain compressive and are well below the rocks UCS strength, indicating that overstressing is not expected.

The conservative Sensitivity Case predicted a worst-case displacement of 11 mm and angular distortion of 0.42 mm/m, slightly above the 10 mm guideline, however, this represents an unlikely upper bound. Track level movements remain below 6 mm, satisfying the 8 mm limit.

Both cases indicate that the development is geotechnically viable, subject to final structural tunnel liner assessment by SYSTRA, implementation of the proposed monitoring plan and targeted geotechnical investigation to confirm design parameters prior to construction.

5.3 Structural Modelling

The detailed structural tunnel lining Engineering Impact Assessment prepared by SYSTRA (refer Appendix E – Tunnel Engineering Impact Assessment) confirms that the proposed 52-storey tower and six-level basement can be safely constructed above the Sydney Metro RT01/RT02 tunnels.

The Douglas Partners 3D assessment provides the governing tunnel distortion, lining stress and soil–structure interface conditions, which SYSTRA has relied upon to confirm that, under these deflections and loading conditions, the segmental lining, longitudinal joints, dowels and gaskets all satisfy ULS and SLS capacity requirements.

The analysis further confirms that the tunnel lining retains adequate reserve capacity even under the most onerous sensitivity-case loading, demonstrating the lining's robustness against both unloading (demolition/excavation) and reloading (tower construction).

It is worth noting that these conclusions have been achieved using slightly more onerous parameters than were considered in Sydney Metro's original design. Specifically, the geotechnical parameters are slightly less favorable and checks for the sensitivity case have not involved relaxation of design load factors.

Overall, the assessment concludes that the development is geotechnically and structurally viable, with no adverse effects anticipated on Sydney Metro operations, provided that the recommended monitoring regime and geotechnical validation measures are implemented prior to and during construction.

5.4 Building Piling and Foundation Works

Concrete bored retention piles are proposed for retention of the building basement. The piles are to be socketed 1.5m below the basement excavation level to base of pile RL 71.7. The base of the piles will be a minimum of 2.55m above the Metro First Reserve. The lowest raft base and footings will be a minimum of 2.05m above the Metro First Reserve. As such, no piling or foundations are proposed to encroach into the Metro First Reserve.

Vibration and movement monitoring will be installed and maintained in accordance with the approved Monitoring Plan. Refer to Section 6 for further detail on construction methodology.

6 Construction Methodology & Sequencing

Detailed construction methodologies will be prepared as part of the pre-construction Monitoring Plan submissions once construction design has been finalised and a contractor has been engaged.

For the purposes of this report a preliminary methodology has been prepared as follows:

6.1 Services and Preliminary Investigations

- Undertake a comprehensive service search and BYDA investigations within and adjacent to the site boundary.
- Engage a licensed service locator to identify and mark all underground utilities, including Sydney Metro tunnels and assets.
- Coordinate anchor layout and foundation set out with survey results to ensure clearance from all existing in-ground assets and Sydney Metro protection reserves.

6.2 Service Disconnections and Site Preparation

- Remove or relocate redundant services in accordance with authority requirements.
- Always maintain protection of live assets, including installation of physical barriers or protective coverings as needed.

6.3 Monitoring and Risk Management

- Install vibration and movement monitoring equipment in line with the Monitoring Plan (once approved).
- Establish baseline readings before excavation begins.
- All monitoring results are to be reviewed by the relevant engineers during the excavation and construction process in accordance with the Monitoring Plan.

6.4 Demolition of Existing Structure and Shoring Wall Installation

- Complete demolition of the existing structure to ground level.
- Bench the site to the top of pile level as per geotechnical and structural requirements beyond the extent of the existing basement structure.
- Install bored piles using a piling rig along the site boundaries from within the property line.
    - Piling to proceed in accordance with approved shop drawings and temporary works designs.
    - The Geotechnical Engineer must inspect pile excavations and confirm subsurface conditions match design assumptions.
    - All piles to achieve the design toe level.
- Install temporary shoring above the capping beam as required for safe excavation.

6.5 Capping Beam Construction

- Form, reinforce, and cast the capping beam in-situ, tying all piles together structurally.
- Ensure embedment of temporary anchors and any corbel or bracket details required for future structural interface.

6.6 Staged Excavation, Basement Demolition and Anchor Installation

- Excavate in stages to a maximum of 500 mm below the temporary anchor level.
    - Shotcrete to be applied progressively as excavation advances.
    - Geotechnical Engineer to confirm the maximum permissible height of the exposed face before shotcrete is applied.
    - Exposed rock faces to be mapped by the Geotechnical Engineer during excavation.
- Demolish the existing basement structure in stages as per design specifications to suit excavation and temporary anchor installation sequence.
- Install and stress temporary ground anchors as per design specifications.
- Repeat staged excavation, demolition and anchor installation for multiple rows of anchors, as required.

6.7 Bulk and Detailed Excavation

- Excavate to Bulk Excavation Level (BEL) with shotcrete applied as required.
- Proceed to Detailed Excavation Level (DEL) for pad footings, strip footings, crane base, lift pits, and stair pits using hydraulic rock saws and excavators in accordance with the limits nominated in the Monitoring Plan.
- Survey all base levels to ensure compliance with the Metro First Reserve Clearances.

6.8 Foundation and Superstructure Works

- Construct all footings and substructure elements with appropriate reinforcement and concrete.

6.9 Construction of Permanent Structural Support for Shoring Wall

- Erect permanent columns, walls, and suspended slabs which will act as permanent support to the shoring wall system.
- Ensure structural connection between slab and capping beam is achieved via detailed reinforcement tie-in.
- Once permanent slabs are cured and structurally verified:
    - Structural Engineer to confirm the slabs are capable of taking the applied loads.
    - Proceed to de-stress and remove the temporary ground anchors.

6.10 Superstructure

- Continue vertical construction above ground, erecting permanent columns, walls, and suspended slabs.
- Install façade and internal fit-out.
- Continue monitoring of Sydney Metro tunnels throughout construction as per the approved Monitoring Plan until construction is completed and handover occurs.

7 Monitoring Plan

A project specific Monitoring Plan (Appendix F) has been prepared for Sydney Metro approval and establishes the proposed monitoring, verification and hold-point framework to enable the safe delivery of the project.

The plan sets out all required baseline surveys, tunnel convergence targets, track distortion monitoring, crack meters, vibration sensors, site survey markers and an extensometer to validate ground and tunnel behaviour throughout the excavation and construction stages.

Trigger levels for tunnel displacement, crack width/length, vibration and tunnel angular distortion are aligned with Sydney Metro guidelines, with defined Alert, Action and Exceedance responses.

A risk assessment prepared in accordance with TS 04982:1.0 demonstrates that all identified tunnel-related risks are reduced to acceptable levels, as far as reasonably possible, through the numerical modelling, instrumentation and monitoring regime, and construction methodology constraints.

Overall, the monitoring plan provides a comprehensive and compliant risk-based framework to manage and mitigate potential impacts to Sydney Metro infrastructure during the proposed development.

7.1 Dilapidation Survey

A baseline dilapidation survey of the Metro tunnels will be conducted to map any visible cracks and seepage of the tunnel lining. Photos of identified defects will be taken and the information from the dilapidation survey will be provided in a baseline report.

Further dilapidation survey of the tunnels is proposed to be undertaken at the completion of the bulk excavation, at 50% construction and at 100% construction. For further details, refer to the project specific Sydney Metro Monitoring Plan (Appendix F).

7.2 Noise & Vibration Management

The Sydney Metro Guideline specifies that during construction of Development, and in accordance with TS 01717 Development Near Rail Tunnels, vibration impacts on Sydney Metro structures must be minimised.

Noise and Vibration monitoring methodologies, monitoring levels, trigger levels and escalation procedures have been established in the project specific Monitoring Plan in accordance with the Metro Guidelines.

Detailed pre-construction phase monitoring plans will be developed once construction plans and methodologies are available and a contractor is appointed. These plans may be staged for different scopes of construction including demolition, bulk excavation and main construction works.

8 Conclusions

The Engineering Impact Assessment Report demonstrates that the proposed redevelopment at 601 Pacific Highway, St Leonards has been robustly evaluated through detailed geotechnical and structural modelling, comprehensive site investigations, and consultation with Sydney Metro.

The combined analysis undertaken by Douglas Partners and SYSTRA confirms that all stages of the works, including demolition, excavation and construction of the 52-storey tower with a six-level basement, can be safely undertaken above the RT01 and RT02 tunnels.

The assessment verifies that the predicted ground settlements, tunnel liner actions, joint rotations and structural demands remain within the capacity of the precast segmental lining, even when tested against conservative sensitivity assumptions.

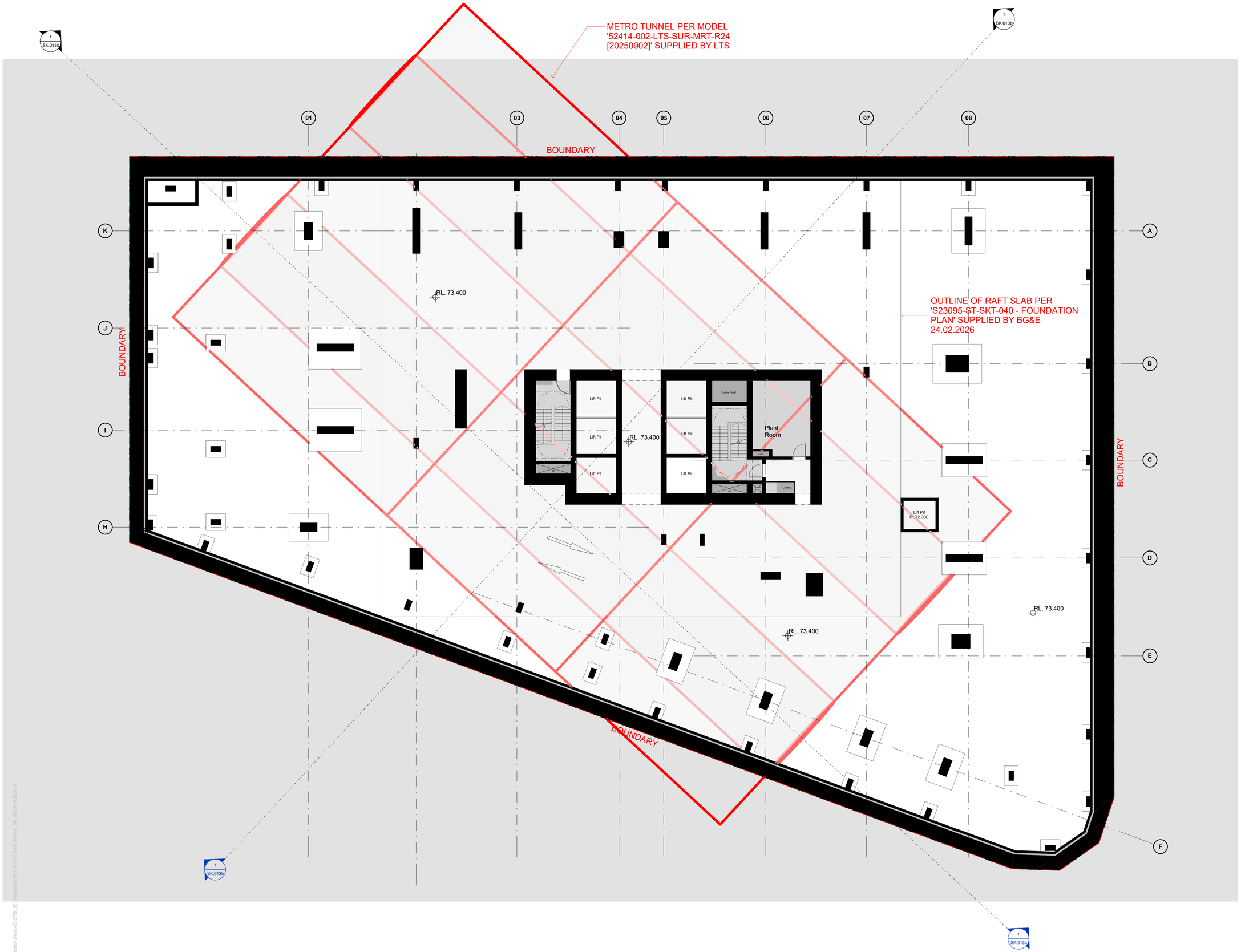
No piling or foundations encroach into the First Protection Reserve, and minimum required vertical clearances to the Rail Stratum are maintained. Contamination investigations confirm low environmental risk to Metro assets, with all hazardous materials to be safely managed during demolition.

A project specific Monitoring Plan has been prepared to manage ground movement, vibration, tunnel convergence, and structural behaviour throughout the works, supported by a risk register and staged verification requirements. Implementation of this monitoring regime as well as additional targeted geotechnical validation during excavation will ensure that any potential impacts are identified early and mitigated in accordance with Sydney Metro's Corridor Protection Technical Guidelines.

Overall, the investigations and modelling conclude that the proposed development is geotechnically and structurally viable, and that no adverse effects on Sydney Metro operations or infrastructure are anticipated, subject to adherence to the recommended construction controls and monitoring framework.

9 Appendices

Appendix A – Architectural Drawings



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Client

Stockland Development

Current Revision Description

REV 3
25.02.2026

Data Issue Record
Current Revision released by

Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
Metro - B6 Plan Overlay

Phase
SSDA

Status
PRELIMINARY

Scale
1 : 125 @ A1

Drawing no.
SK.013a

Revision

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt



1 SECTION - TUNNEL CROSS SECTION
1 : 200

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt

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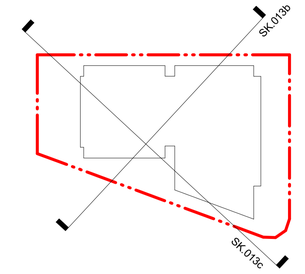

Current Revision Description

REV 3
25.02.2026

Data Issue Record
Current Revision released by

Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
DA10 - Building Sections
Metro Section - Cross Section

Phase
Concept Design

Status
PRELIMINARY

Scale
As indicated @ A1

Drawing no.
SK.013b

Revision



1 SECTION - CENTRELINE RT02
1 : 200

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt

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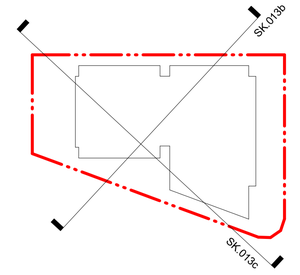
Client

Stockland Development



Current Revision Description

REV 3
25.02.2026

Data Issue Record
Current Revision released by

Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
DA10 - Building Sections
Metro Section - Centreline RT02

Phase
Concept Design

Status
PRELIMINARY

Scale
As indicated @ A1

Drawing no.
SK.013c

Revision

Appendix B – Structural Drawings

601 PACIFIC HIGHWAY, ST LEONARDS
STRUCTURAL DRAWINGS FOR SYDNEY METRO

DRAWING LIST:

1 - COVER PAGE
2 - BASEMENT 06 FOUNDATION PLAN
3 - BASEMENT SECTIONS
4 - RETENTION PLAN
5 - RETENTION SECTIONS AND DETAILS
6 - CONSTRUCTION SEQUENCE

GENERAL NOTES:

G.1. COLUMNS AND WALLS TO BE REINFORCED CONCRETE
G.2. COLUMNS SUPPORTED BY PAD FOOTINGS
G.3. COREWALLS SUPPORTED BY RAFT FOUNDATION
G.4. SUSPENDED SLABS TO BE POST-TENSIONED
G.5. B06 SLAB TO BE REINFORCED SLAB ON GROUND
G.6. SHORING WALLS TO BE BORED SOLIDER PILES WITH PERMANENT SHOTCRETE INFILL. TEMPORARY ANCHORS REQUIRED FOR SUPPORT DURING EXCAVATION AND CONSTRUCTION.

DESIGN DATA:

D.1. STRUCTURAL DESIGN IS IN ACCORDANCE WITH THE FOLLOWING STANDARDS; AS1170.0-2002, AS1170.1-2002, AS1170.2-2021, AS1170.3-2003, AS1170.4-2024, AS3600-2018, AS4100-2020.

D.2. IMPORTANCE LEVEL: 2
DESIGN LIFE: 50 YEARS

D3. WIND LOADS ARE IN ACCORDANCE WITH WIND TUNNEL TEST CARRIED OUT BY RWDI.
REGIONAL WIND SPEED V_R = 45 m/s FOR ULS AND V_R = 37m/s FOR SLS
ANNUAL PROBABILITY OF EXCEEDANCE = 1:500
REGION: A2
TERRAIN CATEGORY: TC3

D.4. SEISMIC LOADS ARE IN ACCORDANCE WITH AS1170.4 - 2024 AS FOLLOWS:
EARTHQUAKE DESIGN CATEGORY: III
SITE SUB-SOIL CLASS: Be
HAZARD FACTOR Z = 0.08
PROBABILITY FACTOR kp = 1.0
STRUCTURAL DUCTILITY FACTOR μ = 1.0
STRUCTURAL PERFORMANCE FACTOR Sp = 0.77

REV	DATE	DESCRIPTION	
B	12.03.26	FOR INFORMATION	EC
A	27.02.26	FOR INFORMATION	EC

REVISIONS

NOTES

CLIENT: Stockland

PROJECT: 601 PACIFIC HIGHWAY, ST LEONARDS

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BG&E Part of SYSTRA

STATUS				TITLE
FOR INFORMATION				COVER PAGE
DRAWN: EC	DESIGNED: EC	CHECKED: RH	APPROVED: RH	
DATUM:	GRID:	SCALE: 1 : 125	SIZE: A1	

PROJECT No.	SKETCH No.	SHEET No.	REV.
S23095	ST-SKT-040	1	B

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EXTENT OF SYDNEY METRO TUNNEL

EXTENT OF SYDNEY METRO TUNNEL

EXTENT OF SYDNEY METRO FIRST RESERVE

EXTENT OF SYDNEY METRO FIRST RESERVE

BOUNDARY

SITE BOUNDARY

B1

HATCH DENOTES RETENTION ZONE. REFER TO RETENTION PLAN FOR DETAILS.

2000 THICK RAFT FOUNDATION

DETAILED EXCAVATION LEVEL= RL 71.2
SOFFIT OF RAFT IS FLAT TO SIT UNDER B06 SLAB ON GROUND

CORE WALLS

2,200 mm

2,200 mm

1,500 mm

RL. 73.400

RL. 73.400

RL. 73.400

5800

5800

6500

PF1 PF2 PF3 PF4

PAD FOOTING SCHEDULE					
MARK	PAD SIZE (mm)			f'c (MPa)	BASE RL (AHD)
	LENGTH	WIDTH	DEPTH		
PF1	1400	1000	800	65	72.4
PF2	2800	2000	1800	65	71.4
PF3	3200	2400	2000	65	71.2
PF4	3500	2800	2000	65	71.2

NOTE: PAD FOOTING SIZES BASED ON AN ALLOWABLE BEARING CAPACITY OF 6000kPa

BASEMENT 06 FOUNDATION PLAN (TOP OF FOOTINGS AT RL 73.2)

REV	DATE	DESCRIPTION	RVD
B	12.03.26	FOR INFORMATION	EC
A	27.02.26	FOR INFORMATION	EC

REVISIONS

NOTES

CLIENT: Stockland

PROJECT: 601 PACIFIC HIGHWAY, ST LEONARDS

Sydney *Office*
L2, 8 Windmill Street
Sydney NSW 2000
P / +61 2 9770 3300
E / info@bgeeng.com
bgeeng.com —

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STATUS: FOR INFORMATION

DRAWN	DESIGNED	CHECKED	APPROVED
EC	EC	RH	RH

DATUM	GRID	SCALE	SIZE
		1 : 125	A1

TITLE: BASEMENT 06 FOUNDATION PLAN

PROJECT No.	SKETCH No.	SHEET No.	REV.
S23095	ST-SKT-040	2	B

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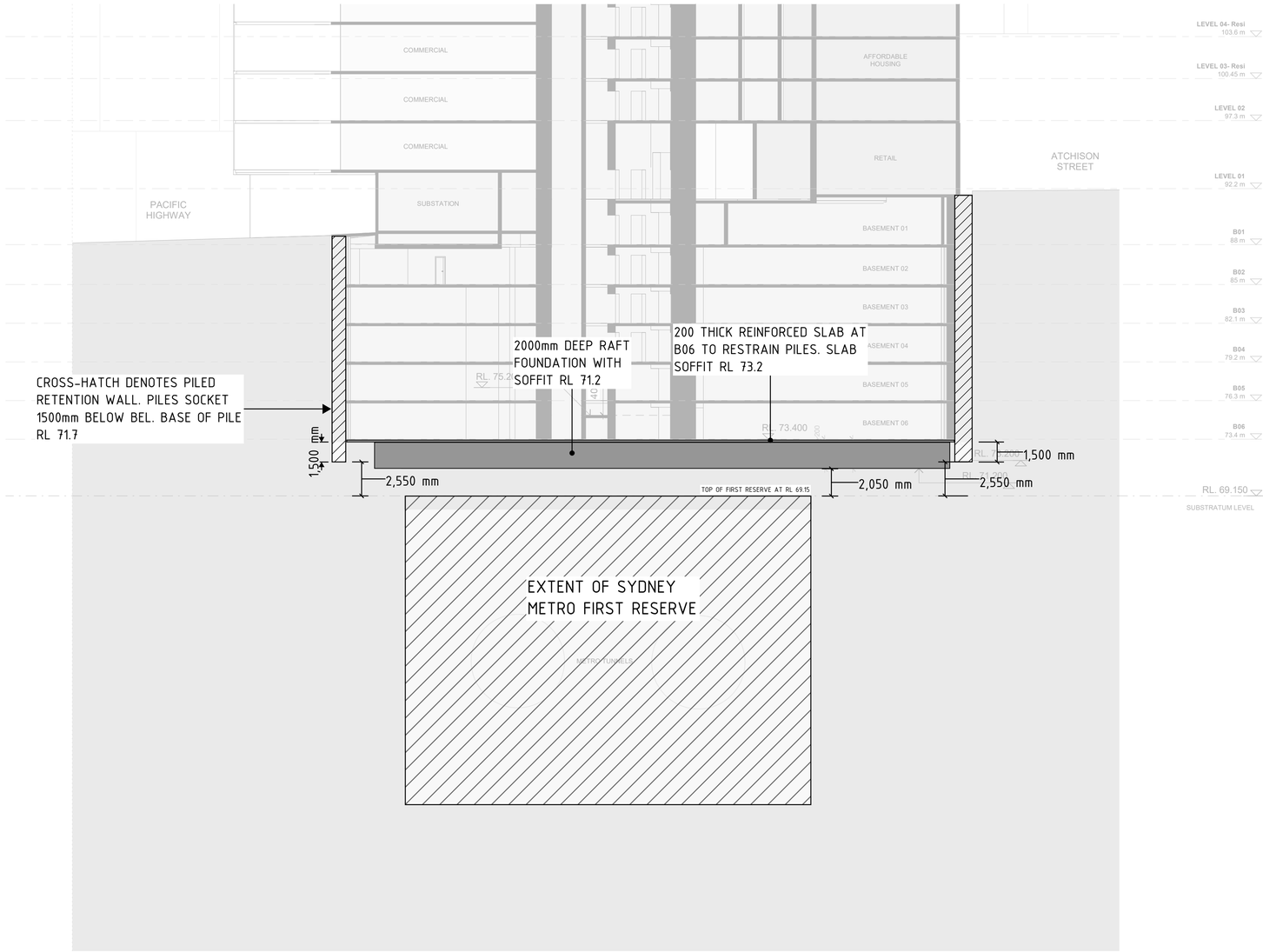

SECTION B1

SCALE 1 : 200

REV	DATE	DESCRIPTION	
B	12.03.26	FOR INFORMATION	EC
A	27.02.26	FOR INFORMATION	EC

REVISIONS

NOTES

CLIENT: Stockland

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STATUS: FOR INFORMATION

DRAWN	DESIGNED	CHECKED	APPROVED
EC	EC	RH	RH

DATUM	GRID	SCALE	SIZE
			A1

TITLE: BASEMENT SECTIONS

PROJECT No.	SKETCH No.	SHEET No.	REV.
S23095	ST-SKT-040	3	B

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GREEN DENOTES EXTENT OF EXISTING RETENTION WALL. REFER TO SECTION 1 FOR DETAILS WHERE NEW RETENTION WALL IS TO BE BUILT IN FRONT.

EXTENT OF SYDNEY METRO FIRST RESERVE

EXTENT OF SYDNEY METRO FIRST RESERVE

SITE BOUNDARY

BOUNDARY

BOUNDARY

BOUNDARY

BLUE DENOTES EXTENT OF NEW PILED RETENTION WALL TO BE CONSTRUCTED. REFER TO SECTION 2 FOR DETAILS.

RETENTION PLAN

REV	DATE	DESCRIPTION	
B	12.03.26	FOR INFORMATION	EC
A	27.02.26	FOR INFORMATION	EC

REVISIONS

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STATUS				
FOR INFORMATION				
DRAWN	DESIGNED	CHECKED	APPROVED	
EC	EC	RH	RH	
DATUM	GRID	SCALE	SIZE	
		1 : 125	A1	

TITLE: RETENTION PLAN

PROJECT No.	SKETCH No.	SHEET No.	REV.
S23095	ST-SKT-040	4	B

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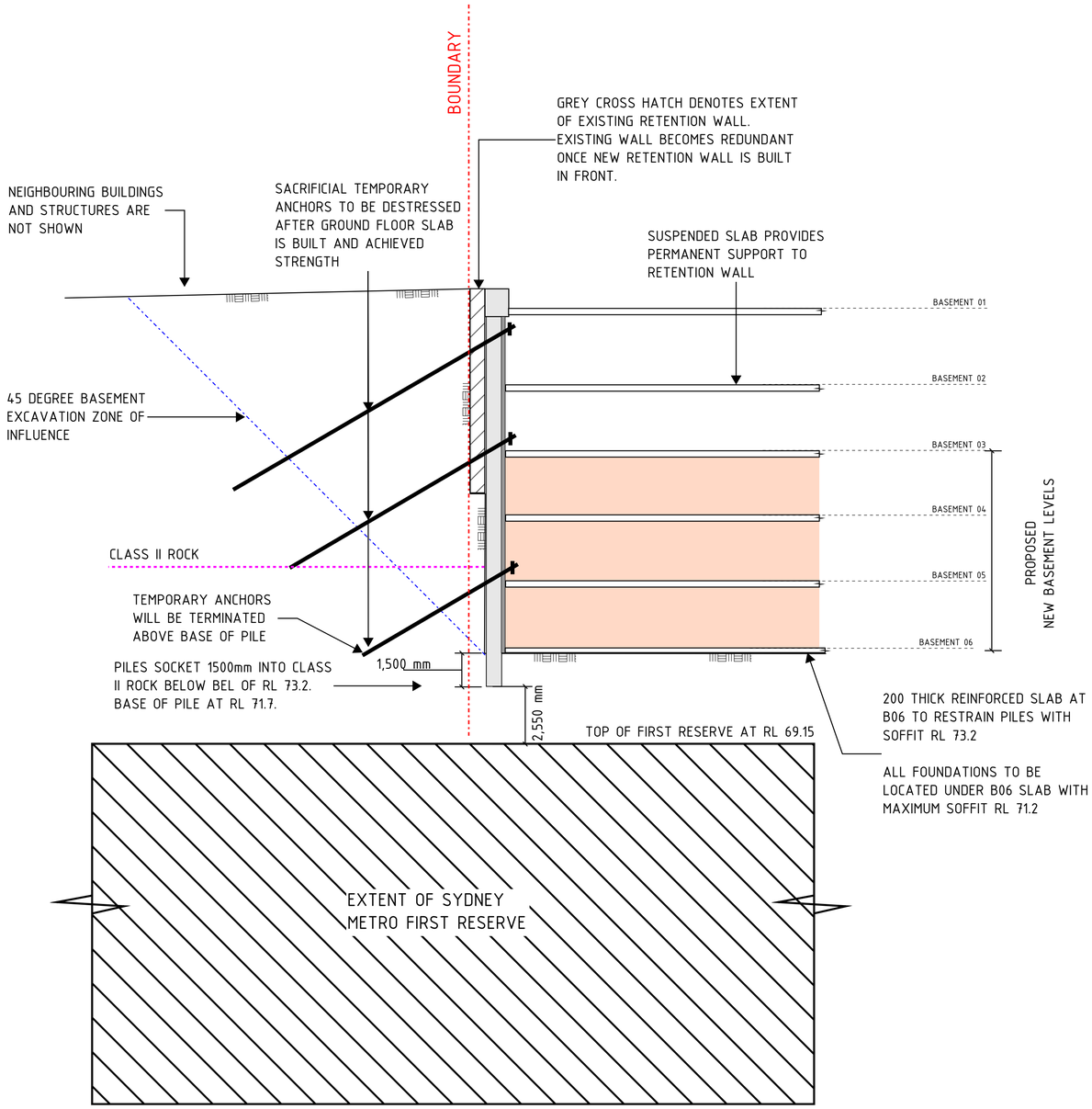
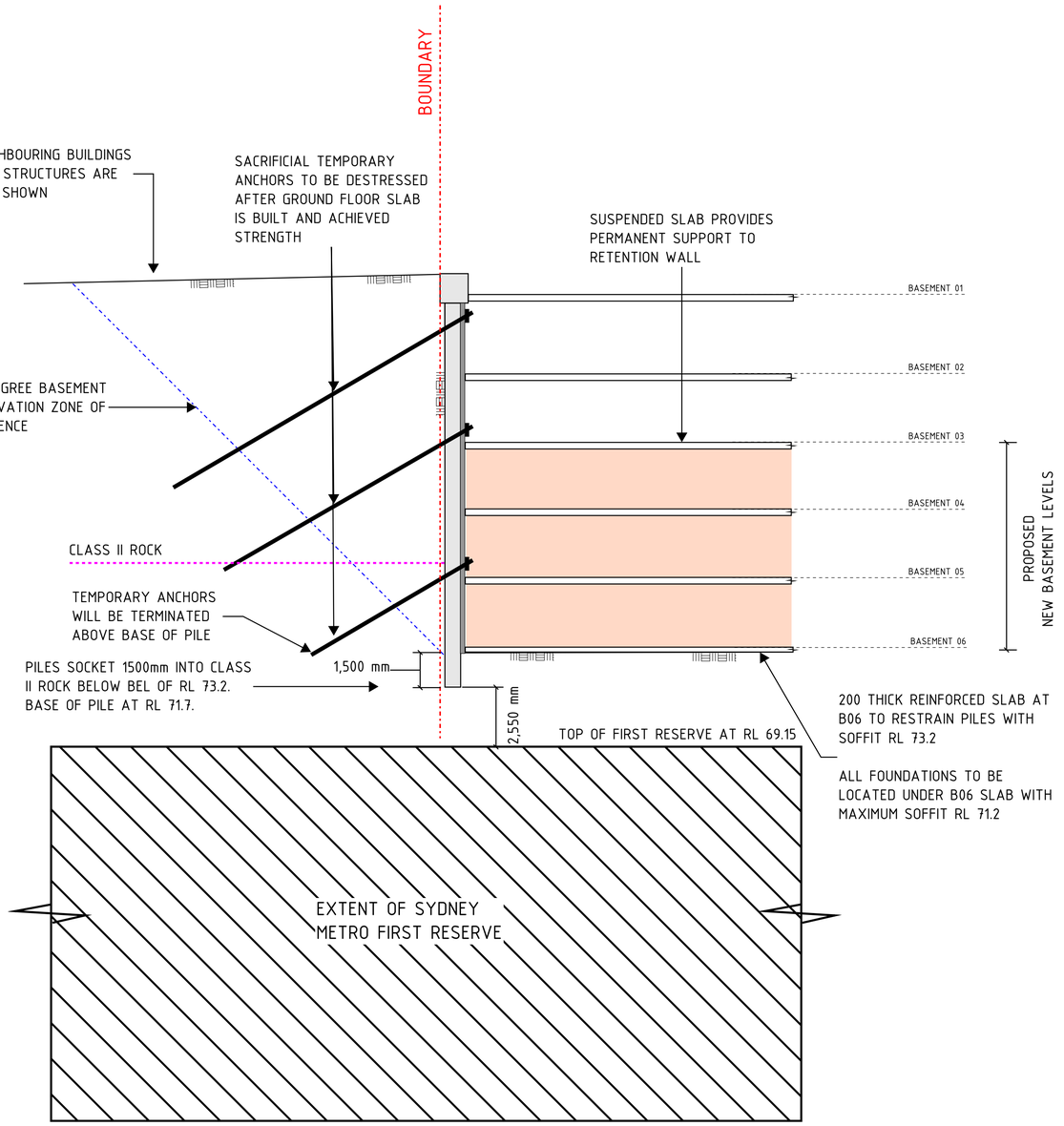


SECTION R1

SCALE 1 : 125



SECTION R2

SCALE 1 : 125

REV	DATE	DESCRIPTION	
B	12.03.26	FOR INFORMATION	EC
A	27.02.26	FOR INFORMATION	EC

REVISIONS

NOTES

CLIENT: Stockland

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STATUS				
FOR INFORMATION				
DRAWN	DESIGNED	CHECKED	APPROVED	
EC	EC	RH	RH	
DATUM	GRID	SCALE		SIZE
				A1

TITLE: RETENTION SECTIONS AND DETAILS

PROJECT No.	SKETCH No.	SHEET No.	REV.
S23095	ST-SKT-040	5	B

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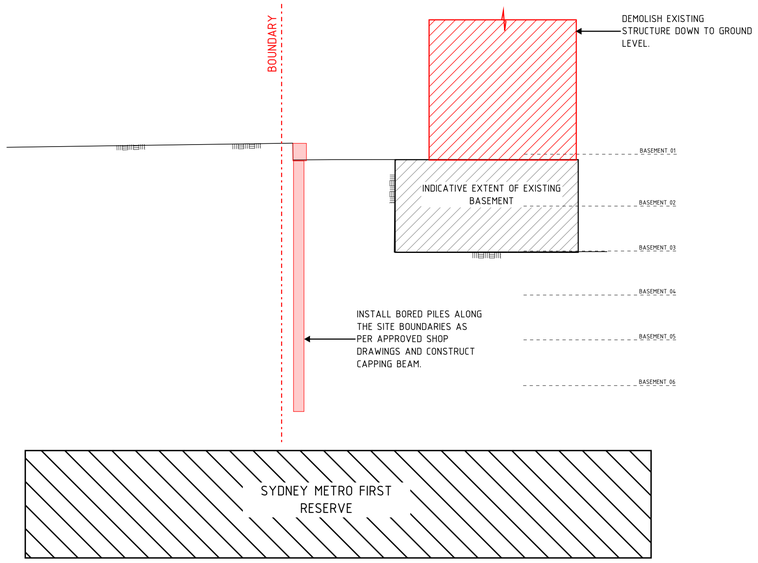
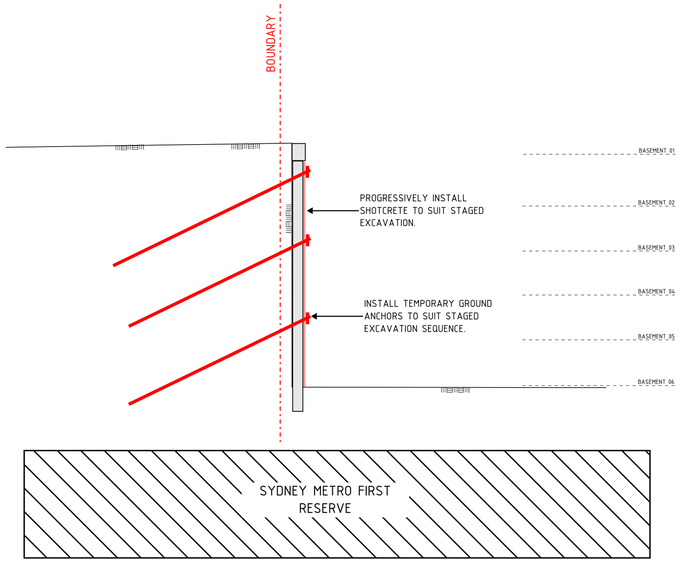


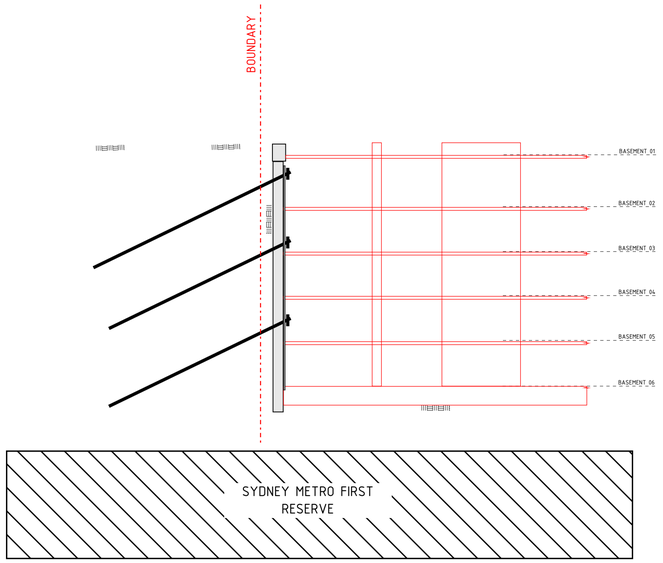
STAGE 1:

1a. INSTALL MONITORING INSTRUMENTATION AS PER GEOTECHNICAL ENGINEERS MONITORING PLAN THAT HAS BEEN APPROVED BY SYDNEY METRO.
1b. DEMOLISH THE EXISTING STRUCTURE DOWN TO GROUND LEVEL.
1c. INSTALL BORED PILES ALONG SITE BOUNDARIES.
1d. CONSTRUCT CAPPING BEAM.



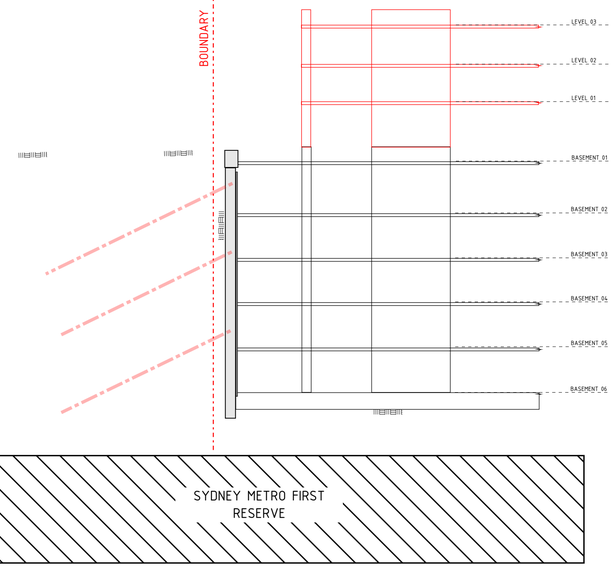
STAGE 2:

2a. COMPLETE STAGED EXCAVATION AND DEMOLITION OF THE EXISTING BASEMENT.
2b. PROGRESSIVELY INSTALL SHOTCRETE TO SUIT STAGED EXCAVATION.
2c. INSTALL AND STRESS TEMPORARY GROUND ANCHORS TO SUIT STAGED EXCAVATION.
2d. CONTINUE EXCAVATION TO BULK EXCAVATION LEVEL.
2e. COMPLETED DETAILED EXCAVATION FOR FOUNDATIONS.



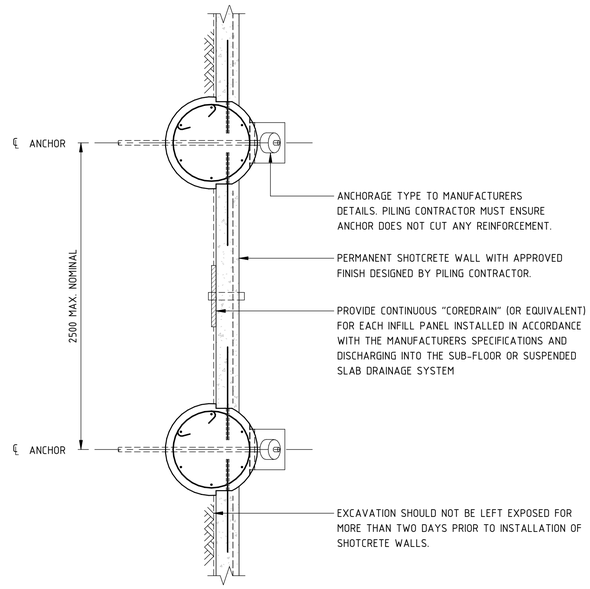
STAGE 3:

3a. CONSTRUCT ALL FOOTINGS AND SUBSTRUCTURE ELEMENTS.
3b. ERECT PERMANENT COLUMNS, WALLS, AND SLABS.



STAGE 4:

4a. ONCE BASEMENT SLABS HAVE REACHED ADEQUATE DESIGN STRENGTH, TEMPORARY ANCHORS CAN BE DE-STRESSED.
4b. CONTINUE CONSTRUCTION OF SUPERSTRUCTURE TO ROOF.
4c. MONITORING OF SYDNEY METRO TUNNELS TO CONTINUE AS PER GEOTECHNICAL ENGINEERS MONITORING PLAN THAT HAS BEEN APPROVED BY SYDNEY METRO.



TYPICAL SOLDIER PILE RETENTION WALL DETAIL IN PLAN

PROPOSED CONSTRUCTION SEQUENCE

REV	DATE	DESCRIPTION	RVD
B	12.03.26	FOR INFORMATION	EC
A	27.02.26	FOR INFORMATION	EC

REVISIONS

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BG&E Part of SYSTRA

STATUS: FOR INFORMATION

DRAWN	DESIGNED	CHECKED	APPROVED
EC	EC	RH	RH

DATUM	GRID	SCALE	SIZE
		NTS	A1

TITLE: CONSTRUCTION SEQUENCE

PROJECT No.	SKETCH No.	SHEET No.	REV.
S23095	ST-SKT-040	6	B

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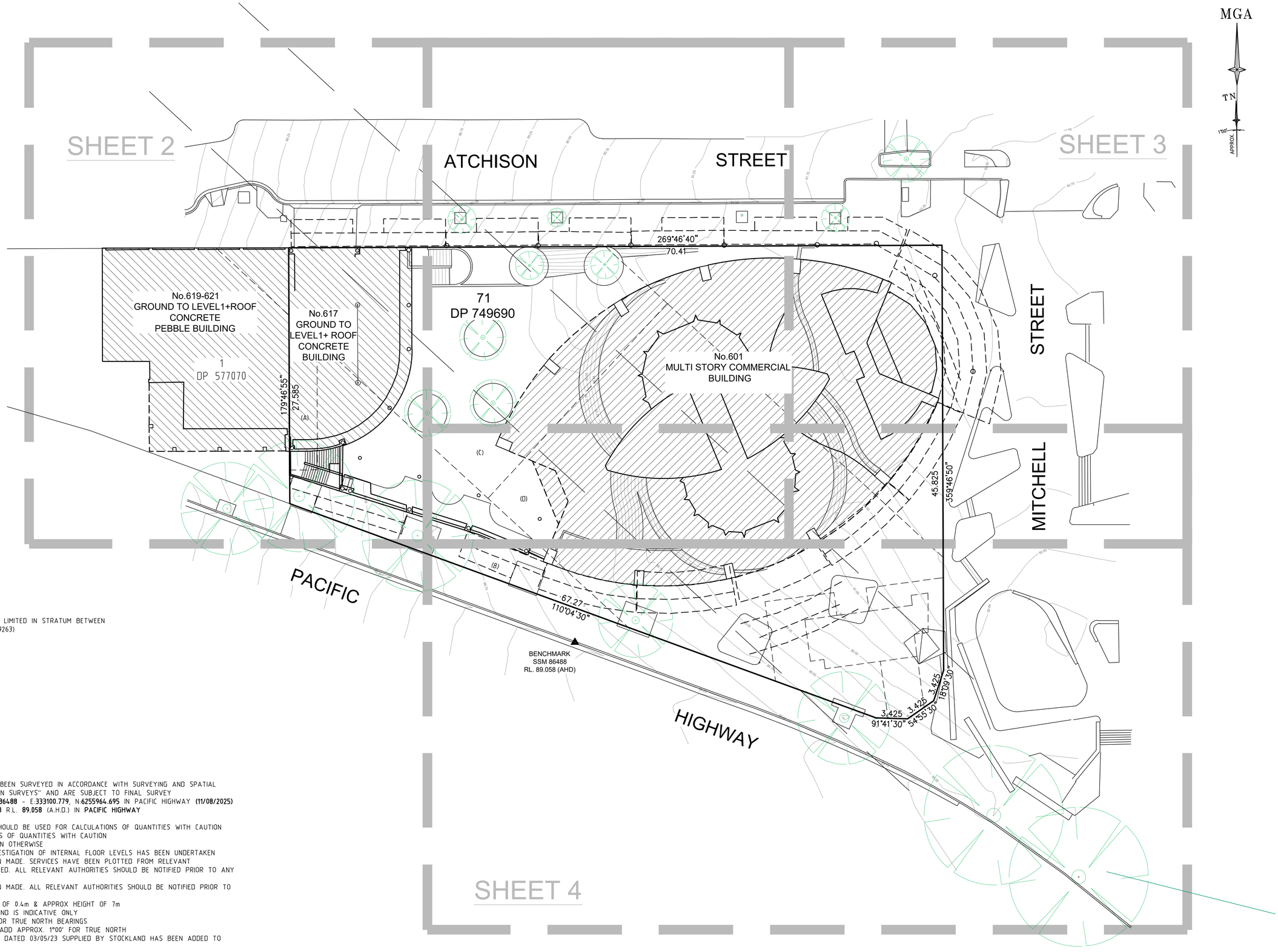
Appendix C – Registered Survey Plans

LEGEND

BENCH MARK	▲
COMMS PIT	COM
ELECTRIC LIGHT POLE	ELP
ELECTRIC LIGHT BOL	LB
POWER POLE	PPL
POWER POLE WITH LIGHT	PP
GRATED INLET PIT	GIP
GRATED DRAIN	
SEWER INSPECTION POINT	SIP
SEWER MANHOLE	SMH
STOP VALVE	SV
HYDRANT	HYD
GAS VALVE	GAS
SERVICE PIT	PIT
SERVICE PIT	PIT
PIT WITH METAL LID	MLID
STREET SIGN	SS
BOL	BOL
COLUMN	COL
GATE	
VEHICLE CROSSING	(VC)
PRAM CROSSING	(PC)
WINDOW	W
DOOR	D
HEAD/SILL	H/S



EASEMENT

(A) EASEMENT FOR SIGNAGE ACESS AND OVERHANG 3 WIDE LIMITED IN STRATUM BETWEEN HORIZONTAL PLANES AT RL98 AND RL 113 AHD. (DP1019263)

LEASE OF PREMISES

(F) SUBSTATION PREMISES NO.6594
(E) EASEMENT FOR RIGHT OF WAY (I149811)
(G) EASEMENT FOR ELECTRICITY PURPOSES 4 WIDE (I149811)

STRATUM LIMITS

(C) RAIL STRATUM LIH RL67.15 LID RL43.95
(D) RAIL STRATUM LIH RL69.15 LID RL45.95

NOTES

1. THE BOUNDARIES HAVE NOT BEEN MARKED ON GROUND
2. THE BOUNDARY SURVEY (DIMENSIONS AND AREA) HAVE BEEN SURVEYED IN ACCORDANCE WITH SURVEYING AND SPATIAL INFORMATION REGULATION 2017 CLAUSE 10 "IDENTIFICATION SURVEYS" AND ARE SUBJECT TO FINAL SURVEY
3. ORIGIN OF **MGA2020** COORDINATES IS TAKEN FROM **SSM 86488** - E.**333100.779**, N.**6255964.695** IN PACIFIC HIGHWAY **(11/08/2025)**
4. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM **SSM 86488** R.L. **89.058** (A.H.D.) IN **PACIFIC HIGHWAY**
5. CONTOUR INTERVAL **0.5 m**
6. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
7. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
8. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
9. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
10. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
11. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
12. 8/4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
13. SHOWS APPROXIMATE POSITION OF ROAD LINEMARKING AND IS INDICATIVE ONLY
14. BEARINGS SHOWN ARE MAGNETIC. ADD APPROX. 9°30' FOR TRUE NORTH BEARINGS
15. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH
16. UTILITY SERVICES PLAN BY VERIS 203610-UTIL-001A.DWG DATED 03/05/23 SUPPLIED BY STOCKLAND HAS BEEN ADDED TO THIS PLAN (AS A XREF)

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GDA2020

0 4 8 12 16 20
SCALE 1: 200 @ A1

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

Revision	Date	Description	Reference
D	00/00/00	–	00
C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

LTS CONFIDENCE TOGETHER
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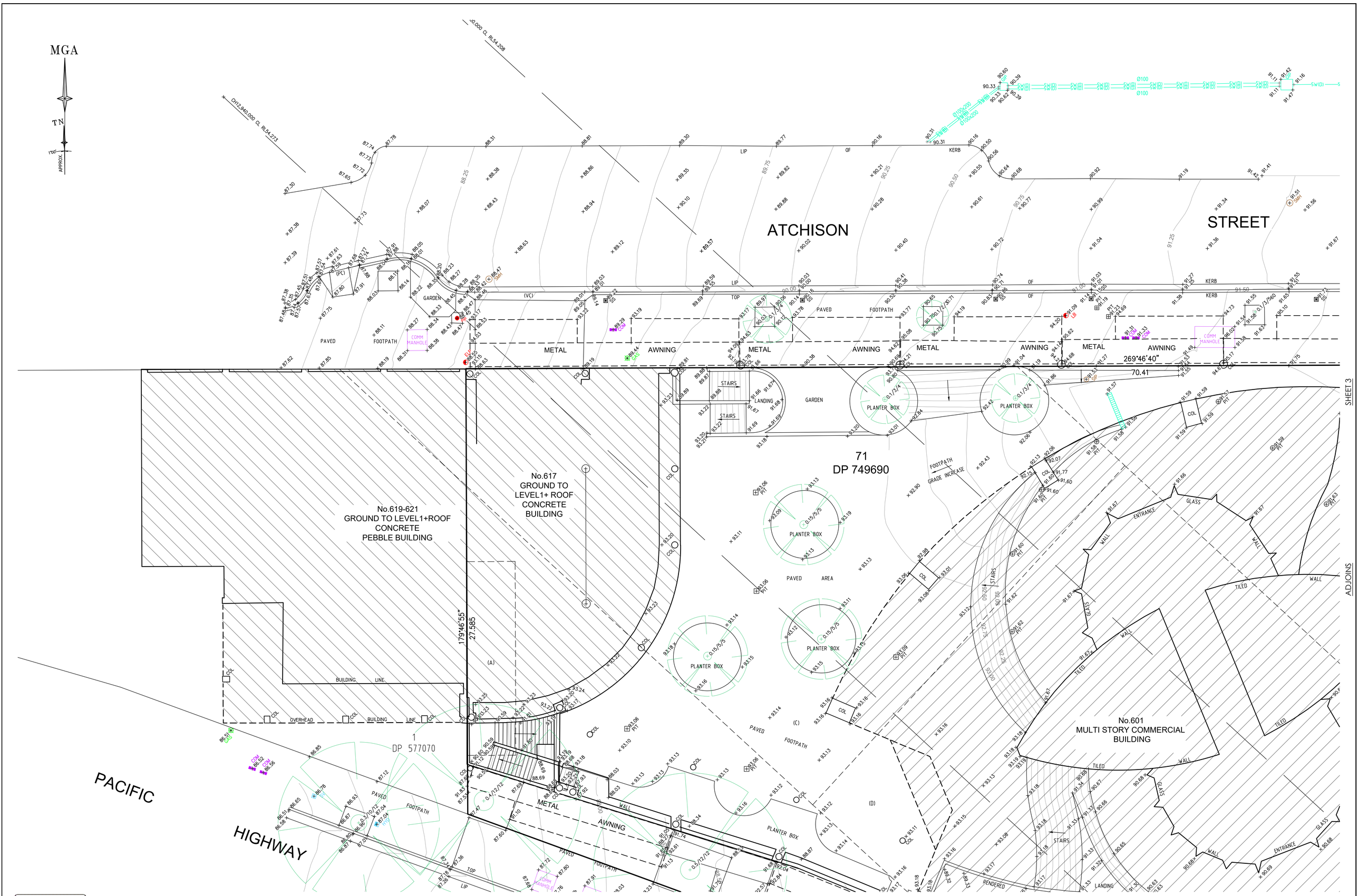
THIS IS THE PLAN REFERRED TO IN MY LETTER DATED: 02-03-26
Registered Surveyor NSW

Client STOCKLANDS
Drawing title
PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD
site Area 2842 m²
LGA NORTH SYDNEY
reference number 52414 002DT
scale 1:200 @A1
date of survey 12/08/2025
SHEET 1 OF 12



SEE SHEET 1 FOR LEGEND & NOTES

ADJOINS

SHEET 4

Revision	Date	Description	Reference
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G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00
D	00/00/00	–	00
C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

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GDA2020

0 2 4 6 8 10

SCALE 1:100 @ A1

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Joseph Monarch

Registered Surveyor NSW

Client STOCKLANDS

Drawing title

PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690 KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD

site Area 2842 m²

LGA NORTH SYDNEY

reference number 52414 002DT

scale 1:100 @A1

date of survey 12/08/2025

SHEET 2 OF 12

ATCHISON STREET

MITCHELL STREET

71
DP 749690

No.601
MULTI STORY COMMERCIAL BUILDING

269°46'30"
70.41

359°46'50"
45.825

110°04'30"
67.27

METAL FRAME AWNING, CLEAR ROOF

ADJOINS

SHEET 2

SHEET 4

SEE SHEET 1 FOR LEGEND & NOTES

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

Revision	Date	Description	Reference
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C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

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0 2 4 6 8 10
SCALE 1:100 @ A1

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PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD	reference number 52414 002DT		
site Area 2842 m²	scale 1:100 @A1	date of survey 12/08/2025	
LGA NORTH SYDNEY	SHEET 3 OF 12		

ADJOINS SHEET 3

No.601
MULTI STORY COMMERCIAL
BUILDING

PACIFIC HIGHWAY

MITCHELL STREET

BENCHMARK
SSM 86488
RL. 89.058 (AHD)

67.27
110°04'30"
45.825
359°46'50"
3.425
91°41'30"
3.425
54°55'30"
3.425
180°30"

MGA
TN
APPROX.

SEE SHEET 1 FOR LEGEND & NOTES

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GDA2020

0 2 4 6 8 10
SCALE 1:100 @ A1

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

Revision	Date	Description	Reference
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C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

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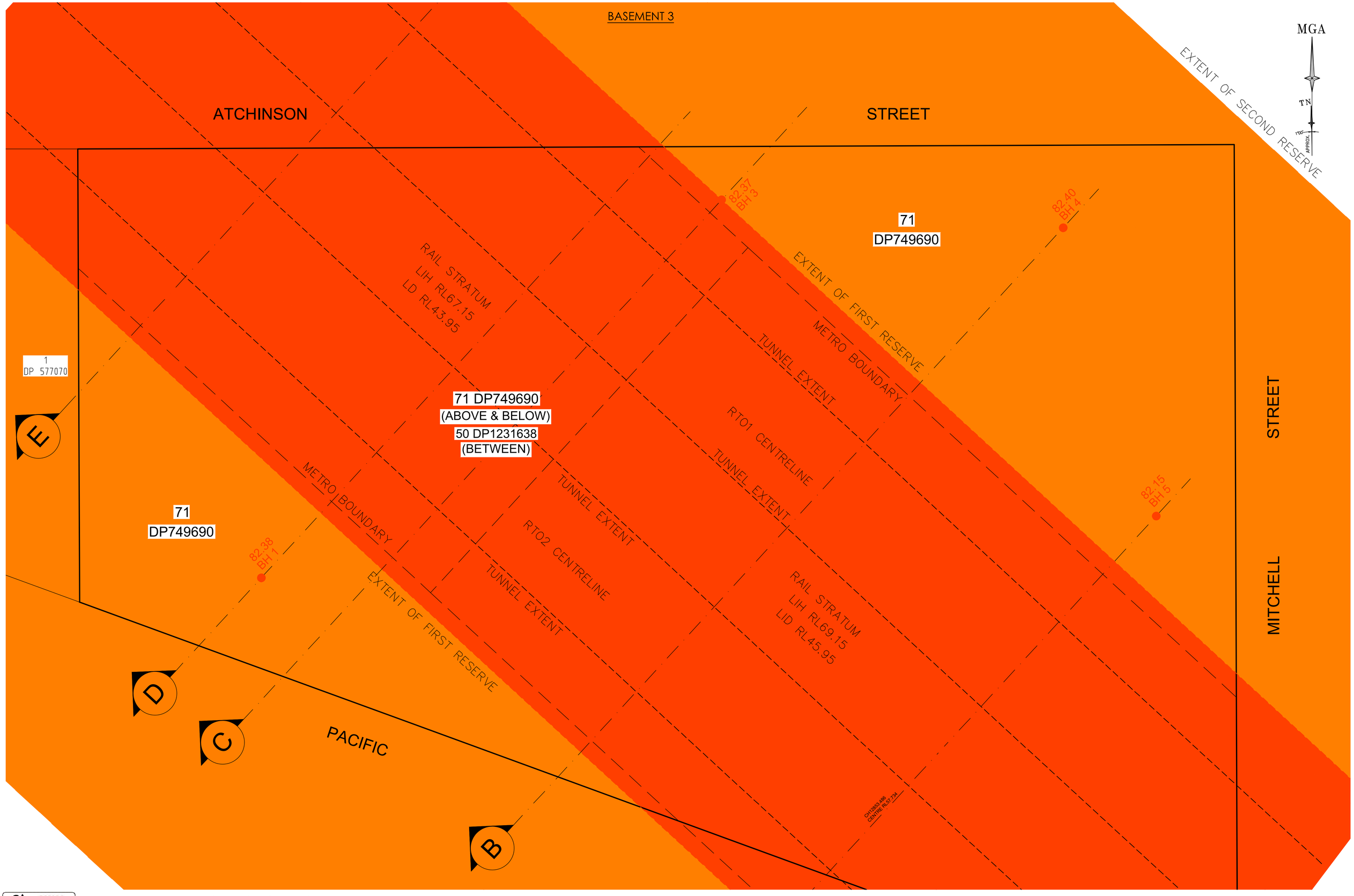
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD
site Area 2842 m²
LGA NORTH SYDNEY

reference number 52414 002DT
scale 1:100 @A1
date of survey 12/08/2025
SHEET 4 OF 12



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Zero Damage - Zero Harm

GDA2020

SEE SHEET 1 FOR LEGEND & NOTES

0 2 4 6 8 10
SCALE 1:100 @ A1

Revision	Date	Description	Reference
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Joseph Monsrob
Registered Surveyor NSW

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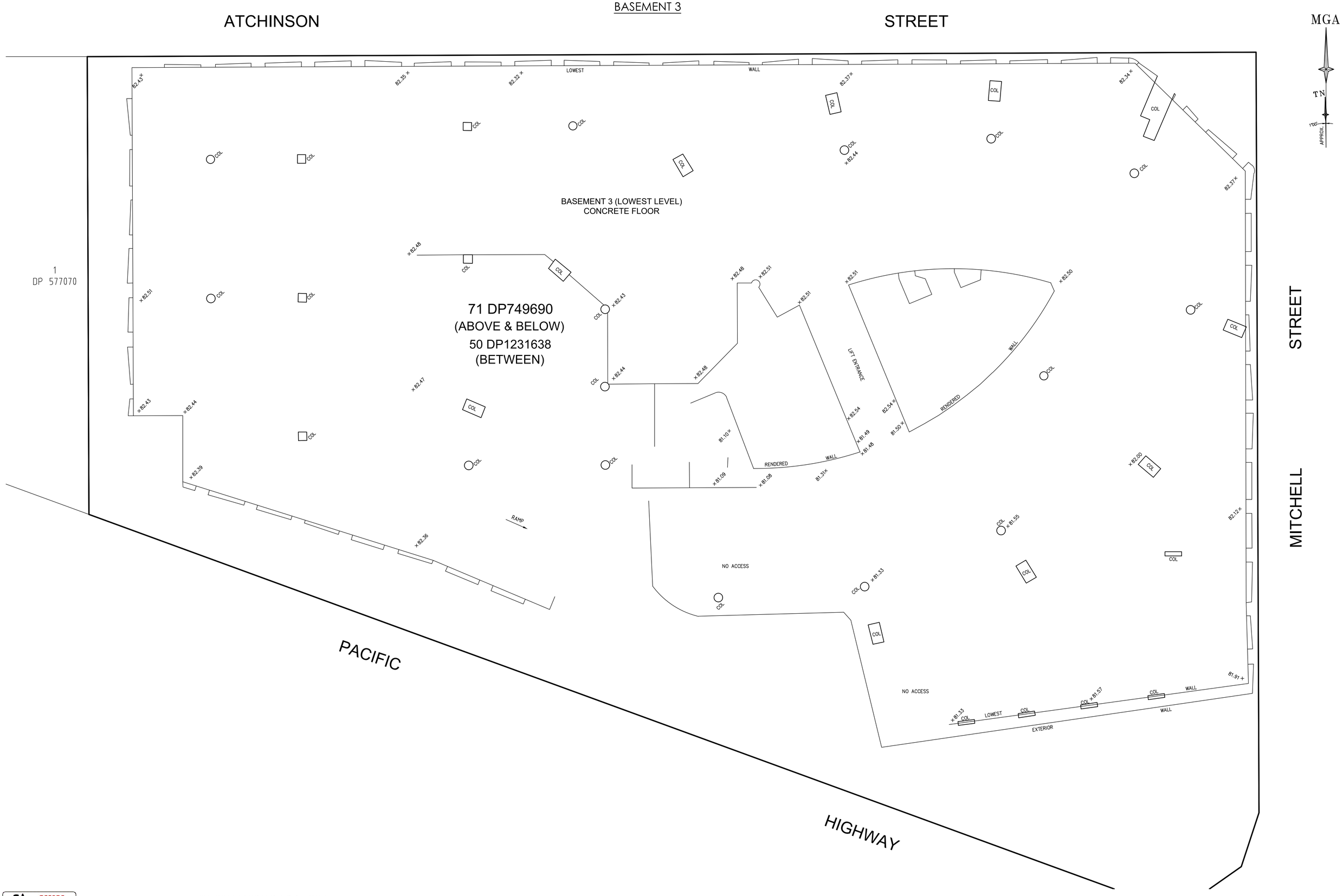
PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD
reference number 52414 002DT
site Area 2842 m²
scale 1:100 @A1
date of survey 12/08/2025
LGA NORTH SYDNEY
SHEET 5 OF 12

BASEMENT 3



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GDA2020

SEE SHEET 1 FOR LEGEND & NOTES

0 2 4 6 8 10

SCALE 1:100 @ A1

Revision	Date	Description	Reference
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Joseph Monarch

Registered Surveyor NSW

Client STOCKLANDS

Drawing title

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datum AHD

site Area 2842 m²

LGA NORTH SYDNEY

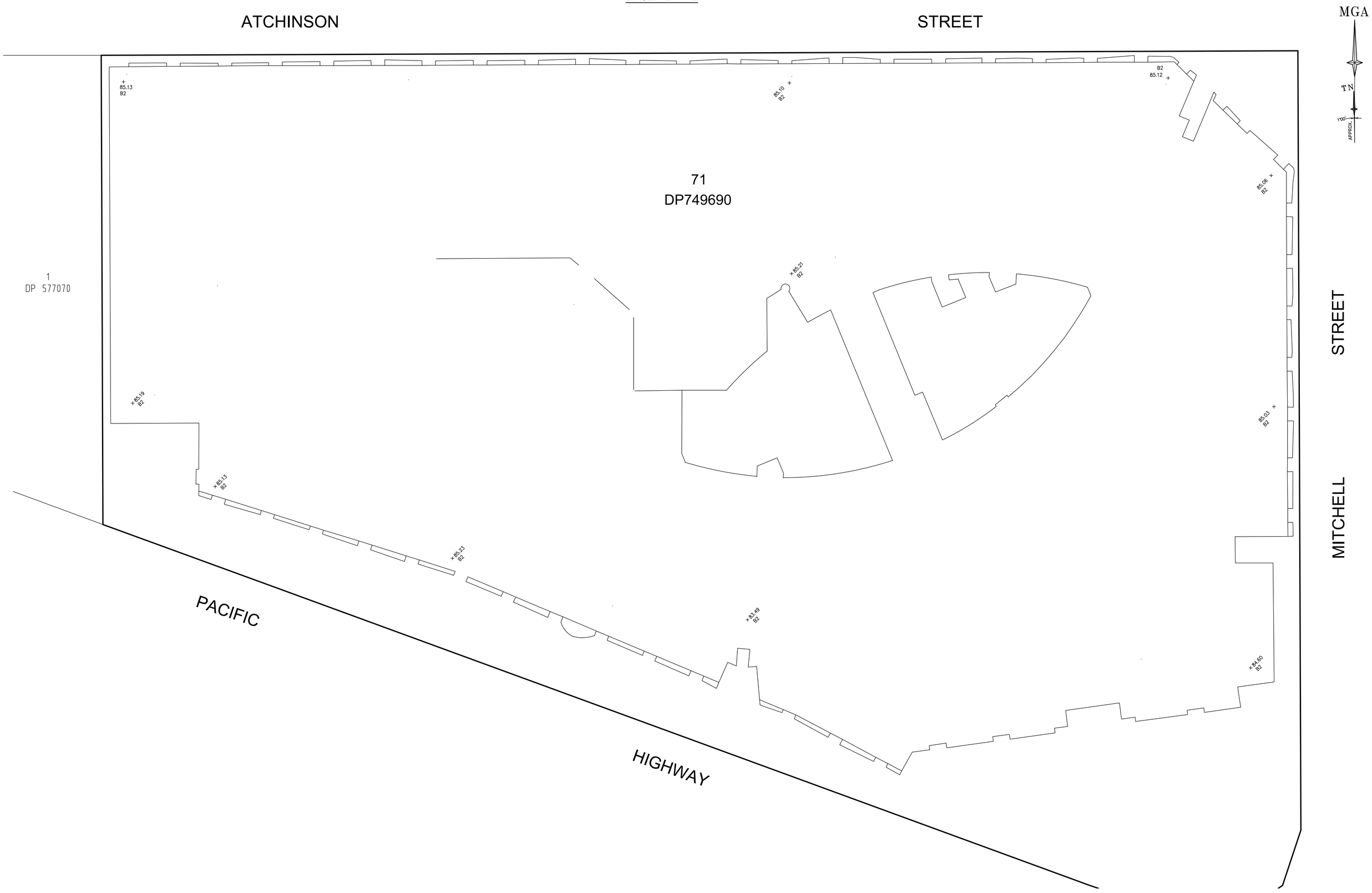
reference number 52414 002DT

scale 1:100 @A1

date of survey 12/08/2025

SHEET 6 OF 12

BASEMENT 2



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GDA2020

SEE SHEET 1 FOR LEGEND & NOTES

0 2 4 6 8 10

SCALE 1:100 @ A1

Revision	Date	Description	Reference
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G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

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Drawing title

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datum AHD

reference number 52414 002DT

site Area 2842 m²

scale 1:100 @A1

date of survey 12/08/2025

LGA NORTH SYDNEY

SHEET 7 OF 12

BASEMENT 1

ATCHINSON STREET

MGA

TN

1° APPROX.

88.68 B1

88.46 B1

87.83 B1

87.89 B1

71
DP749690

1
DP 577070

88.69 B1

88.74 B1

88.54 B1

87.94 B1

STREET

MITCHELL

PACIFIC HIGHWAY

85.83 B1

87.10 B1

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GDA2020

0 2 4 6 8 10

SCALE 1:100 @ A1

SEE SHEET 1 FOR LEGEND & NOTES

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
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datum AHD

reference number 52414 002DT

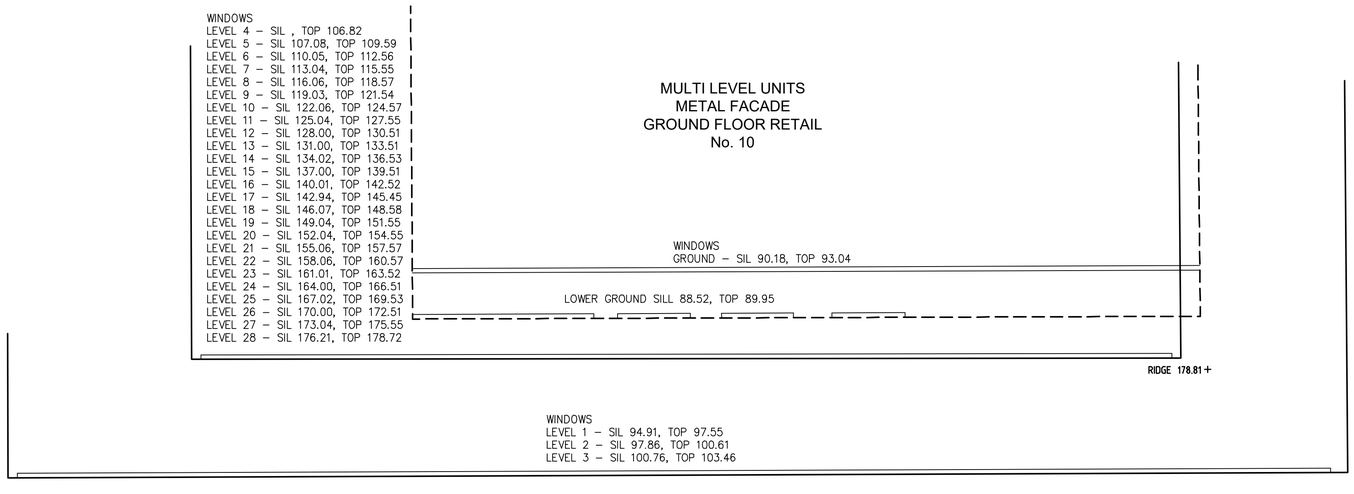
site Area 2842 m²

scale 1:100 @A1

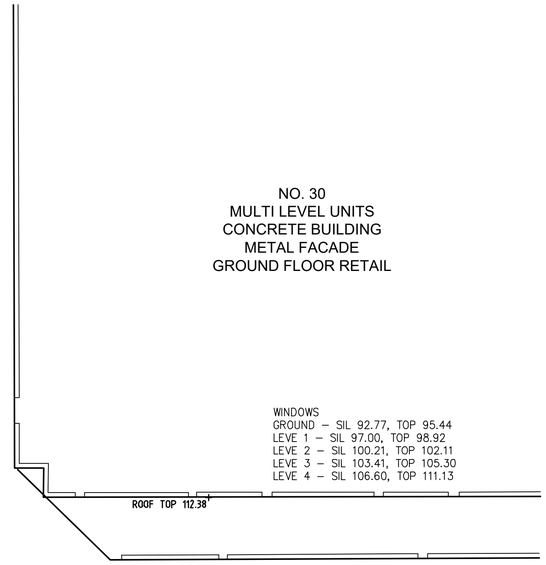
date of survey 12/08/2025

LGA NORTH SYDNEY

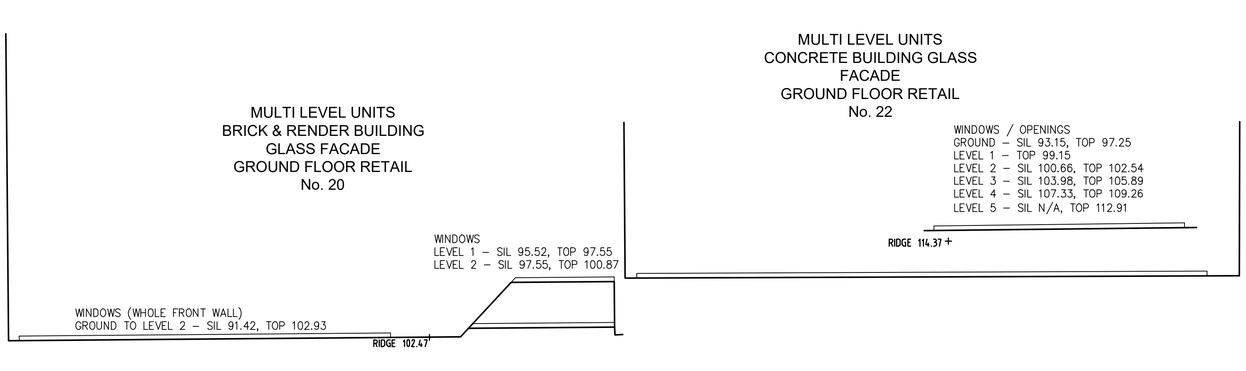
SHEET 8 OF 12



ELEVATION
SCALE 1:100



ELEVATION
SCALE 1:100



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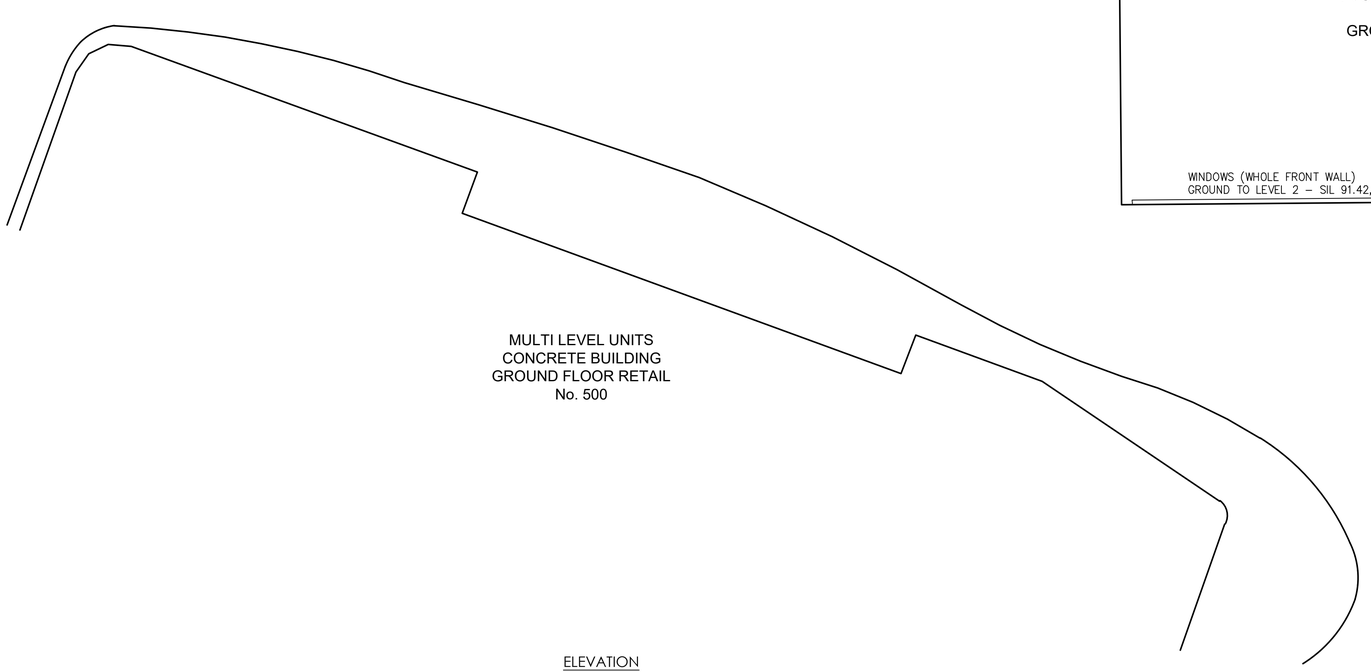


ELEVATION
SCALE 1:150

BEFORE YOU DIG www.byda.com.au Zero Damage · Zero Harm

GDA2020

0 2 4 6 8 10
SCALE 1:100 @ A1

SEE SHEET 1 FOR LEGEND & NOTES

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00
D	00/00/00	–	00
C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

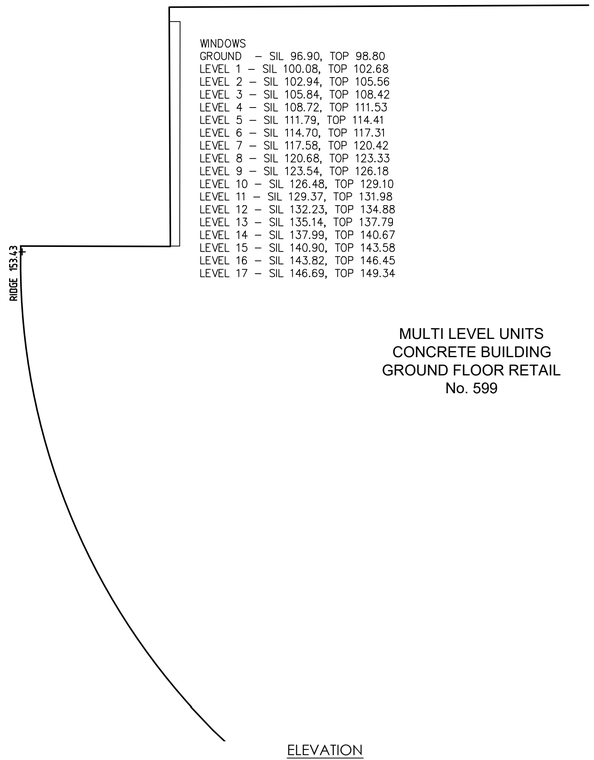
LTS CONFIDENCE TOGETHER
www.ltsi.com.au | P 1300 587 000

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED: 02-03-26
Registered Surveyor NSW

Client STOCKLANDS
Drawing title
PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD
site Area 2842 m²
LGA NORTH SYDNEY

reference number 52414 002DT
scale 1:100 @A1
date of survey 12/08/2025
SHEET 9 OF 12



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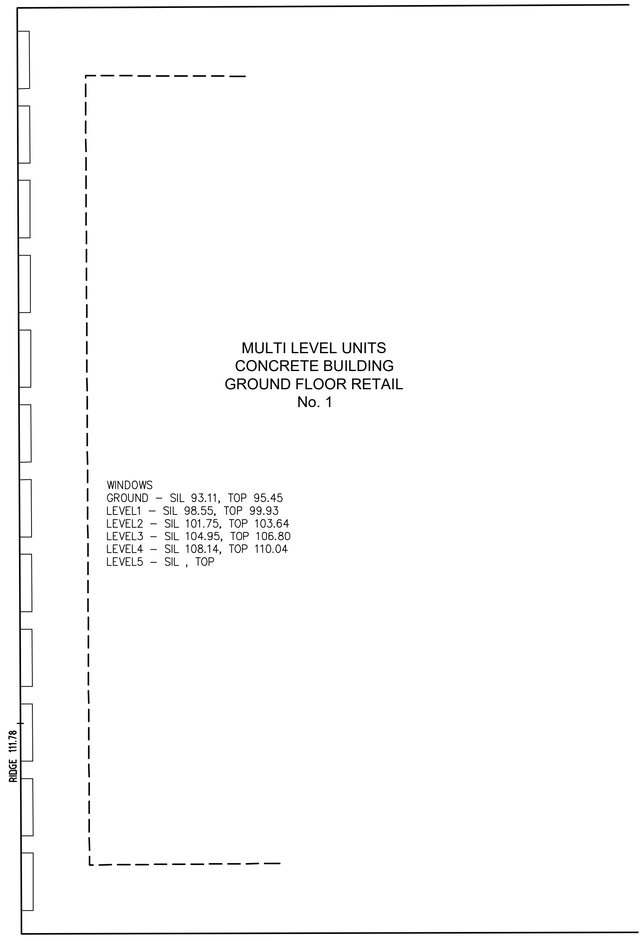
SCALE 1:100



ELEVATION
SCALE 1:100

BEFORE YOU DIG www.byda.com.au Zero Damage · Zero Harm

GDA2020

0 2 4 6 8 10
SCALE 1:100 @ A1

SEE SHEET 1 FOR LEGEND & NOTES

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

Revision	Date	Description	Reference
D	00/00/00	–	00
C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

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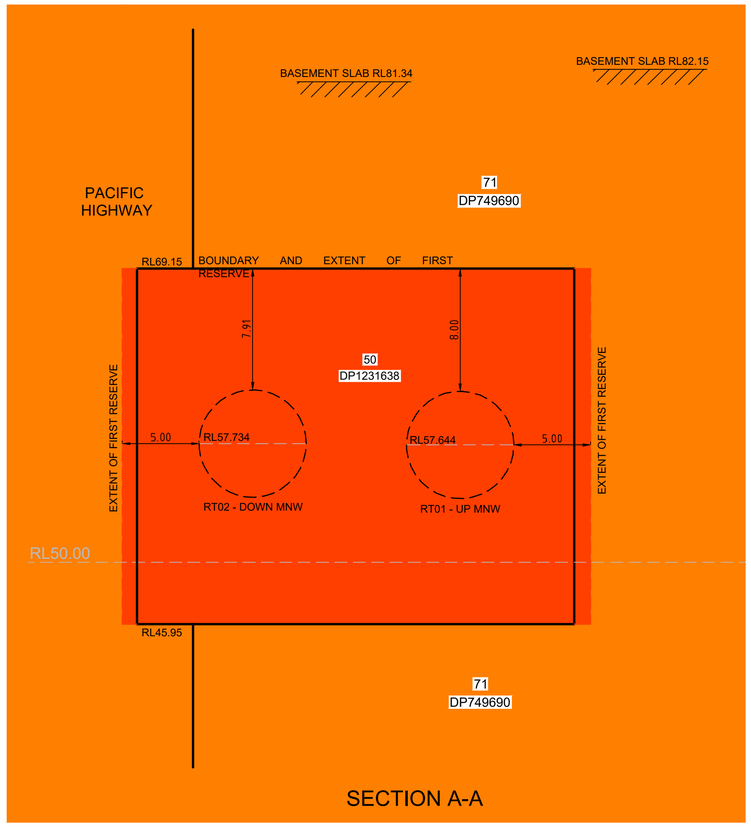
datum AHD
site Area 2842 m²
LGA NORTH SYDNEY
reference number 52414 002DT
scale 1:100 @A1
date of survey 12/08/2025
SHEET 10 OF 12

FIRST RESERVE

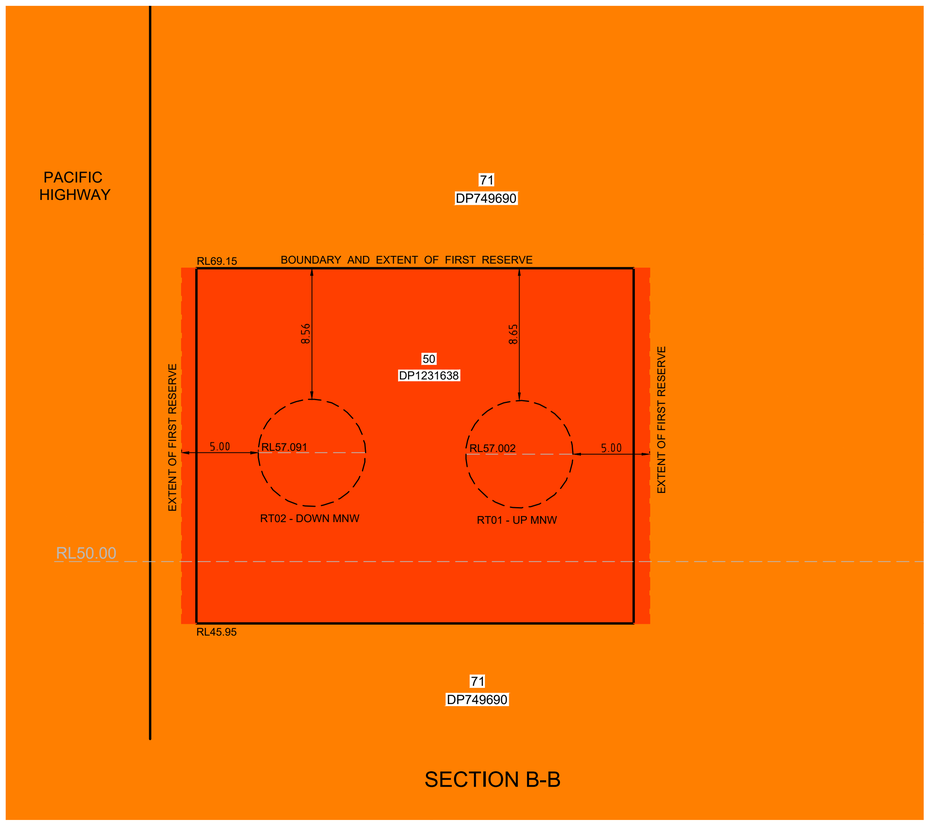
SECOND RESERVE

NOTES

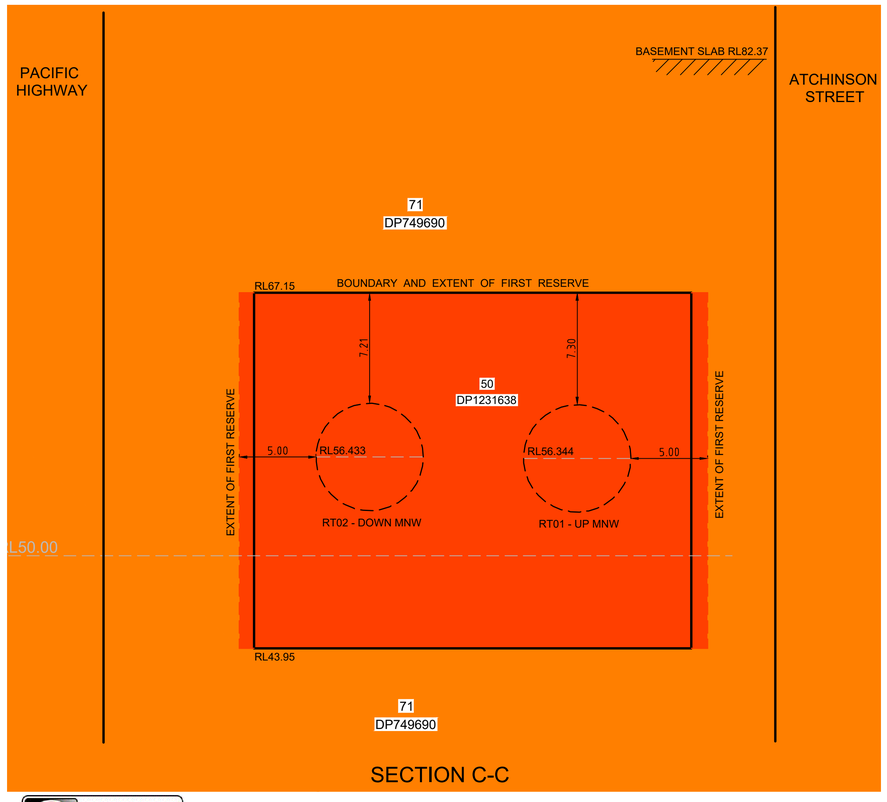
1. PROPOSED BOREHOLES ARE 0.1m DIAMETER



SECTION A-A



SECTION B-B



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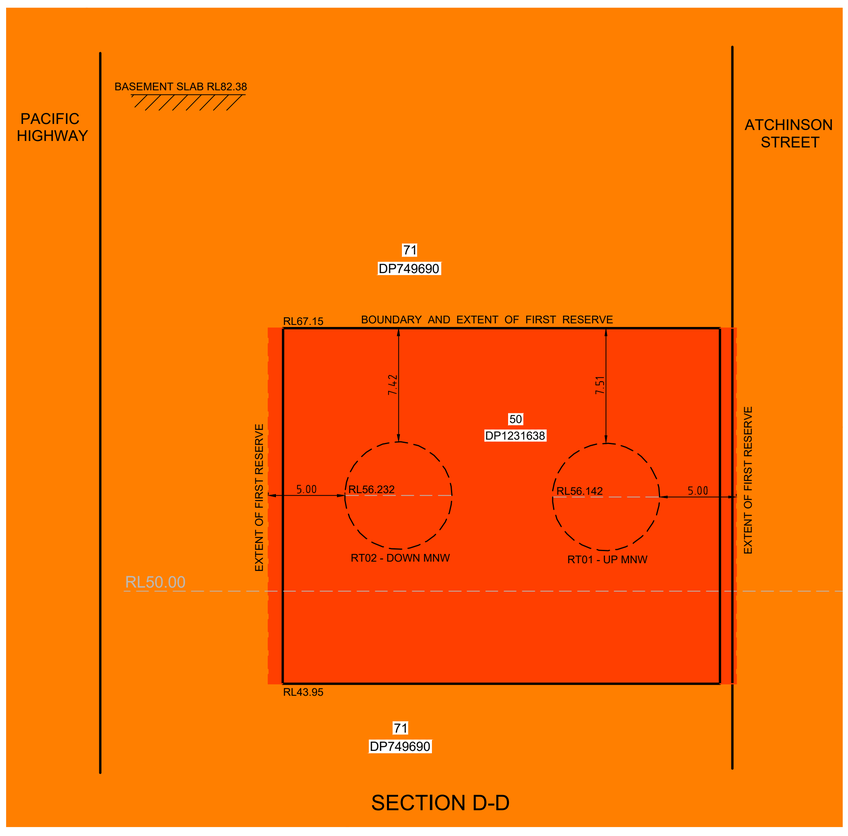

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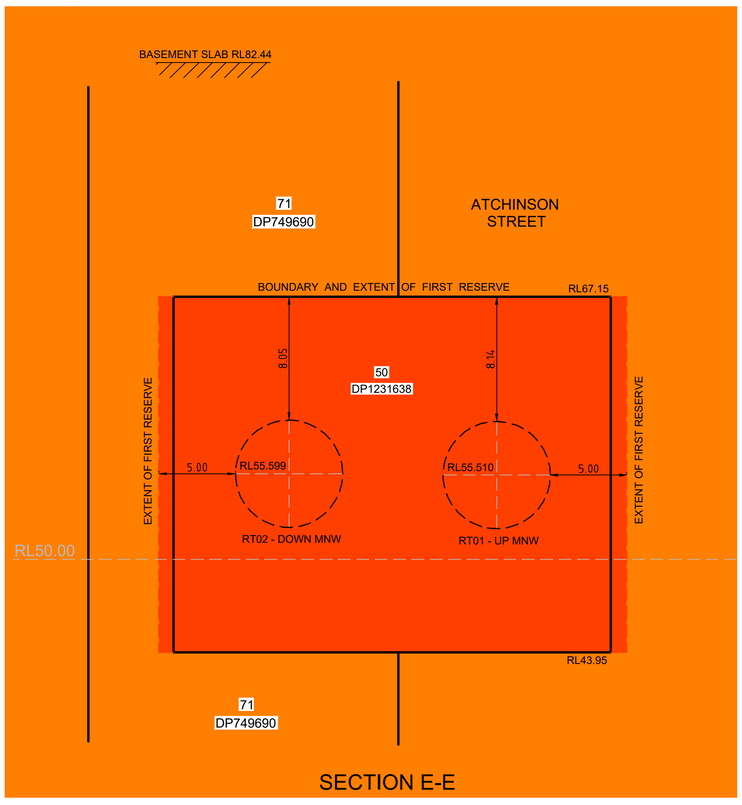

SECTION E-E

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

0 4 6 8 12 16 20

SCALE 1:200 @ A1

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

Revision	Date	Description	Reference
D	00/00/00	–	00
C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

LTS CONFIDENCE TOGETHER
www.ltsl.com.au | P 1300 587 000

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Registered Surveyor NSW

Client STOCKLANDS

Drawing title

PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD

reference number 52414 002DT

site Area 2842 m²

scale 1:200 @A1

date of survey 12/08/2025

LGA NORTH SYDNEY

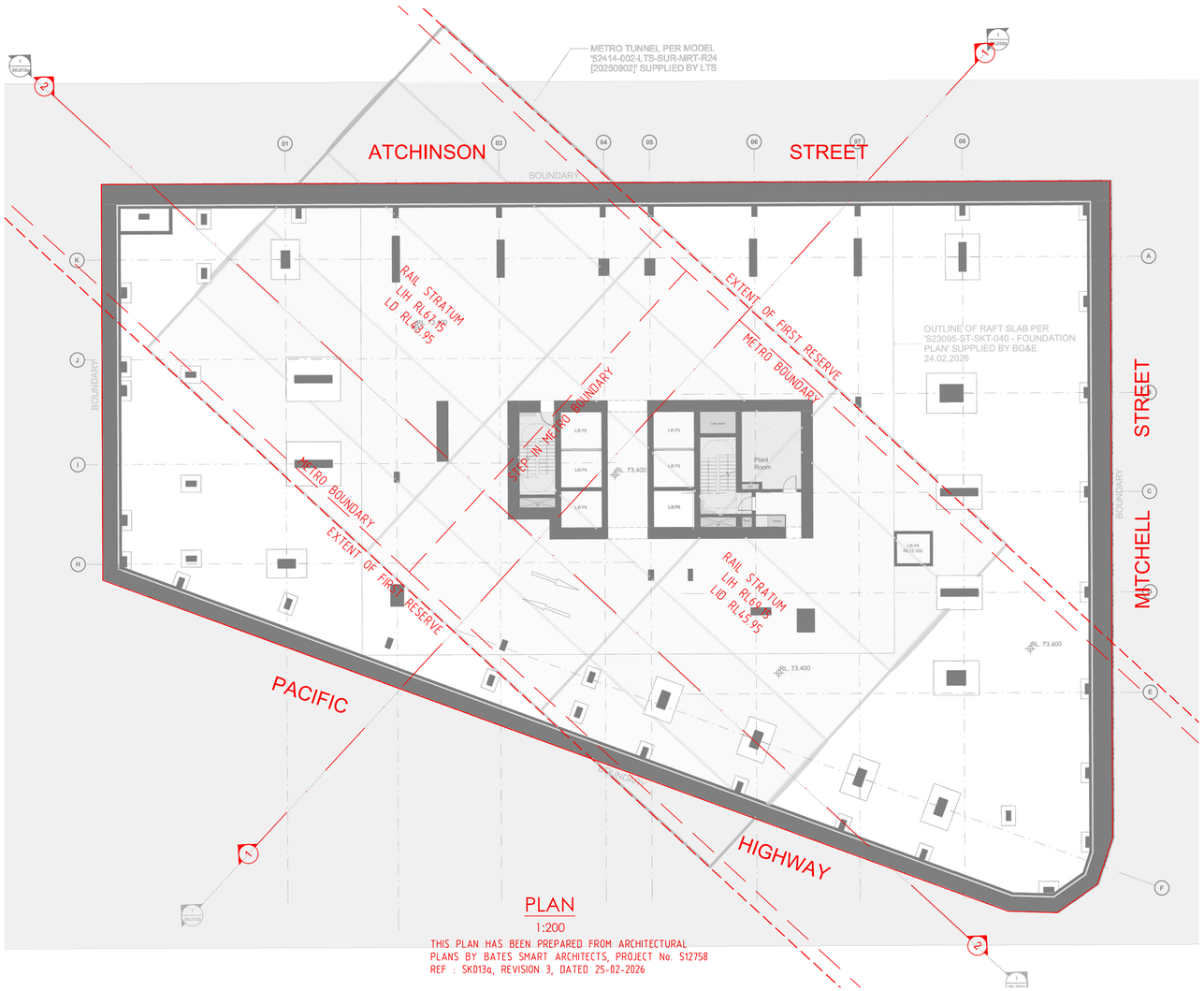
SHEET 11 OF 12

METRO RAILWAY CERTIFICATION

MGA

TN

APPROX. 190°

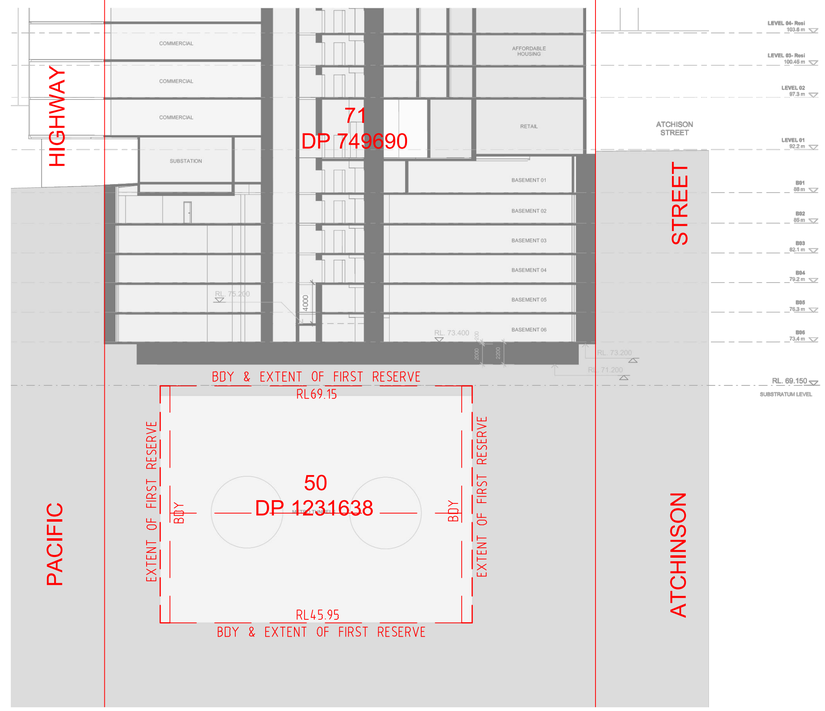


PLAN
1:200

THIS PLAN HAS BEEN PREPARED FROM ARCHITECTURAL PLANS BY BATES SMART ARCHITECTS, PROJECT No. S12758
REF : SK013a, REVISION 3, DATED 25-02-2026

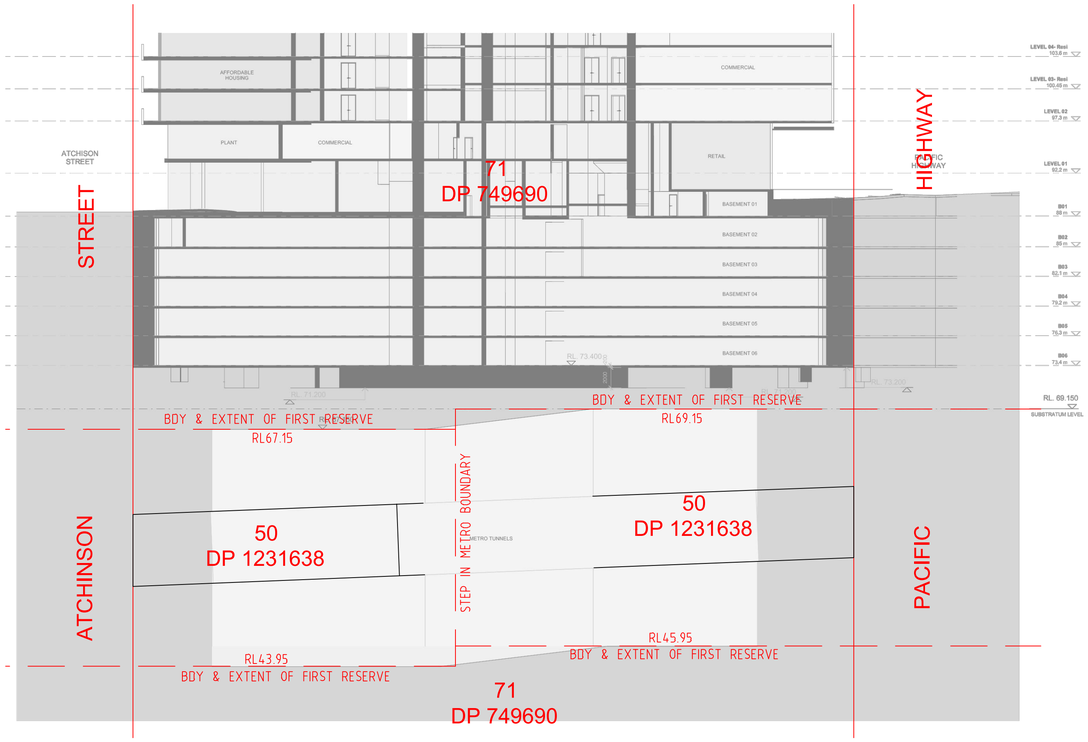
I JOSEPH MONARDO, REGISTERED SURVEYOR, HEREBY CERTIFIES THAT ALL INFORMATION SHOWN HEREON IN RED IS TRUE & ACCURATE

JOSEPH MONARDO
REGISTERED SURVEYOR
DATE: 02-03-2026
REF: 52414/003



SECTION 1
1:300

THIS PLAN HAS BEEN PREPARED FROM ARCHITECTURAL PLANS BY BATES SMART ARCHITECTS, PROJECT No. S12758
REF : SK013b, REVISION 3, DATED 25-02-2026



SECTION 2
1:300

THIS PLAN HAS BEEN PREPARED FROM ARCHITECTURAL PLANS BY BATES SMART ARCHITECTS, PROJECT No. S12758
REF : SK013c, REVISION 3, DATED 25-02-2026

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GDA2020

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SCALE 1: 200 @ A1

Revision	Date	Description	Reference
H	00/00/00	–	00
G	00/00/00	–	00
F	00/00/00	–	00
E	00/00/00	–	00

Revision	Date	Description	Reference
D	00/00/00	–	00
C	00/00/00	–	00
B	00/00/00	–	00
A	02/03/26	METRO RAIL CERTIFICATION ADDED – SHEET 12	003

LTS CONFIDENCE TOGETHER
www.ltsi.com.au P 1300 587 000

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED: 02-03-26
Registered Surveyor NSW

Client STOCKLANDS
Drawing title
PLAN OF DETAIL AND LEVELS OVER LOT 71 IN DP 749690
KNOWN AS NO.601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD
site Area 2842 m²
LGA NORTH SYDNEY
reference number 52414 002DT
scale 1: 200 @A1
date of survey 12/08/2025
SHEET 12 OF 12

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 71/749690

SEARCH DATE	TIME	EDITION NO	DATE
27/5/2025	7:02 PM	91	28/3/2025

LAND

LOT 71 IN DEPOSITED PLAN 749690
AT ST LEONARDS
LOCAL GOVERNMENT AREA NORTH SYDNEY
PARISH OF WILLOUGHBY COUNTY OF CUMBERLAND
TITLE DIAGRAM DP749690

FIRST SCHEDULE

STOCKLAND TRUST MANAGEMENT LIMITED (T AT802128)

SECOND SCHEDULE (18 NOTIFICATIONS)

1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2 AN392027 THE LAND ABOVE DESCRIBED EXCLUDES THE STRATUM IN LOT 50 IN DP1231638 (RAILWAY TUNNEL)
3 I149811 LEASE TO SYDNEY ELECTRICITY OF SUBSTATION PREMISES NO 6594 TOG WITH RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES OVER ANOTHER PART OF THE LAND ABOVE DESCRIBED EXPIRES 30/4/2042
AK971351 LEASE OF LEASE I149811 TO BLUE ASSET PARTNER PTY LTD, ERIC ALPHA ASSET CORPORATION 1 PTY LTD, ERIC ALPHA ASSET CORPORATION 2 PTY LTD, ERIC ALPHA ASSET CORPORATION 3 PTY LTD & ERIC ALPHA ASSET CORPORATION 4 PTY LTD EXPIRES: SEE DEALING. CLAUSE 2.3 (b) (ii).
AK971352 LEASE OF LEASE AK971351 TO BLUE OP PARTNER PTY LTD, ERIC ALPHA OPERATOR CORPORATION 1 PTY LTD, ERIC ALPHA OPERATOR CORPORATION 2 PTY LTD, ERIC ALPHA OPERATOR CORPORATION 3 PTY LTD & ERIC ALPHA OPERATOR CORPORATION 4 PTY LTD EXPIRES: SEE DEALING. CLAUSE 12.1
AK971502 MORTGAGE OF LEASE AK971351 TO ANZ FIDUCIARY SERVICES PTY LTD
AK971571 CHANGE OF NAME AFFECTING LEASE I149811 LESSEE NOW ALPHA DISTRIBUTION MINISTERIAL HOLDING CORPORATION
4 DP1019263 EASEMENT FOR SIGNAGE, ACCESS AND OVERHANG 3 METRE(S) WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN DP1019263
5 AP775606 LEASE TO VERTEX PHARMACEUTICALS (AUSTRALIA) PTY LTD OF SUITE 3.02, LEVEL 3, 601 PACIFIC HIGHWAY, ST

END OF PAGE 1 - CONTINUED OVER

SECOND SCHEDULE (18 NOTIFICATIONS) (CONTINUED)

LEONARDS. EXPIRES: 31/10/2023.

AR956334 VARIATION OF LEASE AP775606 EXPIRY DATE NOW 31/10/2026.

6 AQ905819 LEASE TO FLEET PARTNERS PTY LIMITED OF LEVELS 5 AND 6, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 11/10/2024.

7 AQ975701 LEASE TO ASTERX PTY LTD OF SUITE 3.01, LEVEL 3, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 31/5/2024.

8 AR894169 LEASE TO RSL CARE RDNS LIMITED (SEE AS839254) OF LEVEL 7, 601 PACIFIC HIGHWAY, ST LEONARDS NSW 2065. EXPIRES: 31/5/2024. OPTION OF RENEWAL: 3 YEARS.

9 AR944716 LEASE TO AB COLLECTIVE PTY LTD PART FOLIO IDENTIFIER 71/749690 BEING GROUND FLOOR SHOP 2, 601 PACIFIC HIGHWAY, ST LEONARDS NSW 2065 . EXPIRES: 14/11/2026. OPTION OF RENEWAL: 5 YEARS.

AU817884 VARIATION OF LEASE AR944716

10 AR972524 LEASE TO IBM AUSTRALIA LTD OF LEVELS 2, 9 AND 10, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 31/10/2024. OPTION OF RENEWAL: 1 YEARS AND ONE FURTHER OPTION OF 1 YEAR.

AT888562 SURRENDERED AS REGARDS LEVEL 9, 601 PACIFIC HIGHWAY, ST LEONARDS

AT888563 VARIATION OF LEASE AR972524 OPTION OF RENEWAL: PRESERVED.

AU922101 VARIATION OF LEASE AR972524 EXPIRY DATE NOW 31/10/2026. OPTION OF RENEWAL: RELINQUISHED.

11 AS67106 LEASE TO NEXUS DAY HOSPITALS PTY LTD OF LEVEL 8, SUITE 8.01, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 28/2/2027.

AU736986 VARIATION OF LEASE AS67106

12 AS476661 LEASE TO FJA CONSULTING ENGINEERS PTY LTD OF SUITE 1, LEVEL 4, 601 PACIFIC HIGHWAY, ST LEONARDS. COMMENCES 1/10/2022. EXPIRES: 30/9/2025. OPTION OF RENEWAL: 3 YEARS.

AU817670 VARIATION OF LEASE AS476661

13 AS635830 LEASE TO IMASE PTY LTD OF SUITE 1.03, LEVEL 1, 601 PACIFIC HIGHWAY, ST LEONARDS. COMMENCES: 1/01/2023. EXPIRES: 31/12/2027.

14 AS758539 LEASE TO BLD HOLDINGS PTY LTD OF SUITE 8.02, LEVEL 8, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 31/3/2028. OPTION OF RENEWAL: 5 YEARS.

15 AT415681 LEASE TO STUDIO A LIMITED OF SUITE 11.01, LEVEL 11, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 11/1/2027.

16 AT909868 LEASE TO PROCORP HOSPITALITY MANAGEMENT SERVICES PTY LTD OF SHOP 1, RETAIL PLAZA, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 30/6/2028.

END OF PAGE 2 - CONTINUED OVER

FOLIO: 71/749690 PAGE 3

SECOND SCHEDULE (18 NOTIFICATIONS) (CONTINUED)
---

17 AU754851 LEASE TO THE NORTH FOUNDATION (HEALTH PROMOTION CHARITY) LIMITED OF SUITE 1.01, LEVEL 1, 601 PACIFIC HIGHWAY, ST LEONARDS. EXPIRES: 31/5/2027.

18 AU921732 LEASE TO LE CREUSET AUSTRALIA PTY LIMITED OF LEVEL 4, SUITE 4, 601 PACIFIC HIGHWAY, ST LEONARDS.. EXPIRES: 22/1/2027.

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

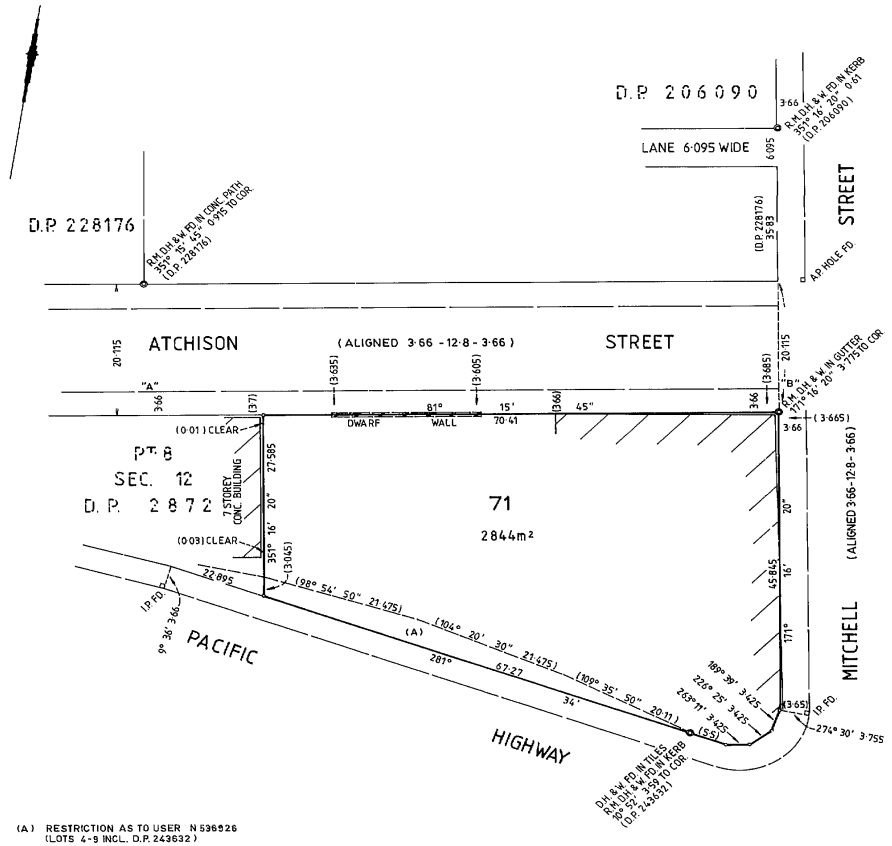
* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2025 Received: 27/05/2025 19:02:43

PLAN FORM 2 — Plan Drawing only to appear in this space — *OFFICE USE ONLY

Signatures and seals only.

[illegible] Cup Consolidated
and Annuello affixed
in the presence of
PRESIDENT
SECRETARY



(A) RESTRICTION AS TO USER N 536826 (LOTS 4-9 INCL. D.P. 243632)

Council Clerk's Certificate

I hereby certify that —

(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans), and

*(b) the requirements of section 348 of the †Metropolitan Water, Sewerage and Drainage Act, 1924, as amended, †Hunter District Water, Sewerage and Drainage Act, 1938, as amended

have been complied with by the applicant in relation to the proposed SUBDIVISION (Insert "new road", "subdivision" or "consolidated lot") set out herein

Subdivision No. 3688(P581/601/2)

Date 19.8.87

(Signature) [illegible]
Council Clerk

*This part of certificate to be deleted where the application is only for a consolidated lot or the opening of a new road or where the land to be subdivided is wholly outside the areas of operations of the Metropolitan Water Sewerage and Drainage Board and the Hunter District Water Board.
†Delete if inapplicable.

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 Table of mm 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390

MPD

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

DP 749690

Registered: 24-11-1987

C.A.: 3688 (P581/601/2) OF 19-8-1987

Title System: TORRENS

Purpose: CONSOLIDATION

Ref. Map: U1852 - 431

Last Plan: DP 2872

PLAN OF CONSOLIDATION OF PART LOTS 1-7 SECTION 12 D.P. 2872

Reduction Ratio 1: 400
Lengths are in metres.

Mun. ~~/Shire~~ ~~City~~: NORTH SYDNEY
Locality: ST. LEONARDS
Parish: WILLOUGHBY
County: CUMBERLAND

This is sheet 1 of my plan in sheets. (Delete if inapplicable).

I, ROGER ERNEST CHARLES HOGAN
of P.W. RYGATE & WEST, SYDNEY
a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that the survey represented in this plan
is accurate and has been made *I/we by me (2) under my immediate supervision in accordance with the Survey Practice Regulations, 1933, and was completed on †
11 - 11 - 85
Signature
Surveyor registered under Surveyors Act, 1929, as amended.
Datum Line of Azimuth 'A' - 'B'
*Strike out either (1) or (2). †Insert date of survey.

Panel for use only for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user.

NOTIFIED

PLAN AMENDED AT LTO. 16-1-89

SURVEYOR'S REFERENCE 58449

AMENDMENTS AND/OR ADDITIONS MADE ON PLAN IN THE LAND TITLES OFFICE

10 20 30 40 50 60 70 Table of mm 110 120 130 140

This negative is a photograph made as a permanent record of a document in the custody of the Registrar General this day. 17th March, 1989

Req:R946790 /Doc:DP 0749690 P /Rev:28-Oct-1992 /Sts:OK.OK /Pgs:ALL /Prt:19-Jul-2018 15:35 /Seq:1 of 1
Ref:50418 001 /Src:M

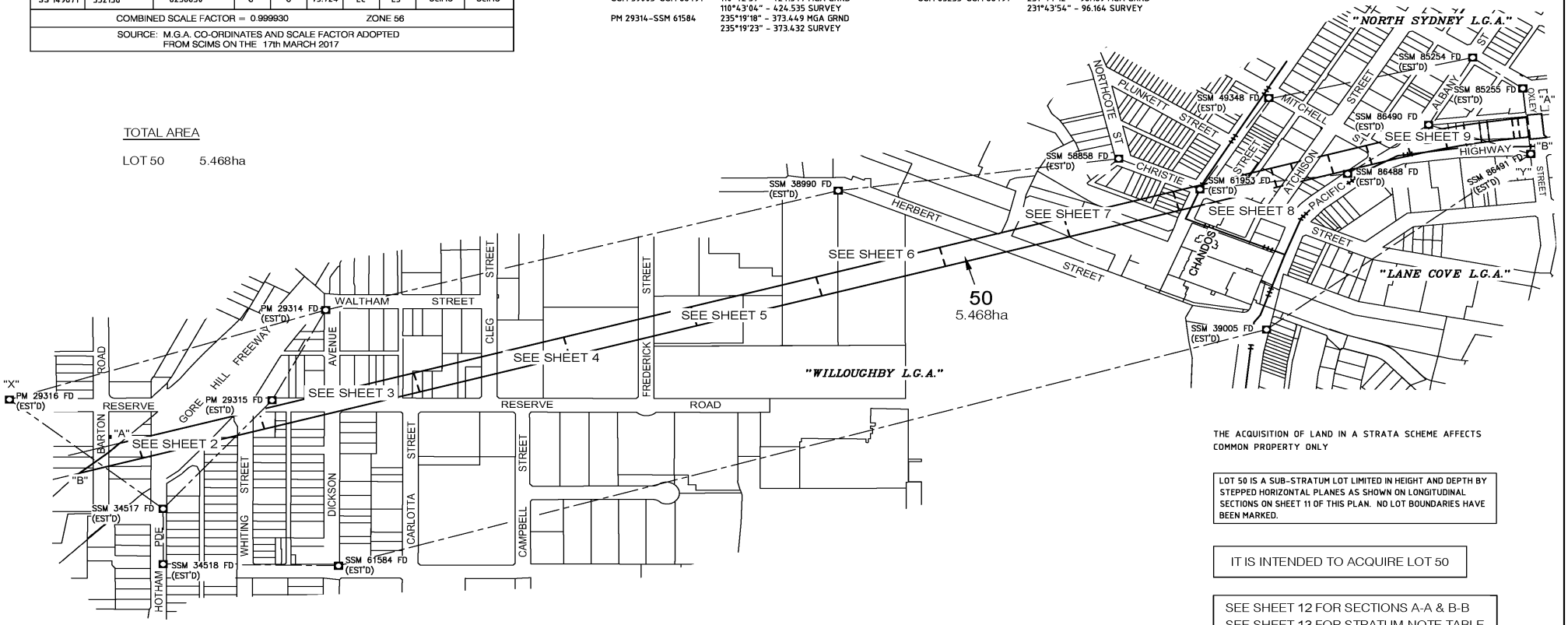
SURVEYING AND SPATIAL INFORMATION REGULATION 2012 : CLAUSE 35(1)(b) & 61(2) AND 62									
MARK	MGA EASTING	MGA NORTHING	CLASS	ORDER	AHD	CLASS	ORDER	METHOD	ORIGIN
PM 29314	332235.444	6256965.459	C	3	65.079	LC	L3	SCIMS	SCIMS
PM 29315	332087.492	6256953.49	B	2	69.848	LC	L3	SCIMS	SCIMS
PM 29316	331889.736	6257268.063	B	2	79.02	LC	L3	SCIMS	SCIMS
SS 34517	331879.12	6256987.353	B	U	70.653	LC	L3	SCIMS	SCIMS
SS 34518	331810.836	6256944.397	B	U	76.631	LC	L3	SCIMS	SCIMS
SS 38990	332732.228	6256502.573	B	2	76.645	LB	L2	SCIMS	SCIMS
SS 39005	332852.847	6255930.306	B	2	78.415	LB	L2	SCIMS	SCIMS
SS 49348	333140.311	6256107.585	B	2	85.555	LB	L2	SCIMS	SCIMS
SS 51275	332301.910	6256897.360	D	4		U	U	SCIMS	SCIMS
SS 58858	332963.021	6256223.248	B	2	73.101	LB	L2	SCIMS	SCIMS
SS 61584	331928.356	6256752.993	B	2	87.382	LC	L3	SCIMS	SCIMS
SS 61953	332984.934	6256113.479	B	2	79.073	LB	L2	SCIMS	SCIMS
SS 85254	333329.233	6255918.044	B	2	82.854	LB	L2	SCIMS	SCIMS
SS 85255	333325.418	6255839.692	B	2	83.599	LB	L2	SCIMS	SCIMS
SS 86488	333100.307	6255963.258	B	2	89.058	LB	L2	SCIMS	SCIMS
SS 86490	333216.173	6255913.59	B	2	90.236	LB	L2	SCIMS	SCIMS
SS 86491	333249.914	6255780.141	B	2	87.604	LB	L2	SCIMS	SCIMS
SS 149671	332156	6256850	U	U	75.724	LC	L3	SCIMS	SCIMS

COMBINED SCALE FACTOR = 0.999930 ZONE 56

SOURCE: M.G.A. CO-ORDINATES AND SCALE FACTOR ADOPTED FROM SCIMS ON THE 17th MARCH 2017

SURVEY CONNECTIONS

PM 29316–SSM86491	137°34'05" – 2016.077 MGA GRND "X"–"Y"	SSM 38990 – SSM 58858	140°26'05" – 362.362 MGA GRND
	137°34'05" – 2016.062 SURVEY		140°26'09" – 362.363 SURVEY
PM 29316–SSM 34517	182°09'57" – 280.931 MGA GRND	SSM 58858–SSM 61953	168°42'38" – 111.943 MGA GRND
	182°09'57" – 280.923 SURVEY		168°42'15" – 111.947 SURVEY
PM 29316–PM 29314	131°11'46" – 459.470 MGA GRND	SSM 61953–SSM 49348	92°10'21" – 155.500 MGA GRND
	131°11'50" – 459.464 SURVEY		92°10'11" – 155.498 SURVEY
SSM 34517–SSM 34518	237°49'37" – 80.678 MGA GRND	SSM 61953–SSM 86488	142°28'30" – 189.426 MGA GRND
	237°49'35" – 80.683 SURVEY		142°28'28" – 189.418 SURVEY
SSM 34517–PM29315	99°13'50" – 211.121 MGA GRND	SSM 49348–SSM 85254	135°05'37" – 267.633 MGA GRND
	99°13'50" – 211.109 SURVEY		135°05'46" – 267.627 SURVEY
PM 29315–PM29314	85°22'30" – 148.445 MGA GRND	SSM 86488–SSM 86490	113°12'12" – 126.072 MGA GRND
	85°22'45" – 148.444 SURVEY		113°12'14" – 126.067 SURVEY
SSM 34518–SSM 61584	148°27'02" – 224.619 MGA GRND	SSM 86490–SSM 85254	87°44'38" – 113.156 MGA GRND
	148°26'55" – 224.611 SURVEY		87°44'46" – 113.152 SURVEY
PM 29314–SSM 38990	132°58'37" – 679.060 MGA GRND	SSM 85254–SSM 85255	182°47'15" – 78.450 MGA GRND
	132°58'34" – 679.047 SURVEY		182°47'20" – 78.447 SURVEY
SSM 61584–SSM 39005	131°39'55" – 1237.624 MGA GRND	SSM 86490–SSM 86491	165°48'39" – 137.658 MGA GRND
	131°39'54" – 1237.622 SURVEY		165° 48'35" – 137.663 SURVEY
SSM 39005–SSM 86491	110°42'57" – 424.547 MGA GRND	SSM 85255–SSM 86491	231°44'12" – 96.169 MGA GRND
	110°43'04" – 424.535 SURVEY		231°43'54" – 96.164 SURVEY
PM 29314–SSM 61584	235°19'18" – 373.449 MGA GRND		
	235°19'23" – 373.432 SURVEY		



TOTAL AREA

LOT 50 5.468ha

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

LOT 50 IS A SUB-STRATUM LOT 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.

IT IS INTENDED TO ACQUIRE LOT 50

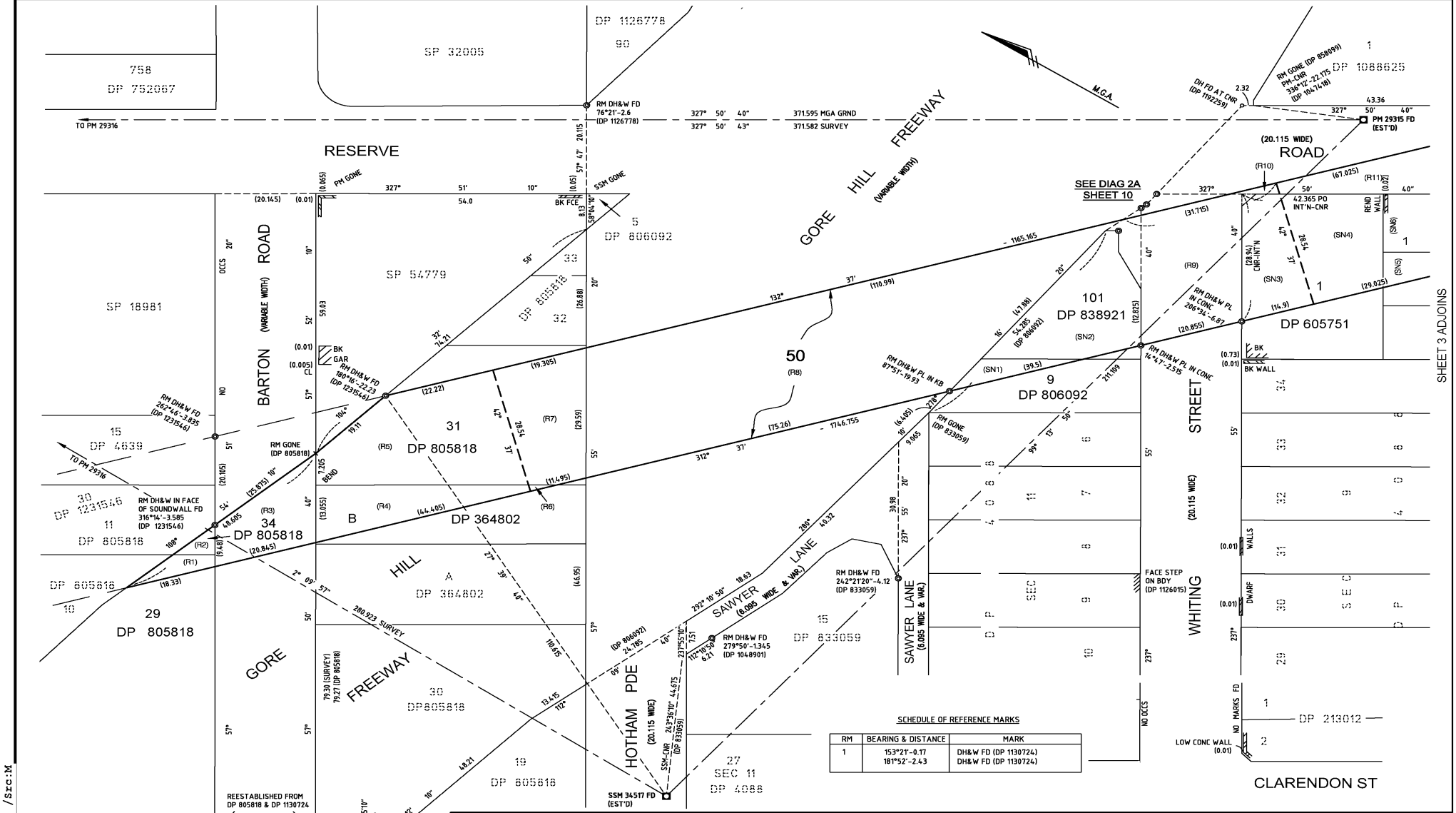
SEE SHEET 12 FOR SECTIONS A-A & B-B
SEE SHEET 13 FOR STRATUM NOTE TABLE

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 3500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:1 of 15
Ref:50418 001 /Src:M



Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:2 of 15
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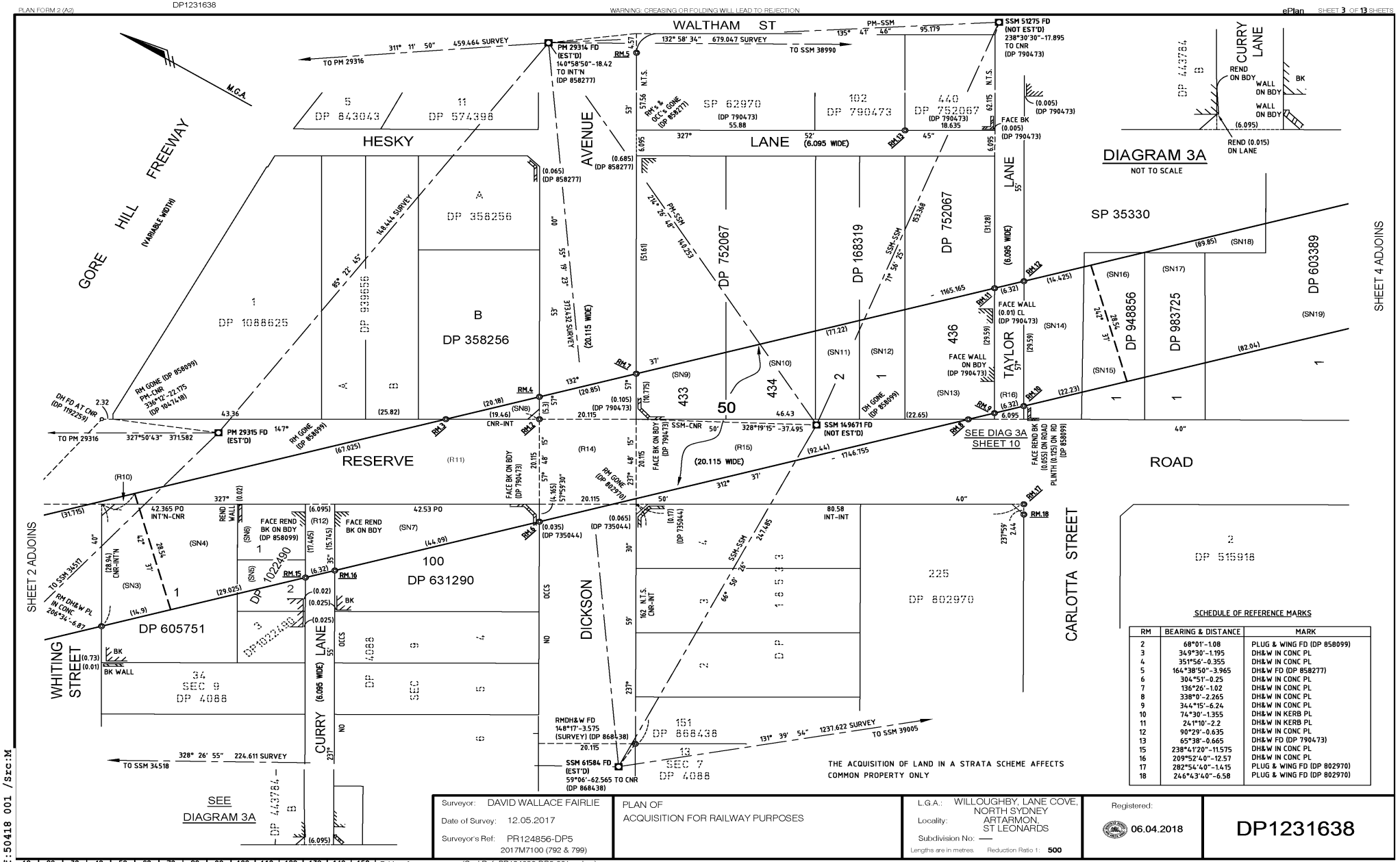


SCHEDULE OF REFERENCE MARKS

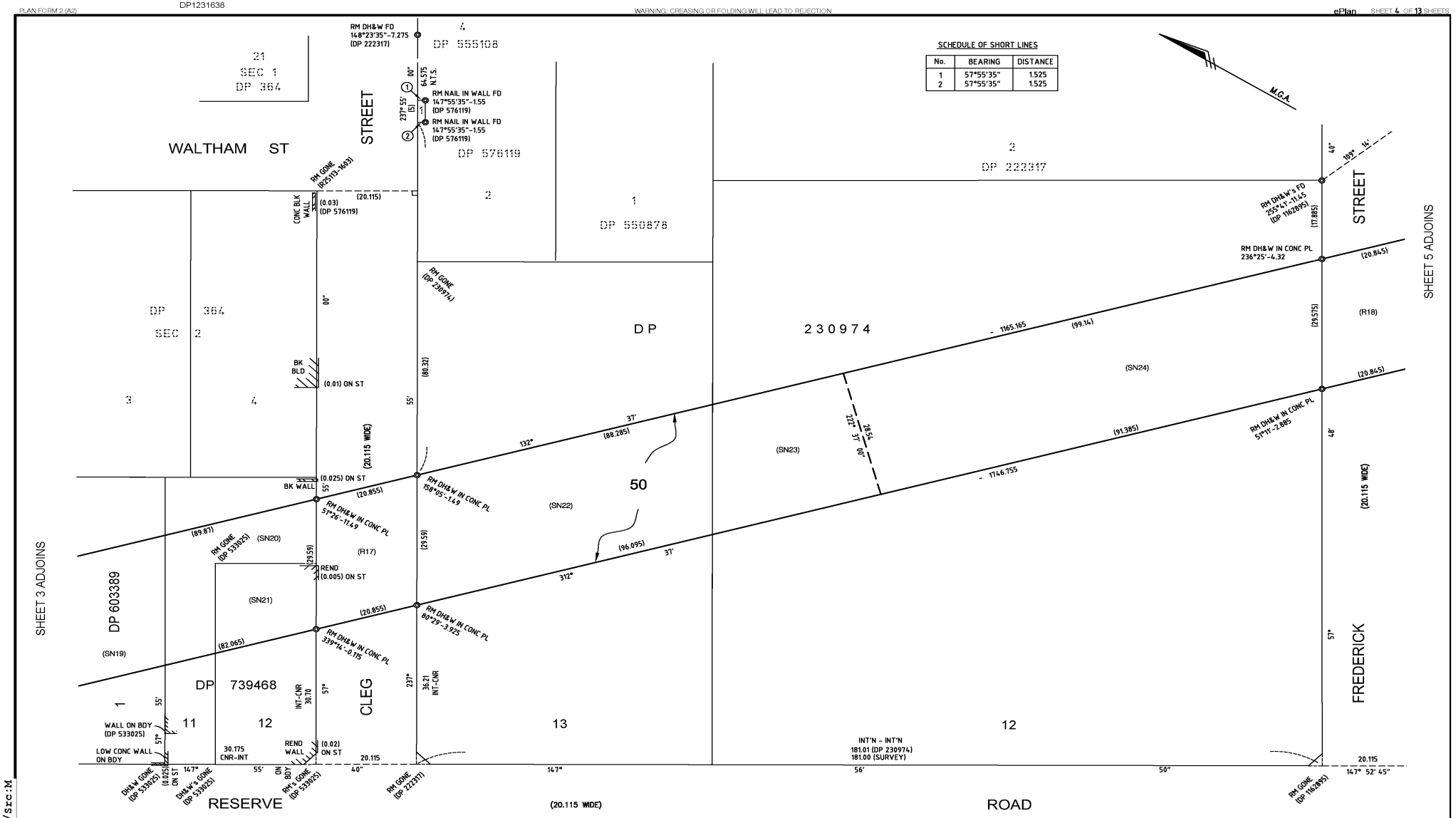
RM	BEARING & DISTANCE	MARK
2	68°01'-1.08	PLUG & WING FD (DP 858099)
3	349°30'-1.195	DH&W IN CONC PL
4	351°56'-0.355	DH&W IN CONC PL
5	164°38'50"-3.965	DH&W FD (DP 858277)
6	304°51'-0.25	DH&W IN CONC PL
7	136°26'-1.02	DH&W IN CONC PL
8	338°0'-2.265	DH&W IN CONC PL
9	344°15'-6.24	DH&W IN CONC PL
10	74°30'-1.355	DH&W IN KERB PL
11	241°10'-2.2	DH&W IN KERB PL
12	90°29'-0.635	DH&W IN CONC PL
13	65°38'-0.665	DH&W FD (DP 790473)
15	238°41'20"-11.575	DH&W IN CONC PL
16	209°52'40"-12.57	DH&W IN CONC PL
17	282°54'40"-1.415	PLUG & WING FD (DP 802970)
18	246°43'40"-6.58	PLUG & WING FD (DP 802970)

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:3 of 15
Ref:50418 001 /Src:M



Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:4 of 15
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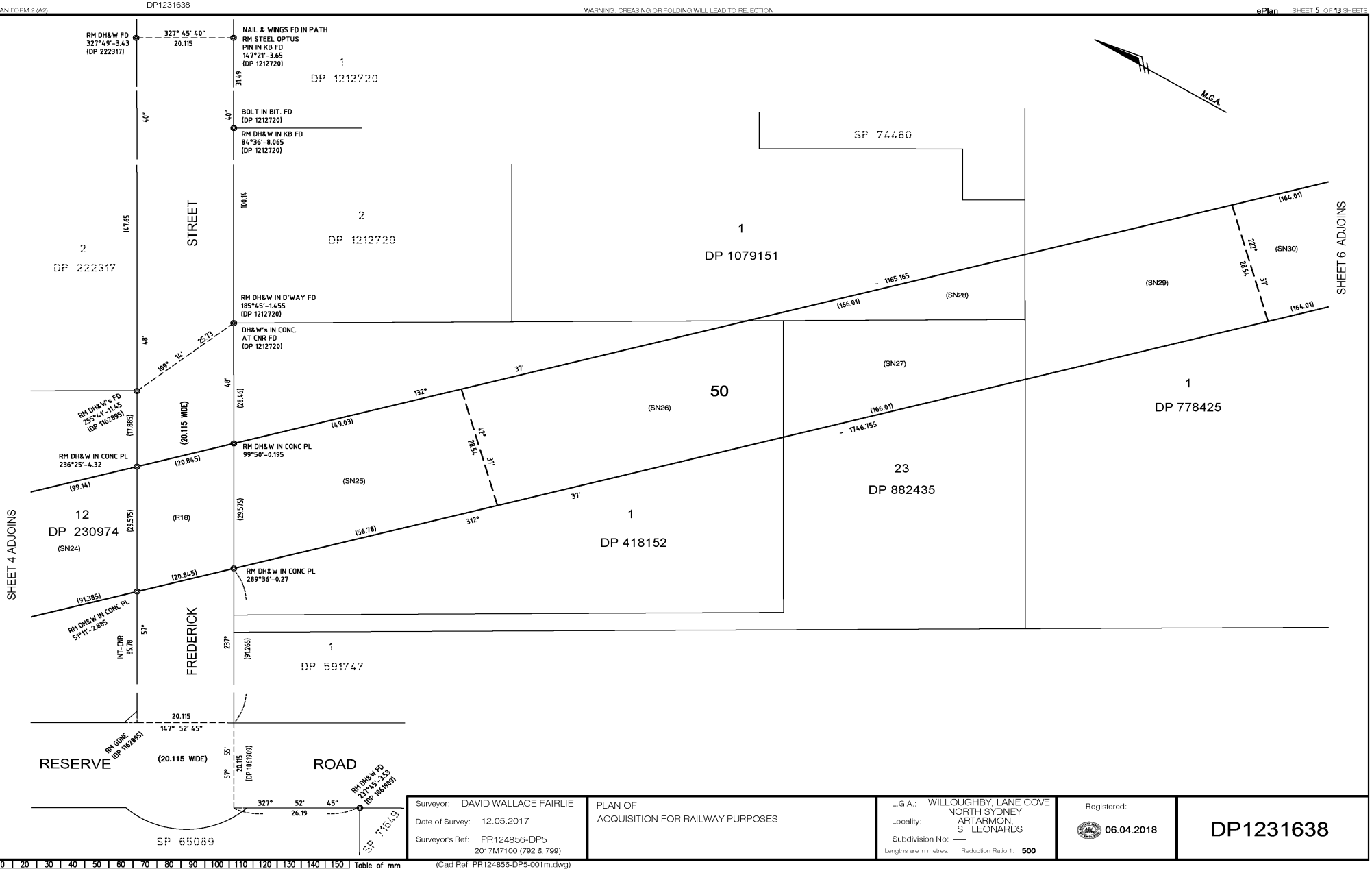
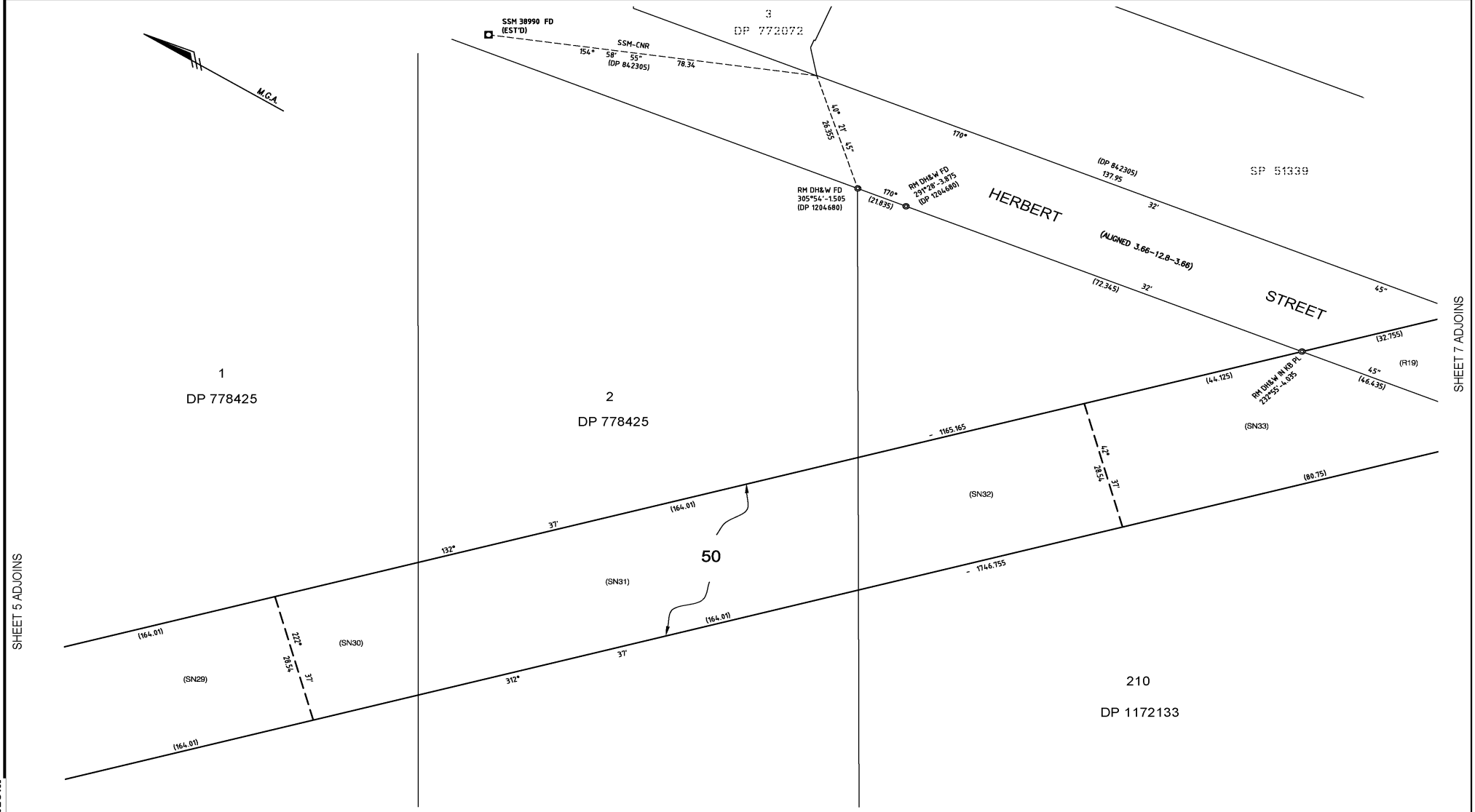


Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:5 of 15
Ref:50418 001 /Src:M



Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

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Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:6 of 15
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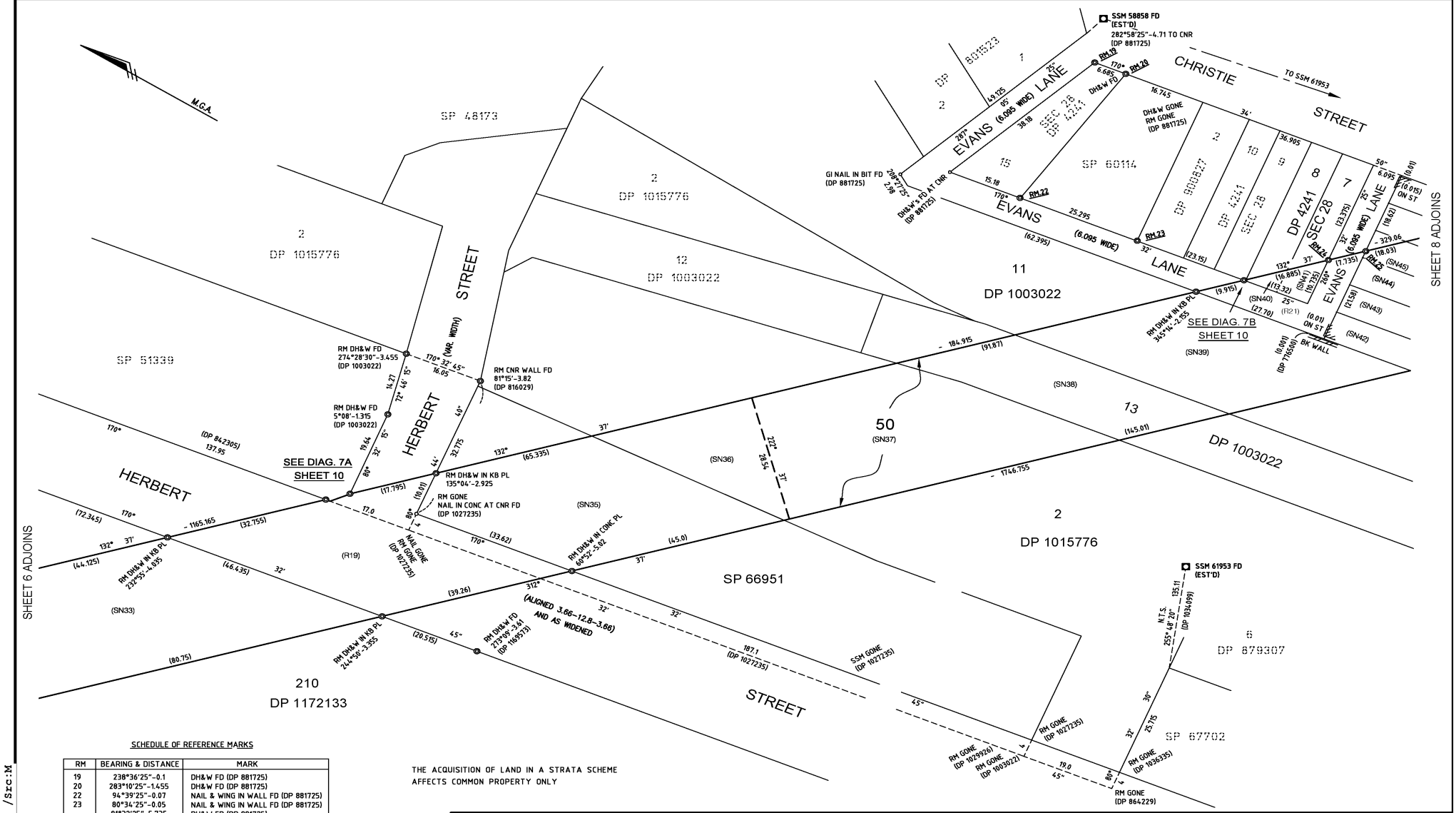


SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
19	238°36'25"-0.1	DH&W FD (DP 881725)
20	283°10'25"-1.455	DH&W FD (DP 881725)
22	94°39'25"-0.07	NAIL & WING IN WALL FD (DP 881725)
23	80°34'25"-0.05	NAIL & WING IN WALL FD (DP 881725)
	81°32'25"-5.735	DH&W FD (DP 881725)
24	305°23'-0.355	DH&W IN KB PL
25	232°19'-0.75	DH&W IN KB PL

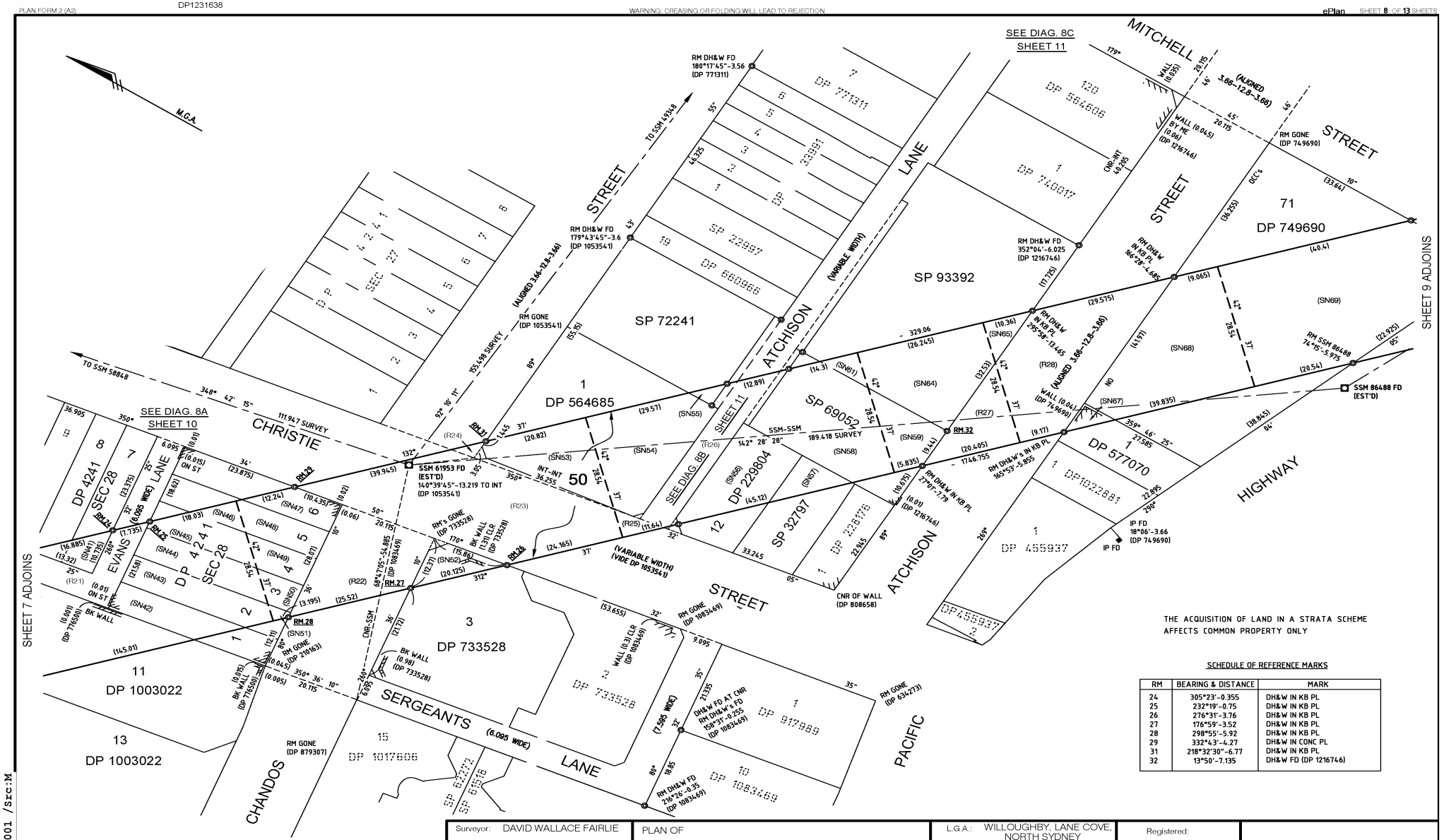
THE ACQUISITION OF LAND IN A STRATA SCHEME AFFECTS COMMON PROPERTY ONLY

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:7 of 15
Ref:50418 001 /Src:M



SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
24	305°23'-0.355	DH&W IN KB PL
25	232°19'-0.75	DH&W IN KB PL
26	276°31'-3.76	DH&W IN KB PL
27	176°59'-3.52	DH&W IN KB PL
28	298°55'-5.92	DH&W IN KB PL
29	332°43'-4.27	DH&W IN CONC PL
31	218°32'30"-6.77	DH&W IN KB PL
32	13°50'-7.135	DH&W FD (DP 1216746)

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

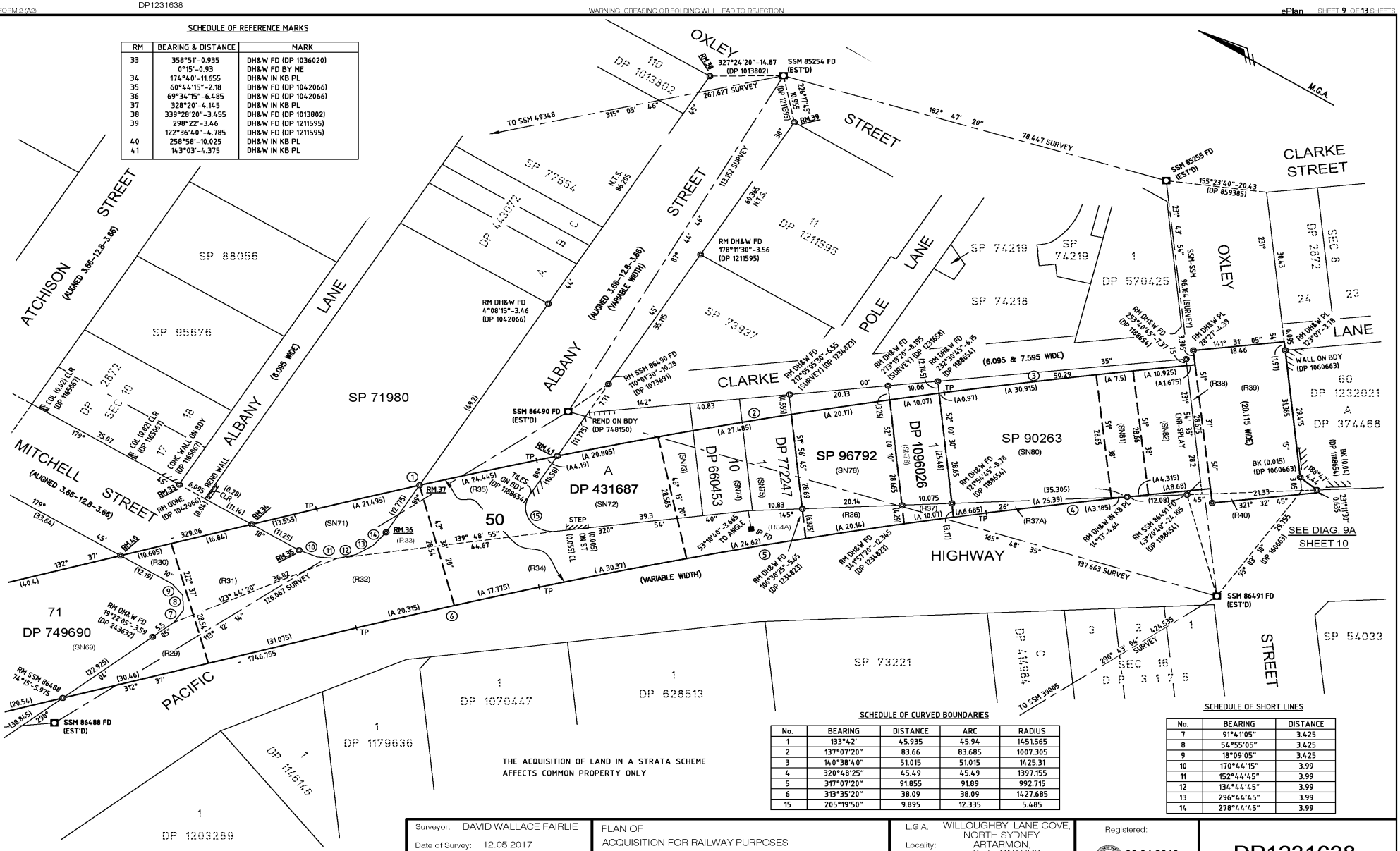
(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:8 of 15
Ref:50418 001 /Src:M

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:9 of 15
Ref:50418 001 /Src:M

SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
33	358°51'-0.935	DH&W FD (DP 1036020)
	0°15'-0.93	DH&W FD BY ME
34	174°40'-11.655	DH&W IN KB PL
35	60°44'15"-2.18	DH&W FD (DP 1042066)
36	69°34'15"-6.485	DH&W FD (DP 1042066)
37	328°20'-4.145	DH&W IN KB PL
38	339°28'20"-3.455	DH&W FD (DP 1013802)
39	298°22'-3.46	DH&W FD (DP 1211595)
	122°36'40"-4.785	DH&W FD (DP 1211595)
40	258°58'-10.025	DH&W IN KB PL
41	143°03'-4.375	DH&W IN KB PL



SCHEDULE OF CURVED BOUNDARIES

No.	BEARING	DISTANCE	ARC	RADIUS
1	133°42'	45.935	45.94	1451.565
2	137°07'20"	83.66	83.685	1007.305
3	140°38'40"	51.015	51.015	1425.31
4	320°48'25"	45.49	45.49	1397.155
5	317°07'20"	91.855	91.89	992.715
6	313°35'20"	38.09	38.09	1427.685
15	205°19'50"	9.895	12.335	5.485

SCHEDULE OF SHORT LINES

No.	BEARING	DISTANCE
7	91°41'05"	3.425
8	54°55'05"	3.425
9	18°09'05"	3.425
10	170°44'15"	3.99
11	152°44'45"	3.99
12	134°44'45"	3.99
13	296°44'45"	3.99
14	278°44'45"	3.99

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

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:10 of 15
Ref:50418 001 /Src:M

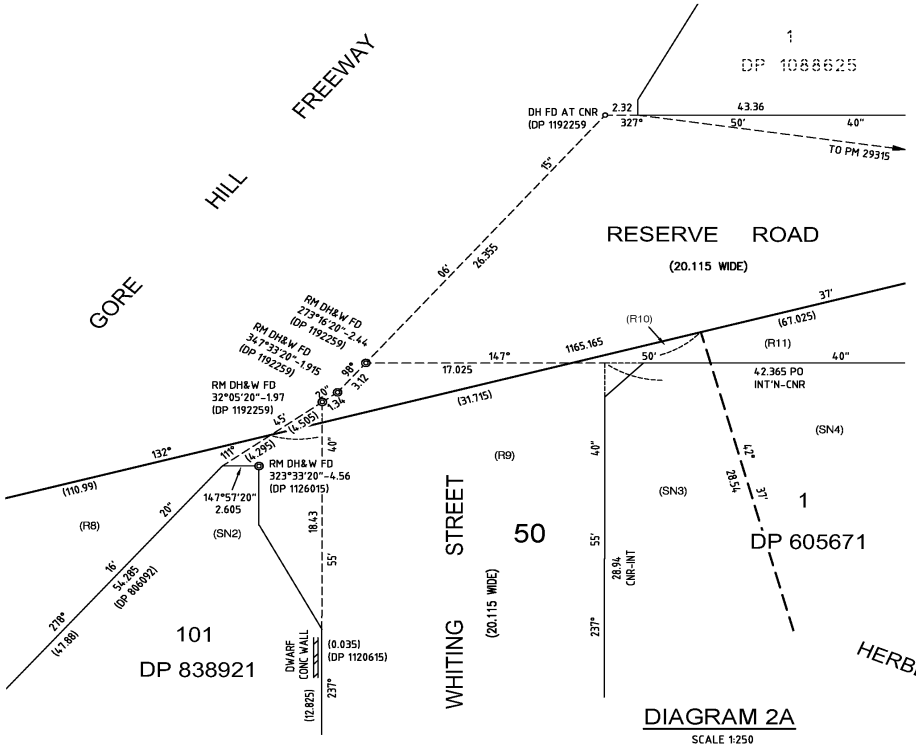


DIAGRAM 2A
SCALE 1:250

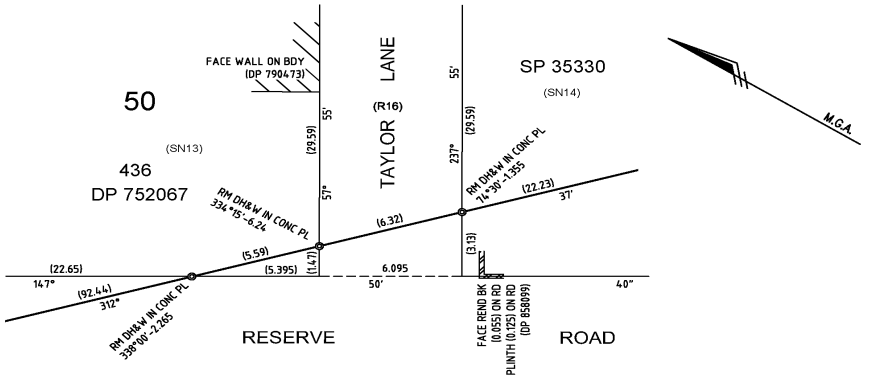
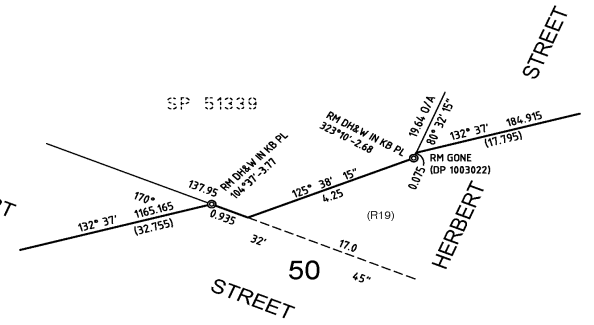


DIAGRAM 3A
SCALE 1:150



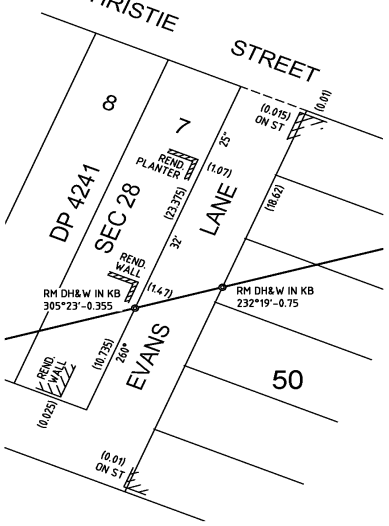


DIAGRAM 7A
NOT TO SCALE

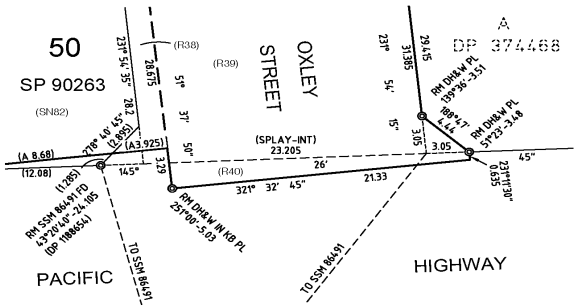


DIAGRAM 9A
SCALE 1:250

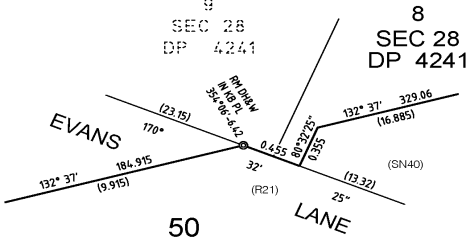


DIAGRAM 7B
NOT TO SCALE

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

DIAGRAM 8A
SCALE 1:250

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: **AS SHOWN**	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

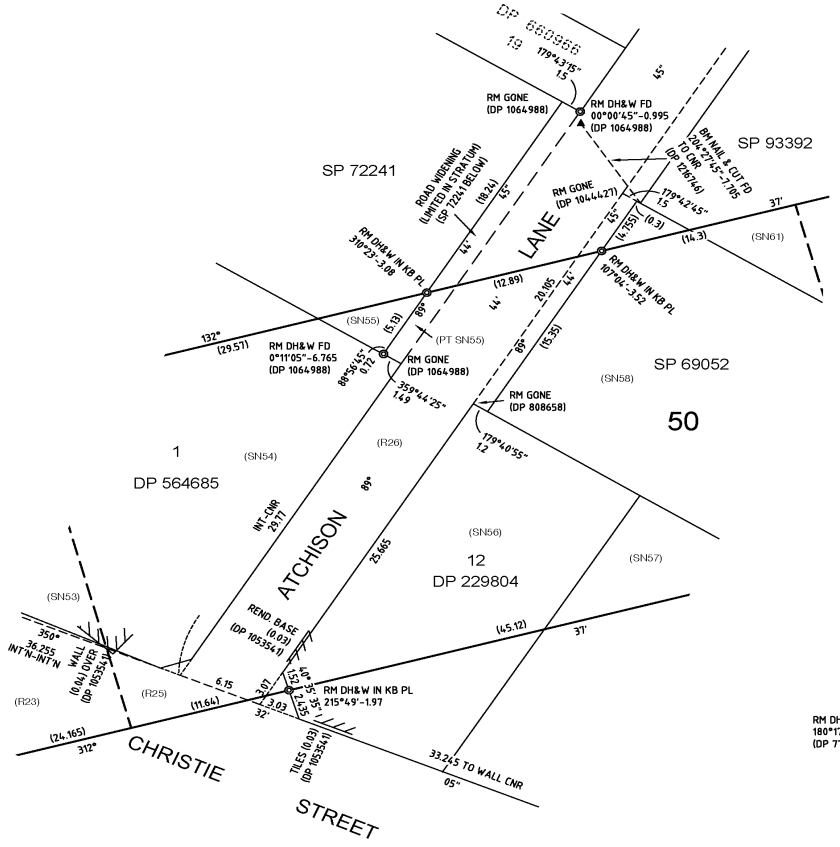


DIAGRAM 8B
SCALE 1:250

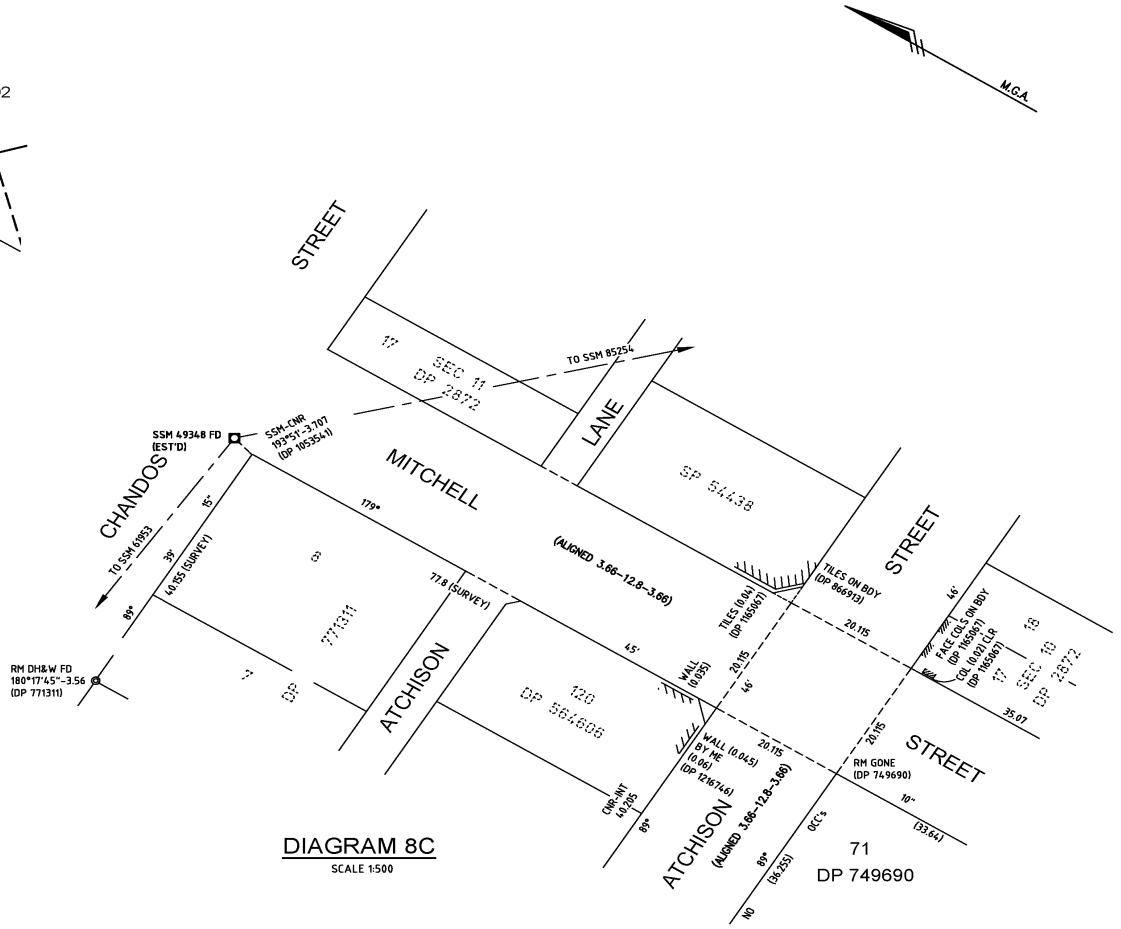


DIAGRAM 8C
SCALE 1:500

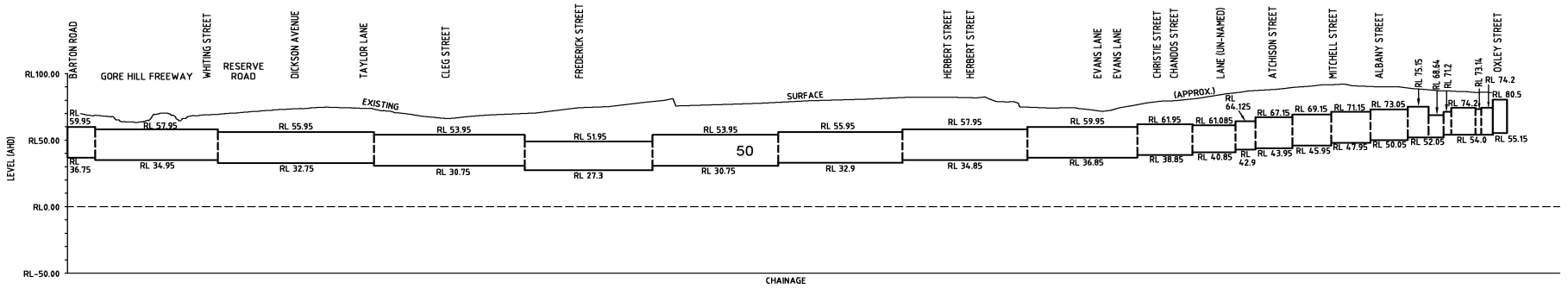
THE ACQUISITION OF LAND IN A STRATA SCHEME
AFFECTS COMMON PROPERTY ONLY

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: **AS SHOWN**	Registered: 06.04.2018	DP1231638

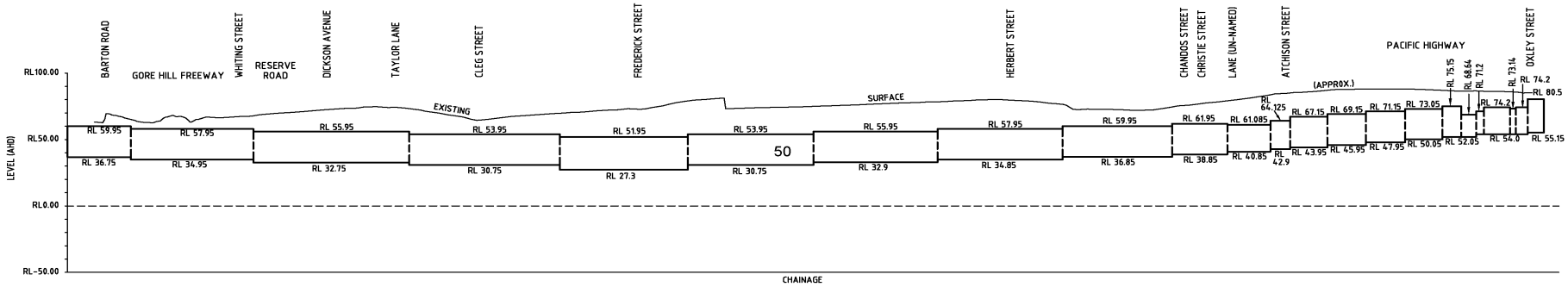
10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:11 of 15
Ref:50418 001 /Src:M



SECTION A-A



SECTION B-B

NOTE

ALL LEVELS RELATIVE TO AUSTRALIAN HEIGHT DATUM (AHD)

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: N.T.S.	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:12 of 15
Ref:50418 001 /Src:M

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 50					
LOT 9 DP 806092	(SN1)	*68*	RL 57.95	RL 34.95	77	77
LOT 101 DP 838921	(SN2)	*68*	RL 57.95	RL 34.95	511	511
LOT 1 DP 605751	(SN3)	*69*	RL 57.95	RL 34.95	299	706
	(SN4)	*70*	RL 55.95	RL 32.75	407	
LOT 2 DP 1022490	(SN5)	*71*	RL 55.95	RL 32.75	87	87
LOT 1 DP 1022490	(SN6)	*71*	RL 55.95	RL 32.75	187	187
LOT 100 DP 631290	(SN7)	*72*	RL 55.95	RL 32.75	425	425
LOT B DP 358256	(SN8)	*73*	RL 55.95	RL 32.75	48	48
LOT 433 DP 752067	(SN9)	*74*	RL 55.95	RL 32.75	248	248
LOT 434 DP 752067	(SN10)	*75*	RL 55.95	RL 32.75	342	342
LOT 2 DP 168319	(SN11)	*75*	RL 55.95	RL 32.75	203	203
LOT 1 DP 168319	(SN12)	*75*	RL 55.95	RL 32.75	233	233
LOT 436 DP 752067	(SN13)	*75*	RL 55.95	RL 32.75	526	526
CP SP 35330	(SN14)	*75*	RL 55.95	RL 32.75	372	460
	(SN18)	*71*	RL 53.95	RL 30.75	88	
LOT 1 DP 948856	(SN15)	*74*	RL 55.95	RL 32.75	151	372
	(SN16)	*74*	RL 53.95	RL 30.75	221	
LOT 1 DP 983725	(SN17)	*73*	RL 53.95	RL 30.75	349	349
LOT 1 DP 603389	(SN19)	*71*	RL 53.95	RL 30.75	903	903
LOT 11 DP 739468	(SN20)	*68*	RL 53.95	RL 30.75	535	535
LOT 12 DP 739468	(SN21)	*68*	RL 53.95	RL 30.75	358	358
LOT 13 DP 230974	(SN22)	*68*	RL 53.95	RL 30.75	1748	1748
LOT 12 DP 230974	(SN23)	*71*	RL 53.95	RL 30.75	884	3603
	(SN24)	*73*	RL 51.95	RL 27.30	2719	
LOT 1 DP 418152	(SN25)	*78*	RL 51.95	RL 27.30	1509	3373
	(SN26)	*80*	RL 53.95	RL 30.75	1864	
LOT 23 DP 882435	(SN27)	*76*	RL 53.95	RL 30.75	1050	1050
LOT 1 DP 1079151	(SN28)	*77*	RL 53.95	RL 30.75	443	443
LOT 1 DP 778425	(SN29)	*77*	RL 53.95	RL 30.75	1381	2101
	(SN30)	*78*	RL 55.95	RL 32.90	720	
LOT 2 DP 778425	(SN31)	*79*	RL 55.95	RL 32.90	2546	2546
LOT 210 DP1172133	(SN32)	*80*	RL 55.95	RL 32.90	1416	3199
	(SN33)	*82*	RL 57.95	RL 34.85	1783	
CP SP 66951	(SN35)	*80*	RL 57.95	RL 34.85	1257	1257
LOT 2 DP 1015776	(SN36)	*77*	RL 57.95	RL 34.85	486	1908
	(SN37)	*74*	RL 59.95	RL 36.85	1422	
LOT 13 DP 1003022	(SN38)	*74*	RL 59.95	RL 36.85	656	656
LOT 11 DP 1003022	(SN39)	*73*	RL 59.95	RL 36.85	1064	1064
LOT 8 SEC 28 DP4241	(SN40)	*73*	RL 59.95	RL 36.85	19	19
LOT 7 SEC 28 DP4241	(SN41)	*73*	RL 59.95	RL 36.85	53	53
LOT 1 SEC 28 DP 4241	(SN42)	*75*	RL 59.95	RL 36.85	154	154
LOT 2 SEC 28 DP 4241	(SN43	*75*	RL 59.95	RL 36.85	201	211
	(SN51)	*77*	RL 61.95	RL 38.85	10	
LOT 3 SEC 28 DP 4241	(SN44)	*76*	RL 59.95	RL 36.85	179	230
	(SN50)	*77*	RL 61.95	RL 38.85	51	
LOT 4 SEC 28 DP 4241	(SN45)	*76*	RL 59.95	RL 36.85	127	213
	(SN49)	*77*	RL 61.95	RL 38.85	86	
LOT 5 SEC 28 DP 4241	(SN46)	*77*	RL 59.95	RL 36.85	36	157
	(SN48)	*77*	RL 61.95	RL 38.85	121	

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 50					
LOT 6 SEC 28 DP 4241	(SN47)	*78*	RL 61.95	RL 38.85	99	99
LOT 3 DP 733528	(SN52)	*79*	RL 61.95	RL 38.85	94	94
LOT 1 DP 564685	(SN53)	*81*	RL 61.95	RL 38.85	276	705
	(SN54)	*82*	RL 61.085	RL 40.85	429	
CP SP 72241	(SN55)	*83*	RL 61.085	RL 40.85	26	26
LOT 12 DP 229804	(SN56)	*83*	RL 61.085	RL 40.85	284	284
CP SP 32797	(SN57)	*84*	RL 61.085	RL 40.85	76	76
CP SP 69052	(SN58)	*85*	RL 61.085	RL 40.85	485	632
	(SN59)	*86*	RL 64.125	RL 42.90	147	
CP SP 93392	(SN61)	*85*	RL 61.085	RL 40.85	33	492
	(SN64)	*87*	RL 64.125	RL 42.90	409	
	(SN65)	*87*	RL 67.15	RL 43.95	50	
LOT 1 DP 577070	(SN67)	*87*	RL 67.15	RL 43.95	29	29
LOT 71 DP 749690	(SN68)	*88*	RL 67.15	RL 43.95	669	1863
	(SN69	*91*	RL 69.15	RL 45.95	1194	
CP SP 71980	(SN71)	*91*	RL 71.15	RL 47.95	272	272
LOT A DP 431687	(SN72)	*90*	RL 73.05	RL 50.05	480	603
	(SN73)	*89*	RL 75.15	RL 52.05	123	
LOT 10 DP 660453	(SN74)	*89*	RL 75.15	RL 52.05	202	202
LOT 1 DP 772247	(SN75)	*88*	RL 75.15	RL 52.05	213	213
CP SP 96792	(SN76)	*88*	RL 68.64	RL 52.05	465	465
LOT 1 DP 1096026	(SN78)	*88*	RL 71.20	RL 54.00	251	251
CP SP 90263	(SN80)	*87*	RL 74.20	RL 54.00	863	1386
	(SN81)	*87*	RL 73.14	RL 54.00	214	
	(SN82)	*87*	RL 74.20	RL 54.00	309	

ROAD OWNERSHIP TABLE

AFFECTED ROAD	FEE SIMPLE
GORE HILL FREEWAY	CT 29/805818, CT 34/805818, CT 924-233, CT B/364802, CT 31/805818, CT 11/1192259, CT 12/806092, CT 34/11/4088, A/C 3560-182, CT 12/1192259, CT 13/806092, CT 14/806092, CT 15/806092
WHITING STREET	CT 690-27, CT 13/1192259, CT 17/1192259, CT 4642-76
CURRY LANE	CT 690-27
RESERVE ROAD	CROWN LAND
DICKSON AVENUE	CROWN LAND, CT 690-27, CT 1380-65
TAYLOR LANE	CROWN LAND
CLEG STREET	CT 1414-210, CT 6975-76
FREDERICK STREET	CT 300-88
HERBERT STREET	CROWN ROAD (VESTED IN WILLOUGHBY C.C.) VIDE GOV'T GAZETTE 23/04/1895 FOL 2642 CT 9/1003022, CT 1/772072
EVANS LANE	CT 1522-116
CHANDOS STREET	CT 1035-34, CT15068-1
CHRISTIE STREET	CT 1035-34, CT 4922-218, CT 10250-41, CT 1522-116
ATCHISON LANE	CT 1035-34, CT 100/808658
ATCHISON STREET	CT 1035-34
MITCHELL STREET	CT 1035-34
PACIFIC HIGHWAY	CROWN ROAD VIDE GOV'T GAZETTE 17/2/1888 FOL 1298 CROWN ROAD VIDE GOV'T GAZETTE 24/1/1958 FOL 162 CT 1321-240, CT 1320-156, CT 5039-144, CT 4318-64, CT 1177-166, CT 1130-226, CT 1177-36, CT 2058-207, CT 1928-18, CT 1/185649, CT 2453-171, CT 2450-94, CT 1832-241, CT 1827-32, CT 1793-93, CT 2502-163, CT 2337-85, CT 1654-139
ALBANY STREET	CT 1035-34
OXLEY STREET	CT 1035-34
CLARKE LANE	CT 1035-34

AFFECTED ROAD	EXTENT OF ACQUISITION					
	PLAN NOTATION	APPROX GROUND LEVEL	UPPER STRATUM LIMIT	LOWER STRATUM LIMIT	PART AREA (approx.) (m^2)	TOTAL AREA (approx.) (m^2)
	ACQUISITION LOT 50					
GORE HILL FREEWAY	(R1)		RL 59.95	RL 36.75	56	4548
	(R2)		RL 59.95	RL 36.75	29	
	(R3)		RL 59.95	RL 36.75	300	
	(R4)		RL 59.95	RL 36.75	312	
	(R5)		RL 59.95	RL 36.75	780	
	(R6)		RL 57.95	RL 34.95	4	
	(R7)		RL 57.95	RL 34.95	435	
	(R8)		RL 57.95	RL 34.95	2632	
WHITING ROAD	(R9)		RL 57.95	RL 34.95	658	658
RESERVE ROAD	(R10)		RL 57.95	RL 34.95	12	1786
	(R11)		RL 55.95	RL 32.75	1123	
	(R15)		RL 55.95	RL 32.75	651	
CURRY LANE	(R12)		RL 55.95	RL 32.75	101	101
DICKSON AVENUE	(R14)		RL 55.95	RL 32.75	595	595
TAYLOR LANE	(R16)		RL 55.95	RL 32.75	180	180
CLEG STREET	(R17)		RL 53.95	RL 30.75	595	595
FREDERICK STREET	(R18)		RL 51.95	RL 27.30	595	595
HERBERT STREET	(R19)		RL 57.95	RL 34.85	1182	1182
EVANS LANE	(R21)		RL 59.95	RL 36.85	228	228
CHANDOS STREET	(R22)		RL 61.95	RL 38.85	411	422
	(R24)		RL 61.95	RL 38.85	11	
CHRISTIE STREET	(R23)		RL 61.95	RL 38.85	926	955
	(R25)		RL 61.085	RL 40.85	29	
ATCHISON LANE	(R26)		RL 61.085	RL 40.85	267	267
ATCHISON STREET	(R27)		RL 64.125	RL 42.90	193	844
	(R28)		RL 67.15	RL 43.95	651	
PACIFIC HIGHWAY	(R29)		RL 69.15	RL 45.95	190	1937
	(R32)		RL 71.15	RL 47.95	739	
	(R34)		RL 73.05	RL 50.05	569	
	(R34A)		RL 75.15	RL 52.05	209	
	(R36)		RL 68.64	RL 52.05	111	
	(R37)		RL 71.20	RL 54.0	37	
	(R37A)		RL 74.20	RL54.0	54	
	(R40)		RL80.50	RL 55.15	28	
MITCHELL STREET	(R30)		RL 69.15	RL 45.95	72	438
	(R31)		RL 71.15	RL 47.95	366	
ALBANY STREET	(R33)		RL 71.15	RL 47.95	98	441
	(R35)		RL 73.05	RL 50.05	343	
OXLEY STREET	(R38)		RL 74.20	RL 54.00	52	678
	(R39)		RL80.50	RL 55.15	626	

Surveyor: DAVID WALLACE FAIRLIE
Date of Survey: 12.05.2017
Surveyor's Ref: PR124856-DP5
2017M7100 (792 & 799)

PLAN OF
ACQUISITION FOR RAILWAY PURPOSES

L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY
Locality: ARTARMON, ST LEONARDS
Subdivision No: —
Lengths are in metres. Reduction Ratio 1: 2000

Registered: 06.04.2018

DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R945133 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:19-Jul-2018 13:29 /Seq:13 of 15
Ref:50418 001 /Src:M

PLAN FORM 6 (2013) WARNING: Creasing or folding will lead to rejection ePlan

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet 1 of 2 sheet(s)

Office Use Only

Registered: 06.04.2018

Title System: TORRENS

Purpose: ACQUISITION

Office Use Only

DP1231638

PLAN OF ACQUISITION FOR RAILWAY PURPOSES

LGA: WILLOUGHBY, LANE COVE, NORTH SYDNEY

Locality: ARTARMON, ST LEONARDS

Parish: WILLOUGHBY

County: CUMBERLAND

Crown Lands NSW/Western Lands Office Approval

I, ... (Authorised Officer) in approving this plan certify that all necessary approvals in regard to the allocation of the land shown herein have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I, ...

*Authorised Person/*General Manager/*Accredited Certifier, certify that the provisions of s.109J of the *Environmental Planning and Assessment Act 1979* have been satisfied in relation to the proposed subdivision, new road or reserve set out herein.

Signature: .....

Accreditation number: .....

Consent Authority: .....

Date of endorsement: .....

Subdivision Certificate number: .....

File number: .....

*Strike through if inapplicable.

Survey Certificate

I, DAVID WALLACE FAIRLIE.....

of RPS AUST EAST PTY LTD.....

a surveyor registered under the *Surveying and Spatial Information Act 2002*, certify that:

*(a) The land shown in the plan was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on 12.05.2017

~~*(b) The part of the land shown in the plan (*being/*excluding ^.....) was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on,..... the part not surveyed was compiled in accordance with that Regulation.~~

~~*(c) The land shown in this plan was compiled in accordance with the *Surveying and Spatial Information Regulation 2012*.~~

Signature: DFairlie Dated: 1-08-2017

Surveyor ID: 1007

Datum Line: "X"-"Y"

Type: *Urban/*~~Rural~~

The terrain is *Level-Undulating / *~~Steep-Mountainous.~~

*Strike through if inapplicable.

^Specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey.

Statements of intention to dedicate public roads, create public reserves and drainage reserves, acquire/resume land.

IT IS INTENDED TO ACQUIRE LOT 50 FOR RAILWAY PURPOSES

Plans used in the preparation of survey/~~compilation.~~

DP1126778, DP805818, DP 833059, DP806092, DP1048901, DP1130724, DP1047418, DP858099, DP868438, DP730544, DP858277, DP790473, DP533025, DP576119, DP1162895, DP1061909, DP1212720, DP1204680, DP842305, DP1003022, DP 816029, DP1027235, DP1169573, DP881725, DP1034099, DP1053541, DP733528, DP1083469, DP1216746, DP749690, DP1188654, DP1060663, DP1042066, DP1013802, DP 1211595, DP1073691, DP859385, DP 1234823

If space is insufficient continue on PLAN FORM 6A

Signatures, Seals and Section 88B Statements should appear on PLAN FORM 6A

Surveyor's Reference: PR124856-DP5
2017M7100(792 & 799)

PLAN FORM 6A (2012) WARNING: Creasing or folding will lead to rejection ePlan

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet 2 of 2 sheet(s)

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Registered: 06.04.2018

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DP1231638

PLAN OF ACQUISITION FOR RAILWAY PURPOSES

This sheet is for the provision of the following information as required:

- A schedule of lots and addresses - See 60(c) *SSI Regulation 2012*
- Statements of intention to create and release affecting interests in accordance with section 88B *Conveyancing Act 1919*
- Signatures and seals- see 195D *Conveyancing Act 1919*
- Any information which cannot fit in the appropriate panel of sheet 1 of the administration sheets.

Subdivision Certificate number: .....

Date of Endorsement: .....

Surveyor's Reference: PR124856-DP5 2017M7100(792 & 799)

Appendix D – Geotechnical Impact Assessment

Douglas PARTNERS

GROUNDED EXPERTISE

Report on Geotechnical Impact Assessment for Sydney Metro

Proposed Mixed-use Residential Building

601 Pacific Highway, St Leonards, NSW

Prepared for Stockland Commercial Property

Project 86230.02

20 March 2026

Document History

Details

Project No.	86230.02
Document Title	Report on Geotechnical Impact Assessment for Sydney Metro
Site Address	601 Pacific Highway, St Leonards, NSW
Report Prepared For	Stockland Commercial Property
Filename	86230.02.R.001.Rev2

Status and Review

Status	Prepared by	Reviewed by	Date issued
Draft A	Craig Stemp	Charles Marais / Peter Hunt	8 December 2025
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Revision 2	Craig Stemp	Hugh Burbidge	20 March 2026

Distribution of Copies

Status	Issued to
Draft A	Hee-Jung Yoon, Stockland
Revision 0	Hee-Jung Yoon, Stockland
Revision 1	Diego Eguiguren, Stockland
Revision 2	Diego Eguiguren, Stockland

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature		Date
Author		20 March 2026
Reviewer		20 March 2026

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Appendix A: About this Report

Appendix B: Drawings

Appendix C: Modelled Geometry and Structural Loads

Appendix D: Results of Numerical Analysis

Report on Geotechnical Impact Assessment for Sydney Metro Proposed Mixed-use Residential Building 601 Pacific Highway, St Leonards, NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of geotechnical numerical modelling carried out to assess the impact of the proposed mixed-use residential building at 601 Pacific Highway, St Leonards, NSW (the site) on the Sydney Metro tunnels beneath. The analysis was commissioned by Stockland Commercial Property and was undertaken in accordance with Douglas' proposal 86230.01.P.001.Rev2 and subsequent email proposal 4 February 2026.

It is understood that the proposed development will include the demolition of the existing 14-storey commercial building, excavation of an additional 10-12 m below the current basement level to extend the existing four partial basement levels to a six-level basement and the construction of a 52-storey mixed-use residential building.

The numerical analysis has been carried out to assess the potential impact of the proposed development on the underlying Sydney Metro tunnels, as required by the Sydney Metro Authority. Two tunnels, RT01 (easternmost) and RT02 (westernmost), run directly beneath the site.

The input parameters, model geometry, model sequence and results are discussed in the sections below.

2. Site description

The site, located at 601 Pacific Highway, St Leonards, is roughly rectangular in shape and has a total area of approximately 2,844 m^2. The site is bound by Aitchson Street to the north, Mitchell Street to the east, Pacific Highway to the south and a 7-storey commercial building with a one level basement carpark to the west (619 Pacific Highway). Beyond Aitchson Street to the north is a 27-storey residential building, understood to have a single level basement. Beyond Mitchell Street to the east is a five-storey commercial building with a basement car park.

Based on the available 'NSW 2 m Elevation Contours', the site topography generally slopes down towards the west, with surface levels of approximately RL 93 m in the east, falling to RL 88 m in the west, relative to Australian Height Datum.

At the time of writing this report the site was occupied by a 14-storey commercial building on the eastern portion of the site and a single level mixed-use retail building on the western portion of the site. The basement comprises 4 partial basements in a gradually spiralling arrangement with the lowest basement level understood to grade from RL 82.4 m at its highest point, down to about RL 81.3 m at its lowest (measured during the initial surveying of the site). Based on the supplied drawings it is understood that the existing basement retention system comprises a soldier pile wall with shotcrete infill panels.

It is understood from Sydney Metro drawings that the entire site is located within the second protection reserve. The top of the first reserve below the site ranges from RL 69 m in the west to RL 65 m in the east. The tunnel crown for both tunnels ranges from about RL 61 m in the west to RL 59 m in the east. A plan view of the protection reserves and tunnel alignments beneath the site are shown in Figure 1. The detailed survey plans prepared by LTS Lockley (Drawing. 52414 001BH), as well as Sydney Metro drawing MCSWTSE-JAB-TPW-AL-DRG-505125, are attached in Appendix B.

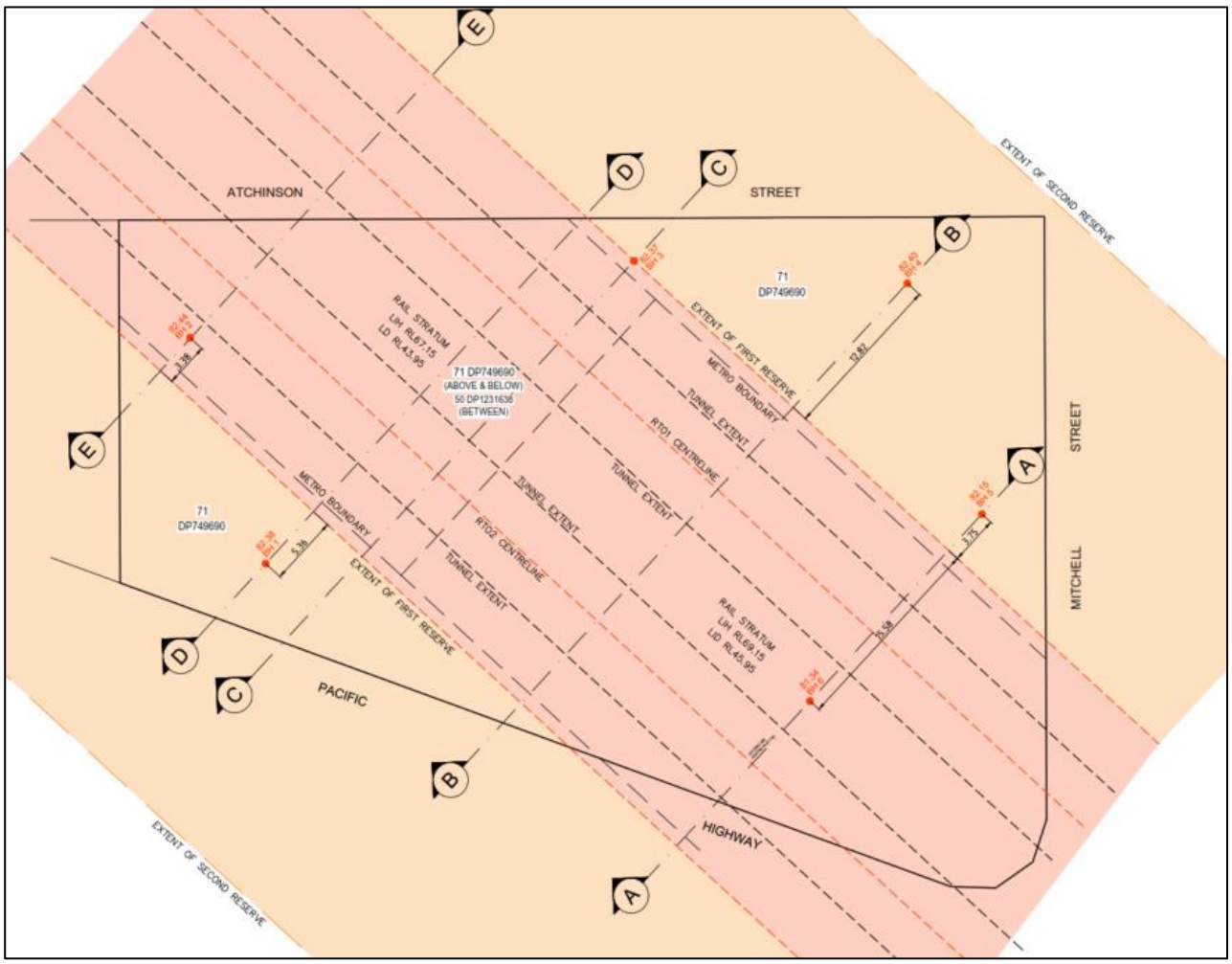

Figure 1 - Sydney Metro Tunnels and Protection Reserves beneath the site (LTS Lockley 52414 001BH - North is up the page)

3. Proposed Development

It is understood that the proposed development of the site will include the demolition of the existing 14-storey building and construction of a new 52-storey mixed-use residential building with 6 basement levels. The proposed bulk excavation level is RL 73.1 m, requiring additional excavation of up to 10 m. The detailed excavation level includes a 2 m deep raft slab to RL 71.2 m which covers the central area of the site directly above the tunnels. The deepest part of the excavation will be approximately 10 m above the tunnel crown. Batessmart architectural drawings have been attached in Appendix B.

Based on the supplied architectural drawings it is understood that the existing soldier pile shoring wall will remain, with a secondary soldier pile wall to be installed in-front of the existing wall, to provide retention for the additional basement levels.

The foundations will comprise a large core raft and pad footings (refer BG&E Drawing ST-SKT-026). Pad footing design is based on an allowable bearing capacity of 6,000 kPa, founded on medium to high strength sandstone/laminite.

4. Numerical Analysis

Douglas has used FLAC3D to assess the likely induced ground movements around the Sydney Metro tunnels as a result of the proposed development.

FLAC3D (Fast Lagrangian Analysis of Continua) is a three-dimensional, explicit finite difference program for modelling of soil, rock and structural behaviour. Used interactively or in batch mode, FLAC3D is an analysis and design tool for geotechnical and civil engineers that can be applied to a broad range of problems in engineering studies. Materials are represented by elements, or zones, which form a grid that is adjusted by the user to fit the shape of the object to be modelled. Each element behaves according to a prescribed linear or non-linear stress/strain law in response to the applied forces or boundary restraints. The material can yield and flow and the grid can deform (in large-strain mode) and move with the material that is represented. The explicit Lagrangian calculation scheme used in FLAC3D ensures that plastic collapse and flow are modelled accurately.

FLAC3D is ideally suited for modelling geomechanical problems that consist of several stages, such as sequential excavation, loading and unloading. The formulation can accommodate large displacements and strains and non-linear material behaviour, even if yield or failure occurs over a large area or if total collapse occurs.

4.1 Geotechnical Model

The geotechnical profile at the site, shown in Table 1, has been interpreted from borehole information from the geotechnical investigation carried out on site by Douglas.

Note that the material units have been assessed to provide an average interpretation over the whole site, with some units combined where their influence is expected to be negligible (i.e., fill and stiff clay). Therefore, geotechnical units may differ slightly from that presented in the geotechnical investigation report and section drawings. The surface level of the model has been adjusted to match the surveyed ground levels.

Table 1: Inferred Geotechnical Profile

Geotechnical Unit	Material	Relative Level to Underside of Stratum (m)
A	Fill	89.5
	Stiff Clay	88.5
B	Low and medium strength Shale	78
C	Medium strength laminite	67

Geotechnical Unit	Material	Relative Level to Underside of Stratum (m)
D	High strength sandstone	Base of Model at RL 23
E*	Medium strength sandstone band	56-52

* Used in the sensitivity case only (discussed further below).

Architectural Drawing SK.013b has been marked up by Douglas to show the geotechnical profile adopted for the modelling (refer the end of Appendix B).

4.2 Geotechnical Properties

Two cases have been adopted for the analyses:

Case 1: The base case model which uses serviceability properties and a typical in situ stress relationship.

Case 2: A sensitivity case which uses lower bound rock mass moduli for the rock units around the tunnel and an upper bound in situ stress. A medium strength sandstone band has also been included at the tunnel invert level. These properties are considered similar to that typically used in metro tunnel design in Sydney[1].

Unit A (soil) and Unit B (low to medium strength shale) were modelled using an elastic constitutive model. Unit C and Unit D were modelled using an elasto-plastic constitutive model, specifically Mohr Coulomb.

Soil properties near-surface have been estimated based on nearby information, together with Douglas' database of similar soils. Douglas have used a correlation factor of 16 for axial point load conversion to uniaxial compressive strength (UCS) for shale and 20 for sandstone.

The UCS estimates, estimated Geological Strength Index (GSI), and estimates of intact Elastic Modulus were processed using RocLab (Rocscience) to estimate the in-situ rock mass properties, based on a tunnel scale calculation method. As mentioned above, a sensitivity run was included with rock mass modulus and in-situ stress relationships in line with parameters similar to those typically used in Metro design[1], shown in brackets in Table 2.

[1] Bertuzzi, R (2014), Sydney sandstone and shale parameters for tunnel design, Australian Geomechanics, Vol 49 No 2, June 2014.

Table 2: Assumed Geotechnical Model Material Properties

Property	Unit A	Unit B	Unit C	Unit D	Unit E
Material	Soil	Low and Medium Strength Shale	Medium strength laminite	High Strength Sandstone	Medium Strength Sandstone Band
Uniaxial Compressive Strength (MPa)	-	2	12	20	(6)
GSI	-	40	65 (55)	80 (70)	(60)
Unit Weight (kN/m^3)	20	23	24	24	(24)
Soil / Rock Mass Elastic Modulus (MPa)	20	200	1500 (1000)	2500 (1700)	(800)
Poisson's Ratio	0.35	0.3	0.25	0.2	(0.25)
Friction angle (°)	-	-	48	53	(40)
Cohesion (kPa)	-	-	400	1100	(300)
Tension (kPa)	-	-	70	300	(44)

( ) Bracketed values are used for Case 2.

The model strength profile is shown on the graph (point load estimations and laboratory testing) in Figure 2 below. Note that Douglas used Australian Standards to classify rock strength.

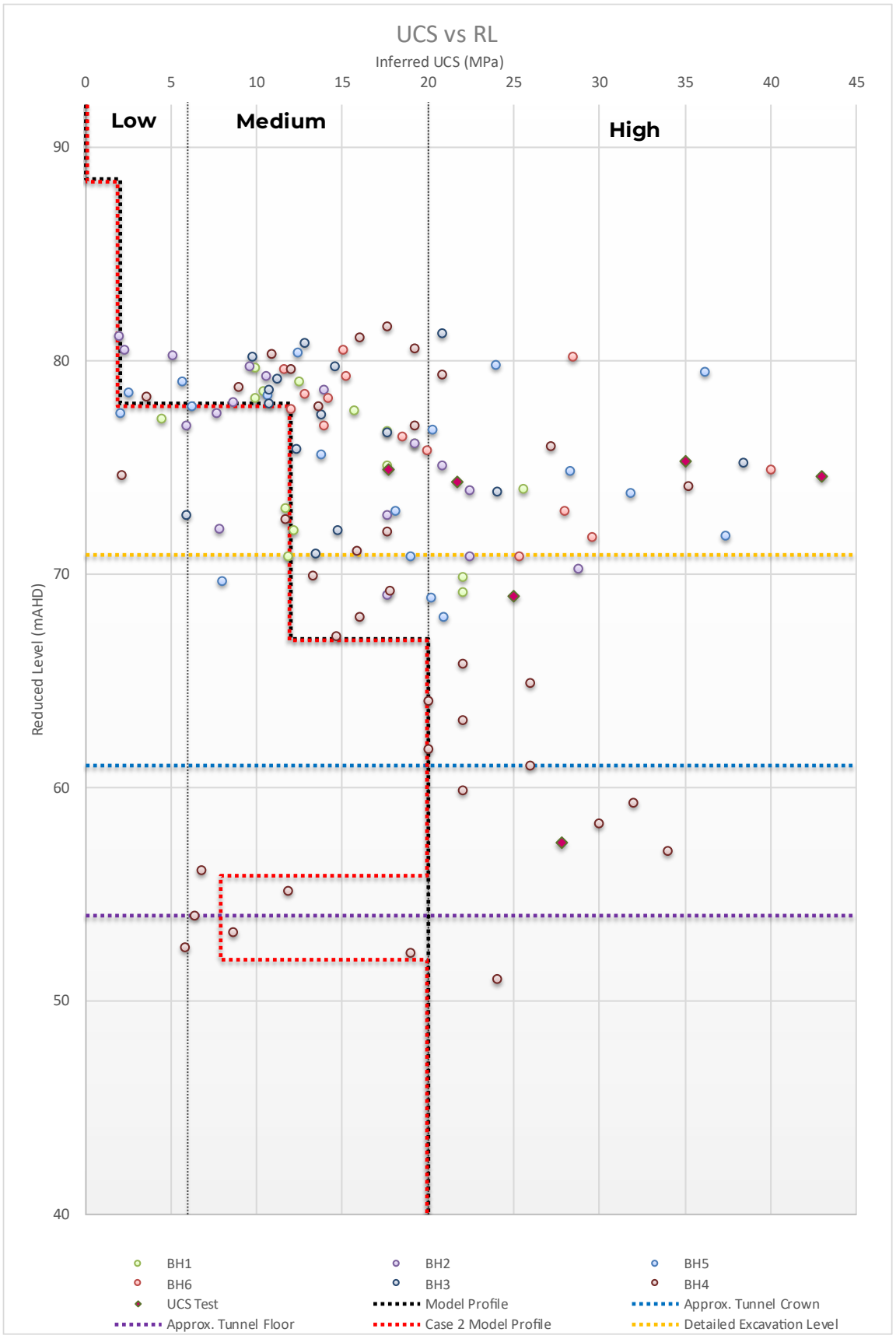

Figure 2: Graph of inferred UCS and Model Profiles

4.3 Bedding and Jointing

The bedding and jointing in the geological model have been simplified for the purposes of the analysis. Discontinuities have not been explicitly modelled as the objective of the model is to analyse the change in stress and related deformation in the rock mass and not to assess local wedge stability. The inferred rock mass strength properties given in Table 2, however, have been downgraded based on the GSI value (to provide some allowance for the effect that defects can have on the material properties).

4.4 In Situ Stress

The horizontal in situ stress in rock consists of a gravity component, equivalent to the overburden weight, plus a tectonic component. The magnitude of the tectonic component of the major horizontal principal stress for a depth 0 to 20 m has been reported to range from zero to 2.5 MPa, ignoring outliers (McQueen 2004[2]). The Pells (2002)2 stresses fit within the measured stress range which is generally higher than the predicted average. Some of the stress relationships for Sydney are presented in Figure 3.

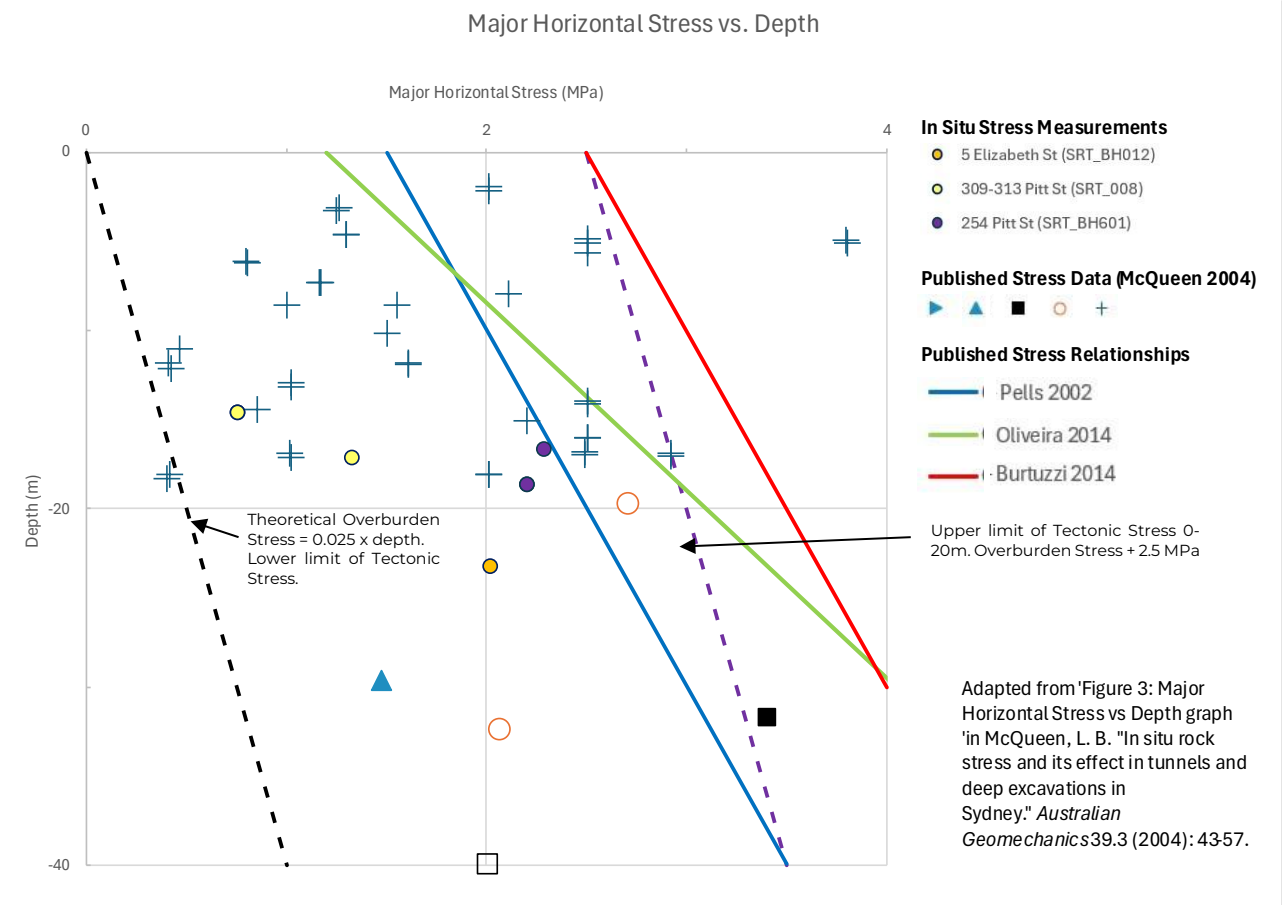

Figure 3: Major Horizontal Stress vs Depth - Comparison Between Measured Stress and Stress Relationships

[2] Pells, P.J.N (2002), Developments in the Design of Tunnels and Caverns in the Triassic Rocks of the Sydney Region, Int J Rock Mech and Min Sci, 39:569-587.

The in-situ stress relationships given in Table 3 have been adopted for Case 1. For the soil materials (Unit A) and lower strength rock (Unit B) a horizontal to vertical stress ratio of 0.5:1 and 1:1 was used respectively, typical for soils and weak rock in Sydney. For Unit D, a stress relationship for high strength sandstone, as presented in Pells (2002)[3], was adopted. Due to differences in stiffness, weaker layers will attract less stress than adjacent high strength layers. Unit C was therefore down-scaled using the stress scaling proposed by Oliveira & Parker (2014)[4].

Table 3: Adopted In Situ Stress Relationships for Case 1

Stress	Unit A	Unit B	Unit C	Unit D
σ_1	0.5 x σ_v	1.0 x σ_v	0.9 MPa + 1.3 x σ_v	1.5 MPa + 2 x σ_v
σ_2	0.5 x σ_v	1.0 x σ_v	0.63 x σ_1	0.63 x σ_1
σ_3	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H

where,

$\sigma_1 = North - South\ horizontal\ stress\ (MPa)$

$\sigma_2 = East - West\ horizontal\ stress\ (MPa)$

$\sigma_3 = Vertical\ stress\ (MPa)$

$\gamma = Unit\ weight\ (kN/m^3)$

$H = Depth\ below\ surface\ (m)$

The in-situ stress adopted for Case 2 (Sensitivity Case) is shown in Table 4, where the high strength rock unit adopts a typical stress relationship as presented by Burtuzzi (2014)[1]. Burtuzzi (2014)[1] stresses are at the upper range. Again, weaker layers were scaled using the stress scaling proposed by Oliveira & Parker.

Table 4: Adopted In Situ Stress Relationships for Case 2

Stress	Unit A	Unit B	Unit C	Unit D	Unit E
σ_1	0.5 x σ_v	1.0 x σ_v	1 MPa + 1.0 x σ_v	2.5 MPa + 2.0 x σ_v	0.5 MPa + 0.7 x σ_v
σ_2	0.5 x σ_v	1.0 x σ_v	0.7 x σ_1	0.7 x σ_1	0.7 x σ_1
σ_3	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H

4.5 Groundwater Table

The water table was not included in the modelling as the water table is expected to be at or just above the bulk excavation level. It is understood that the structural engineer will separately take into account any hydrostatic pressures on the tunnel. Settlement of the competent surrounding rock mass during the construction phase, should any dewatering occur, is expected to be negligible.

[3] Pells, P.J.N (2002), Developments in the Design of Tunnels and Caverns in the Triassic Rocks of the Sydney Region, Int J Rock Mech and Min Sci, 39:569-587.
[4] Oliveira, D.A.F, Parker, C.J (2014), An Alternative Approach for Assessing In Situ Stresses in Sydney, 15th Australasian Tunnelling Conference 2014, Sydney, NSW, 17-19 September 2014.

4.6 Model Geometry

The 3D model geometry was developed based on information provided by the design team, including a 3D survey of the site and tunnel. The foundations were modelled in accordance with BG&E Drawing ST-SKT-031 Rev B (refer Appendix C). The excavation level adopted in the model was RL 70.9 m, approximately 0.3 m deeper than the final proposed scheme (RL 71.2 m), however, this variation is minor and is not expected to affect the results.

The existing bulk level of the site has been taken at RL 81 m, based on the average depth of fill below the basement slab, encountered in the boreholes.

As specific details were not available some assumptions were made for neighbouring buildings. The following has been included in the model:

- 619 Pacific Highway: 7-storey commercial building with 1 level of basement carpark to the west.
- 2 Atchison Street: 15-storey hotel building to the north.
- 10 Atchison Street: 27-storey hotel building to the north.
- 20 Atchison Street: 3-storey building to the north.
- 22 Atchison Street: 5-storey building to the north.
- 1 Atchison Street: 5-storey commercial building to the east.
- 599 Pacific Highway: 20-storey commercial building to the east.
- 500 Pacific Highway: 43-storey commercial building with 6 levels of basement carpark to the south.

4.7 Sydney Metro Tunnels

Structural elements have been used in the model to represent tunnel linings. The tunnel lining stiffness was provided by Systra. Details of the tunnel lining properties adopted for the analysis are presented in Table 5.

Table 5: Properties of Elastic Structural Liner Elements

Type	Interface Stiffness (GPa/m)		Unit Weight (kN/m^3)	Elastic Modulus (GPa)	Poisson's Ratio	Thickness (mm)
	Normal (K_n)	Shear (K_s)				
Running Tunnel	1	0.1	25	27.8	0.2	260

It is understood that the running tunnel liner was installed at a distance of 12 m to 14 m back from the face so that the stress relief can occur before the permanent liner is installed. Despite this lag, the liner may have attracted some stress. To account for this in the model, the tunnel liner was installed after 90% of the stress relief has occurred (based on interpretation of the tunnel design reports).

4.8 Proposed Shoring and Temporary Works

As the tunnels are in rock and quite deep, shoring for the soil and weathered rock was not explicitly modelled (it has no significant impact on the tunnels). For simplicity the soil and weak rock were modelled as an elastic medium. The model results therefore should not be used for shoring design. A separate analysis will be required for shoring/anchor design and other temporary works.

4.9 Foundation Loads

The existing building pressures on the site have been estimated by using 10 kPa per floor with a uniform pressure applied. The existing neighbouring building pressures have also been estimated and applied as a uniform pressure of 10 kPa per floor. The building pressures were applied directly to the model grid.

The proposed building raft pressure and foundation loads have been provided by BG&E. A shear component for the raft has also been provided. The provided pressures and loads are attached in Appendix C.

For the new building the calculated pad pressures and the core pressures were applied directly to the rock. In order to apply the shear components, a structural element representing the 2 m deep raft slab was included.

Several load combination cases were provided for analysis, however, only the following cases were used for modelling, as recommended by BG&E:

- Serviceability gravity Load Case G+0.7Q (S001_ST_G+0.7Q(Red)-NL).
- Serviceability Wind Load Case 11 (S011_LT_G+0.4Qred+W(Rep)(11/24)).
- Serviceability Wind Load Case 14 (S011_LT_G+0.4Qred+W(Rep)(14/24)).
- Serviceability Wind Load Case 15 (S011_LT_G+0.4Qred+W(Rep)(15/24)).

4.10 Modelling Assumptions

The following assumptions were made for the model which should be considered when interpreting the results:

- The metro tunnels are lined using a segmental lining, with gaps between the lining and rock grouted. The model, however, assumes a continuous liner rather than a segmental liner. A high normal stiffness, no tensile capacity and low cohesion have been assumed for the interface between the lining and the rock. This results in a relatively immediate lining response to any movement in the rock mass surrounding the tunnel. This also allows for the liner to become detached from the rock mass when subject to ground movement.
- The gap between the tunnel lining and rock mass is eventually grouted (after the TBM has progressed). In the model, the Metro tunnel liners have been installed after 90% ground relaxation (stress relief) has occurred. This is done to simulate stress relief and deformation that occurs prior to grouting the void between the lining and rock mass (it is understood that the tunnel designers have considered 90% relaxation in their design).
- This study included a sensitivity analysis in which the rock properties for Units C and D were reduced to values more consistent with typical Metro tunnel design parameters. These

sensitivity analyses adopt a lower rock mass modulus and higher in-situ stresses compared to the serviceability properties and in-situ stresses used in Case 1. An additional unit (Unit E) was also introduced to represent a potential weaker layer encountered in Borehole 4, even though it is likely to only be localised (potentially a low-angle thrust fault).

- Angular distortion (differential displacement) was estimated over ¼ of the tunnel diameter. It is expected that the structural engineer will carry out an independent structural assessment of the liners to provide a more accurate assessment of the angular distortions.
- This report is not intended to be used to assess the requirements for excavation shoring. Douglas has assumed that the shoring will be designed separately, adequately braced and anchored back to limit soil movements around the perimeter, design to support the overburden materials and weak rock.
- The assessment does not take into account liner surcharge loads such as wedge loading, hydrostatic pressures, etc. This needs to be considered when carrying out the structural assessment of the liner (to be conducted by the structural engineer).
- If additional information that may impact the results of this assessment becomes available at a later stage, or if the design changes in any way (i.e., basement excavation depth, building loading or if additional tunnel information becomes available), then it will be necessary to update the current assessment.

4.11 Modelling Sequence and Sensitivity Analysis

Two cases were analysed. These included:

Case 1: Serviceability Rock Mass Properties (Serviceability Run).

The following sequence was modelled:

Stage 0: Initial Conditions

- Set up geology, geometry and stress conditions prior to any development and run to equilibrium.
- Reset displacements, excavate the existing site and all neighbouring sites, apply existing building loads and run to equilibrium.
- Excavate Metro tunnels and run to 90% stress relief.
- Install structural element liner and run to 100% stress relief (i.e. equilibrium).

Stage 1: Proposed Demolition and Basement Excavation

- a) Reset displacements, remove applied loads on the site to simulate demolition and run to equilibrium.
- b) Excavate proposed basement and run to equilibrium.

Stage 2: Apply Building Loads

- Apply new G+0.7Q building loads and run to equilibrium.
- Apply wind building loads and run to equilibrium.

Case 1 was run for the four combination load cases in Section 4.9.

Case 2: Sensitivity Rock Mass Properties (Sensitivity Run)

Case 2 comprised a sensitivity run, using the same sequence that was used for Case 1, but with a lower bound modulus, higher in situ stresses and a weak seam near the tunnel invert, as discussed in previous sections.

Results are discussed in the sections to follow.

5. Results

The results of the analysis have been presented as plots of induced displacement and stress in the rock mass. Displacement of the tunnel liners have also been provided. The plots are attached in Appendix D. Additional outputs are available on request, should it be required.

The rock mass and the tunnel liner displacements were reset after Stage 0 (existing conditions). Stages 1a and 1b, therefore, only represent displacement of the rock mass and liners due to the proposed development (demolition – Stage 1a and excavation – Stage 1b). Stage 2 Plots (application of building loads) represent the cumulative effects, including that of demolition and excavation.

Stresses were not reset and hence predict the total stress within the materials, which should be compared to the Stage 0 plots if the expected impact that the proposed development will have on the infrastructure is to be determined.

It should be noted that the results are provided in SI units in metres and Pascals, and that:

- Negative stress represents compression, i.e., the most negative stress is the maximum principal stress and the less negative stress is the minimum principal stress.
- Total displacement or 'displacement magnitude' represents the vector sum of displacement.
- Certain contour plots have been scaled to focus on displacements and stresses around the tunnels and are limited to a defined value range. When interpreting these plots, values outside this range may appear as the same colour and should not be assumed to represent the maximum or minimum actual values.

The following plots have been included:

- Plots of 3D geometry - plan view and perspective view (Plot 1).
- Plots of the geotechnical units along Section 1 (Plot 2).

<u>Case 1: Serviceability Rock Mass Properties</u>

- Plots of total rock mass and tunnel liner displacement for Stages 1a and 1b (Plot 3).
- Plots of raft pressures applied in the model and total tunnel liner displacement for Stage 2, Load Case G+0.7Q (Plot 4).
- Plots of raft pressures applied in the model and total tunnel liner displacement for Stage 2, Load Case 11 (Plot 5).
- Plots of raft pressures applied in the model and total tunnel liner displacement for Stage 2, Load Case 14 (Plot 6).

- Plots of raft pressures applied in the model and total tunnel liner displacement for Stage 2, Load Case 15 (Plot 7).
- Plots of maximum and minimum principal stress for Stage 0, and Stage 1 along Section 1 (Plot 8).
- Plots of maximum and minimum principal stress for Stage 2, Load Cases G+0.7Q and 14 along Section 1 (Plot 9).

Case 2: Lower Bound Rock Mass Properties and High In Situ Stress (Sensitivity Run)

- Plots of total rock mass displacement and total tunnel liner displacement for Stage 1 and Stage 2, for Load Case 14 (Plot 10). Other load cases indicated lower displacements (not included). These plots can be provided if required.
- Plots of maximum and minimum principal stress for Stage 0, and Stage 2, Load Case 14 along Section 1 (Plot 11).

A summary of the results presenting the displacements in the rock mass and tunnel liner for the RT01 tunnel are shown in Table 6.

Only limited plots and stress changes have been provided. Results are limited to the worst affected tunnel (RT01).

Table 6: Case 1 Serviceability Displacement Results for RT01 Tunnel

Stage	Load Case	Maximum Total Rock Mass Displacement Around Tunnel (mm)	Maximum Total Tunnel Liner Displacement (mm)
1	**No Load**	3.6*	3.5*
2	**G+0.7Q**	7.2	7.0
	11	7.2	7.0
	14	7.3	7.1
	15	6.5	6.3

*Displacement is in uplift

Table 7: Case 2 Sensitivity Displacement Results for RT01 Tunnel

Stage	Load Case	Maximum Total Rock Mass Displacement Around Tunnel (mm)	Maximum Total Tunnel Liner Displacement (mm)
1	**No Load-**	6.3*	6.3*
2	**G+0.7Q**	11.0	10.8
	11	11.1	10.9
	14	11.3	11.0
	15	10.0	9.8

*Displacement is in uplift

Serviceability Case (Case 1)

The serviceability model indicates that:

- The maximum rock mass displacement plots indicate that the RT01 tunnel will be impacted slightly more than the RT02 tunnel. The maximum displacement around RT01 predicted during demolition is 2 mm in uplift, reaching up to 3.6 mm after completion of bulk and detailed excavation (end of Stage 1). The displacement in the tunnel liner is similar to the displacement of the surrounding rock mass.
- The maximum rock mass displacement is predicted to be 7.2 mm (downward) after loading (G+0.7Q), reaching up to 7.3 mm for Load Case 14. The displacement in the tunnel liner is very similar to that of the rock mass, predicted to be up to 7.1 mm for Load Case 14. The displacements reported are nett displacements.
- The maximum displacement in the tunnel floor during Stage 2 is predicted to be 4 mm (downward).
- For Load Case 14, a maximum angular distortion of 0.3 mm/m and 0.2 mm/m is estimated in the tunnel crown and tunnel floor, respectively.
- During the excavation stage (end of Stage 1), the plots (Plots 8 and 9) indicate that there is an increase in the maximum and a decrease in the minimum principal stresses in the rock in the vicinity of the crown of the tunnels (i.e., a slight increase in shear stress). The maximum principal stress change was seen in the rock around the RT01 tunnel with an increase in the maximum principal stress of up to 670 kPa, compared to Stage 0. The minimum principal stress change was a decrease in the compressive stress of 30 kPa, compared to Stage 0.
- For Load Case 14, during the loading stage (Stage 2), the results indicate that there is an increase in the maximum and minimum principal stresses in the rock in the vicinity of the

crown of the tunnel. The maximum principal stress change was around the RT01 tunnel with an increase in the maximum principal stress of up to 160 kPa, compared to Stage 0. The minimum principal stress change was an increase of 300 kPa, compared to Stage 0.

- The stress and failure state in the model indicates that the stresses around the tunnel remain in compression, with no significant rock mass failure shown (i.e., shear stresses remain relatively low).

Sensitivity Case (Case 2)

The sensitivity model indicated that:

- The maximum rock mass displacement, again, predicts more impact on the RT01 tunnel. The predicted displacement during demolition is 3.3 mm in uplift, reaching up to 6.3 mm after completion of bulk and detailed excavation (end of Stage 1). The displacement in the tunnel liner is the same as the rock mass.
- For G+0.7Q loading, the Maximum tunnel liner displacement is predicted to be 10.8 mm (downward), reaching up to 11 mm for Load Case 14. The displacement in the tunnel liner was very similar to the surrounding rock mass.
- The maximum displacement in the tunnel floor during Stage 2 is predicted to be 5.6 m (downwards).
- For Load Case 14, a maximum angular distortion of 0.42 mm/m and 0.2 mm/m is estimated in the tunnel crown and tunnel floor, respectively.
- During the excavation stage (Stage 1a), the results indicate that there is an increase in the maximum and a decrease in the minimum principal stresses in the rock mass in the vicinity of the crown of the tunnel. The maximum principal stress change was seen in the rock around the RT01 tunnel with an increase in the maximum principal stress of up to 950 kPa, compared to Stage 0. The minimum principal stress change in the rock around tunnel decreased by 35 kPa, relative to Stage 0.
- For Load Case 14, during the loading stage (Stage 2), the results indicate that there is an increase in the maximum and minimum principal stresses in the rock in the vicinity of the crown of the tunnel, compared to Stage 0. The maximum principal stress change was seen in the rock around the RT01 tunnel with an increase in the maximum principal stress of up to 90 kPa, compared to Stage 0. The minimum principal stress change was an increase in 350 kPa, compared to Stage 0.
- The stress and failure state in the model indicates that the stresses around the tunnel crown remain in compression with no significant rock mass failure shown (i.e., shear stress remains relatively low).

6. Comments

The objective of the analysis was to provide estimates of displacements in rock mass and tunnel lining due to the proposed development (demolition, basement excavation and foundation loading). The following comments discuss the key findings and considerations arising from the analyses.

6.1 Displacements

Plot 1 in Appendix D shows the tunnels relative to the proposed basement and the location of the section used to present the results. The movements due to demolition are predicted to have very little effect on the tunnels (less than 2 mm) with an additional 1.6 mm (total around 3.6 mm) due to bulk and detailed excavation (end of Stage 1). The predicted movements due to unloading are predominantly vertical, in uplift.

The analysis indicates that, for the serviceability rock mass properties (Case 1) and construction sequence modelled, the maximum predicted deformation within the tunnel linings due to the proposed development is estimated to be up to 7.1 mm in nett settlement. This maximum displacement was predicted below the core, in the area of highest concentrated load. The estimated angular distortion (differential displacement) in the lining of RT01 tunnel is in the order of 0.3 mm/m. The predicted displacements and angular distortions for Case 1 are lower than the allowable movement outlined in the TfNSW Standard and the Sydney Metro Technical Guidelines.

The tunnel crowns are approximately 10.6 m below the proposed core excavation, which is approximately 2 m deeper than the proposed bulk excavation level. Wind Load Case 14 (Stage 2) showed the most settlement in the tunnel lining when compared to the other load cases analysed.

The maximum displacement in the tunnel floor at track level is predicted to be up to 4 mm in Case 1. The predicted track displacements are also less than the maximum limits for a train speed of 100 km/hr at the 25% allowable limit in Specification SPC 207[5] and less than the Sydney Metro ecified limit of 8 mm. The calculated angular distortion at the tunnel floor is also less than the Metro specified limit of 0.4 mm/m for the running rails.

6.2 Stresses

Pad footing loads were in the order of 5 MPa with the peak core pressures up to 2 MPa, founded approximately 10.6 m above the crown of the two tunnels. As a result, the group effects of the footings and core raft result in the tunnels being within the zone of increased stress.

For the serviceability rock mass properties (Case 1), the model predicts that the overall change in maximum principal stress within the rock along Section 1, in the RT01 crown, is in the order of 160 kPa (increase in compression). The minimum principal stress in the RT01 crown increases by up to 300 kPa, also in compression.

The maximum principal stress in the rock mass can be seen in the plots to reach up to 6 MPa in the tunnel crown area. The maximum principal stress in the rock mass in the pillar between the two tunnels is predicted to reach up to 2.5 MPa. Ignoring any confinement, the stresses are well under the characteristic UCS of high strength sandstone and below the crack initiation stress (assumed to be 40 to 60 % the UCS of the rock[6]). A more significant increase in the minimum principal stress suggests a reduction in shear stress. Based on the above, it is expected that the predicted stress increase will not adversely affect the rock mass.

[5] Transport NSW Railcorp, Track Monitoring Requirements for Undertrack Excavation (SPC 207), Version 1.5, April 2013.
[6] Hoek,E & Martin, C.D. (2014), Fracture initiation and propagation in intact rock - A review, Journal of Rock Mechanics and Geotechnical Engineering 6 (2014) 287 - 300

6.3 Sensitivity Analysis (Model Case 2)

The sensitivity analysis was carried out to provide estimates of upper bound displacements and stresses. It should be noted that for the sensitivity case (Case 2) the rock mass elastic modulus is reduced to a value well below that used for the serviceability case (Case 1). The serviceability case properties are already at the lower end of the parameter range. Modelling carried out with the serviceability properties have consistently provided realistic results for projects in the Sydney region (through correlation of modelled predictions with on-site survey data). In some cases, however, adverse conditions have resulted in deformations larger than that predicted by the modelling. It is therefore prudent to consider the results of the sensitivity runs.

The sensitivity analyses predict liner displacements of up to 11 mm, at the end of Stage 2. A maximum angular distortion in the order of 0.42 mm/m was calculated in the RT01 tunnel. The overall displacement prediction is slightly higher than the 10 mm tunnel limit provided in the Sydney Metro Technical Guidelines. The results of the sensitivity cases can be assessed in the context that they are considered to be upper bound and quite conservative. The predicted values for the sensitivity case, however, should still satisfy sound limit state design criteria.

For the sensitivity case the maximum displacement in the tunnel floor at track level is predicted to be 5.6 mm. The estimated track displacements are less than the maximum limits for a train speed of 100 km/hr at the 25% allowable limit in Specification SPC 207[7] and less than the Sydney Metro 8 mm limit. The calculated angular distortion at the tunnel invert is also less than the Sydney Metro limit of 0.4 mm/m.

It should be noted that the geotechnical profile conservatively assumes a continuous lower strength sandstone unit (Unit 5) at the base of the tunnels (based on one deep borehole). It is assumed that an additional deep borehole will be conducted prior to CC to confirm the geotechnical profile at depth. The additional borehole will assist in confirming whether this weak layer is present or whether it is just a localised zone.

6.4 Structural Assessment

It is recommended that the structural engineer conduct a structural assessment on the tunnel liner based on the assumptions and predictions in this study. In particular, the structural engineer needs to assess the impact that the predicted deformations will have on a segmented liner, focusing on the expected effect that angular distortion will have on liner stability. The structural engineer also needs to consider the water pressure and any other forces/pressures that may act on the lining.

7. Conclusions

The report presented the results of the numerical analysis for the proposed redevelopment at 601 Pacific Highway, St Leonards. The numerical modelling has been based on loads and basement geometries provided by the design team. The ground profile and rock material parameters have been based on the findings of the geotechnical site investigation.

[7] Transport NSW Railcorp, Track Monitoring Requirements for Undertrack Excavation (SPC 207), Version 1.5, April 2013.

A serviceability assessment, based on four load combinations, has been carried out to evaluate the impact that the proposed development will have on the Metro infrastructure. A sensitivity analysis was also carried out to assess the impact, should weaker than anticipated ground conditions be encountered.

Based on the Serviceability analysis (Case 1), the proposed development is predicted to result in maximum displacements which are within the Sydney Metro limits for the tunnels and tracks. The 10 mm deformation criterion, however, is exceeded by approximately 1 mm in the sensitivity analysis. The sensitivity case adopts more conservative material parameters and in situ stress relationship to present a worst-case. Despite the conservatism, it is essential that the sensitivity case is also considered.

From a geotechnical first principal design point of view, it is Douglas's opinion that both the serviceability and sensitivity analyses indicate that the proposed design is viable, providing the structural analysis also indicates it is viable. As mentioned before, it is critical that the tunnel designer (or structural engineer) carry out an independent assessment on the tunnel linings, based on the predicted rock deformations given in this report, (considering both cases). A detailed structural model will be required to assess the residual capacity of the liner. A similar assessment should be carried out for the new structure to ensure the structure can take the additional displacements.

After completion of all assessments and analyses, it will be necessary to consult with the relevant authorities to obtain their consent and approval.

Further deep boreholes should be drilled before CC to confirm whether the weaker Unit 5 layer (assumed in Case 2) is continuous beneath the site. Stress testing in these boreholes is also recommended to further reduce the risk related to variable ground conditions. Model parameters will be refined as new borehole data becomes available.

As some Metro limits are exceeded in the sensitivity case, it will be necessary to develop detailed monitoring plans with trigger and response plans to ensure that the actual deformation is as predicted, and within the range for which the new building and the underground infrastructure has been designed for. The monitoring plan should include an observational approach with agreed contingencies for this site (i.e. a reduction in load/height of structure). A risk assessment will also need to be carried out.

It is critical that all footings in close proximity to the tunnels are individually assessed by a geotechnical engineer prior to finalising the design. Further numerical analysis may be also required if changes are made.

During excavation and construction all rock faces and footings will need to be inspected by a geotechnical engineer/engineering geologist.

8. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at 601 Pacific Highway, St Leonards, NSW in line with Douglas' email proposal dated 4 February 2026 and acceptance received from Diego Eguiguren of Stockland Commercial Property. The work was carried out under the current agreement. This report is provided for the exclusive use of

Stockland Commercial Property for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

This report provides specialist advice only and no part of it is considered a Regulated Design under the Design and Building Practitioner Act 2020 (NSW).

Appendix A

About this Report

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix B

Drawings

NOTES

1. THE BOUNDARIES HAVE NOT BEEN MARKED
2. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
3. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH
4. SYDNEY METRO TUNNEL RESERVES HAVE BEEN CALCULATED AS PER SYDNEY METRO UNDERGROUND CORRIDOR PROTECTION TECHNICAL GUIDELINE AS PROVIDED. RESERVES HAVE BEEN CALCULATED BASED ON SYDNEY METRO STRATUM OWNERSHIP AS DEFINED IN DP1231638 AND SYDNEY METRO CITY & SOUTHWEST GA PLAN AND LONGITUDINAL SECTION DRAWING No. SMCSWTSE-JAB-TPW-AL-DRG-505225 DATED 09-01-2018

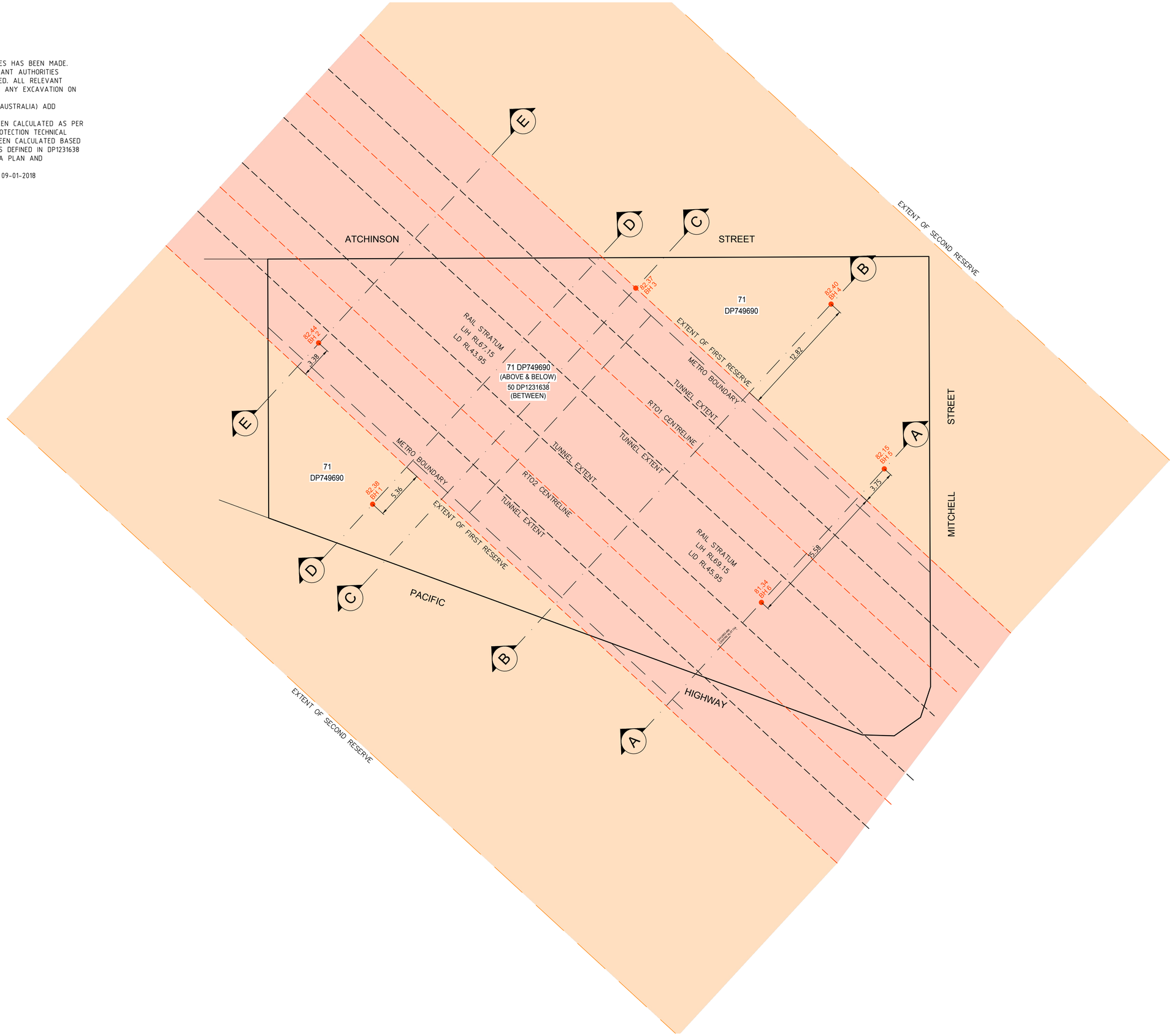
FIRST RESERVE

SECOND RESERVE

MGA

TN

1°00' APPROX.



DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

0 4 6 8 12 16 20

SCALE 1: 200 @ A1

Revision	Date	Description	Reference
-	00/00/00	-	000
-	00/00/00	-	000
-	00/00/00	-	000
-	00/00/00	-	000
-	00/00/00	-	000

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

.....

Registered Surveyor NSW

LTS LOCKLEY
Registered Surveyors NSW
www.lts.com.au
Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client DOUGLAS PARTNERS

Drawing title
PLAN OF SYDNEY METRO RESERVES AND PROPOSED BOREHOLES OVER LOT 71 IN DP 749690 KNOWN AS 601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD
site Area N/A
LGA PARRAMATTA

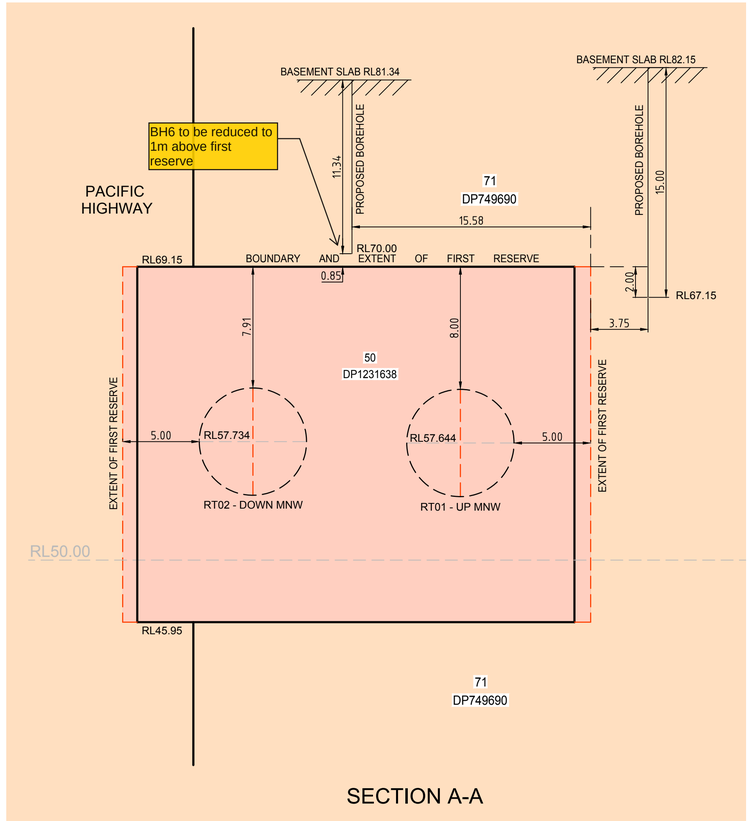
reference number 52414 001BH
scale 1:200 @A1
date of survey 25/11/2024
SHEET 2 OF 1

FIRST RESERVE

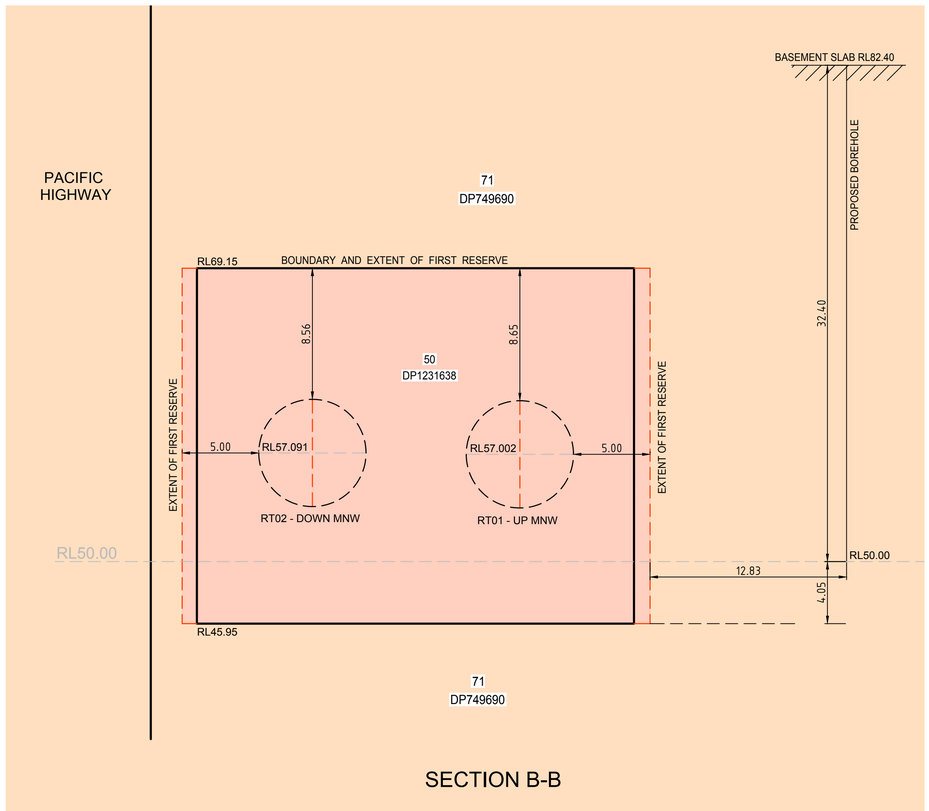
SECOND RESERVE

NOTES

1. PROPOSED BOREHOLES ARE 0.1m DIAMETER



SECTION A-A



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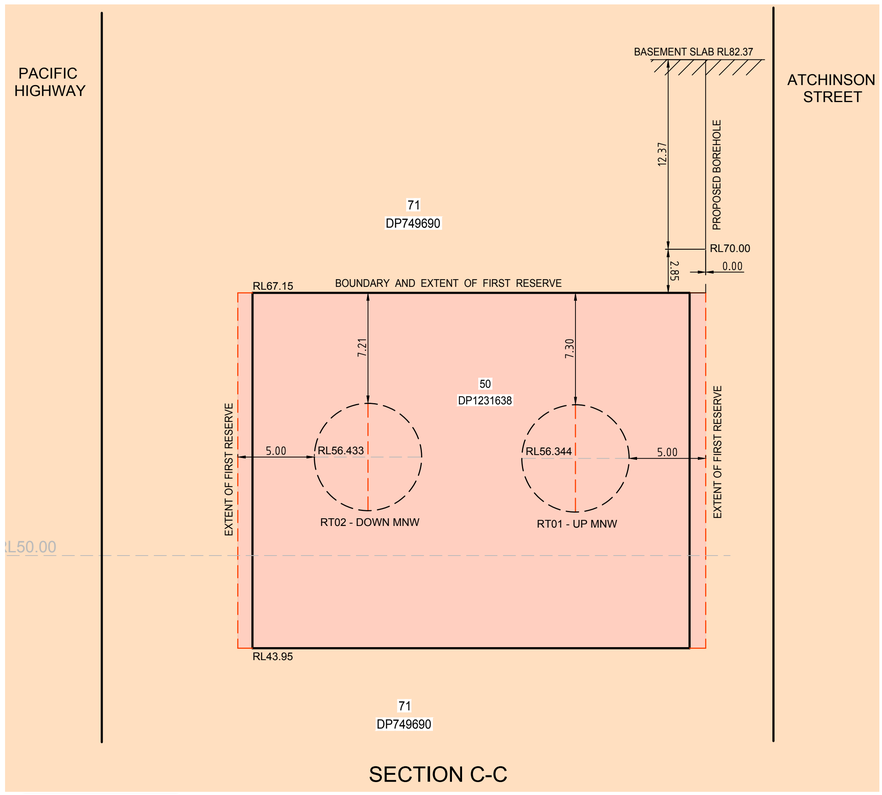

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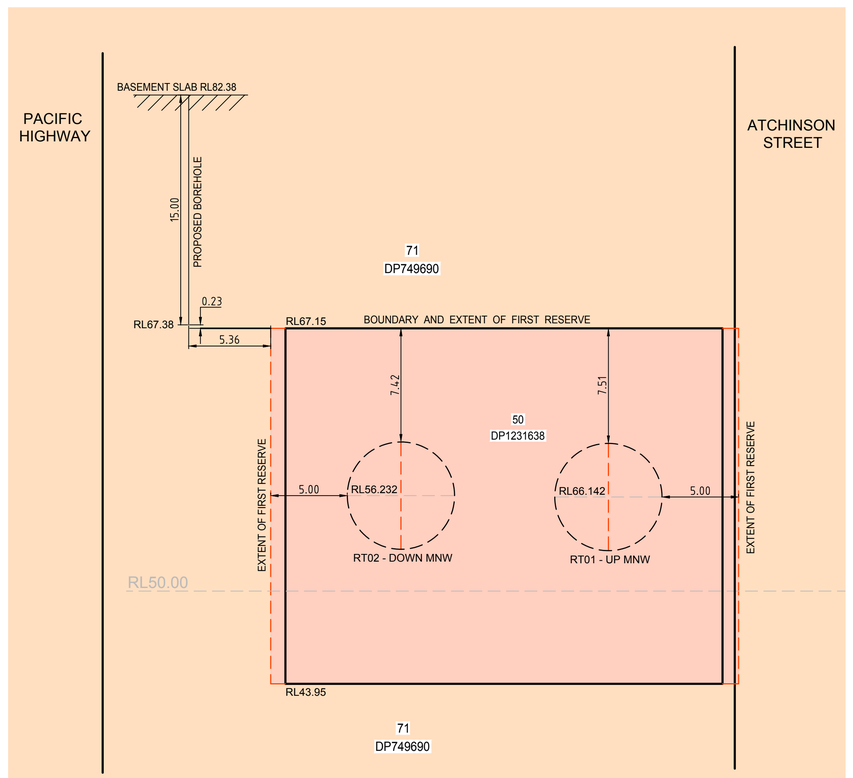

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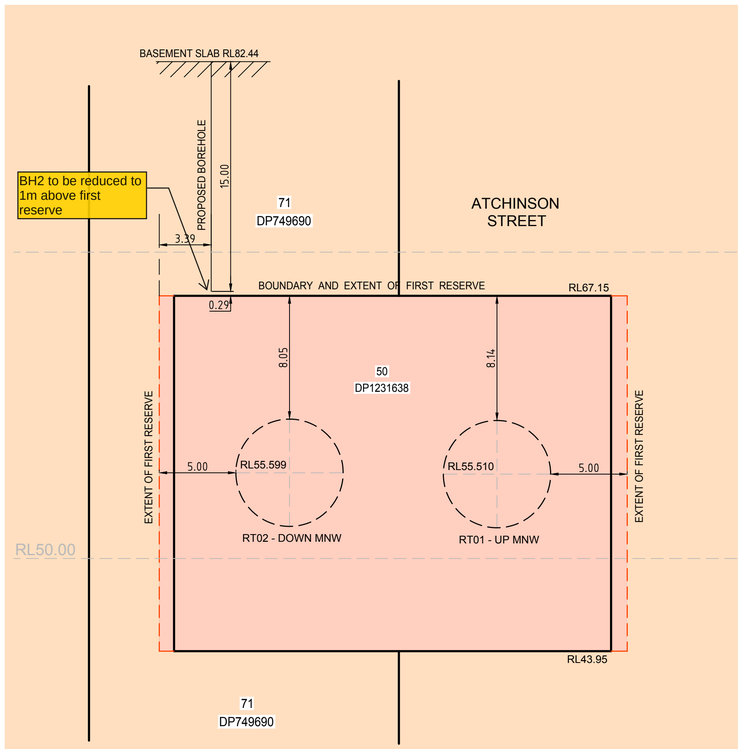

SECTION E-E

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REFER TO NOTES AND LEGEND

SCALE 1:200 @ A1

Revision	Date	Description	Reference
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-	00/00/00	-	000
-	00/00/00	-	000
-	00/00/00	-	000
-	00/00/00	-	000

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Registered Surveyors NSW
www.ltsl.com.au
Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client DOUGLAS PARTNERS

Drawing title

PLAN OF SYDNEY METRO RESERVES AND PROPOSED BOREHOLES OVER LOT 71 IN DP 749690 KNOWN AS 601 PACIFIC HIGHWAY, ST LEONARDS

datum AHD

reference number 52414 001BH

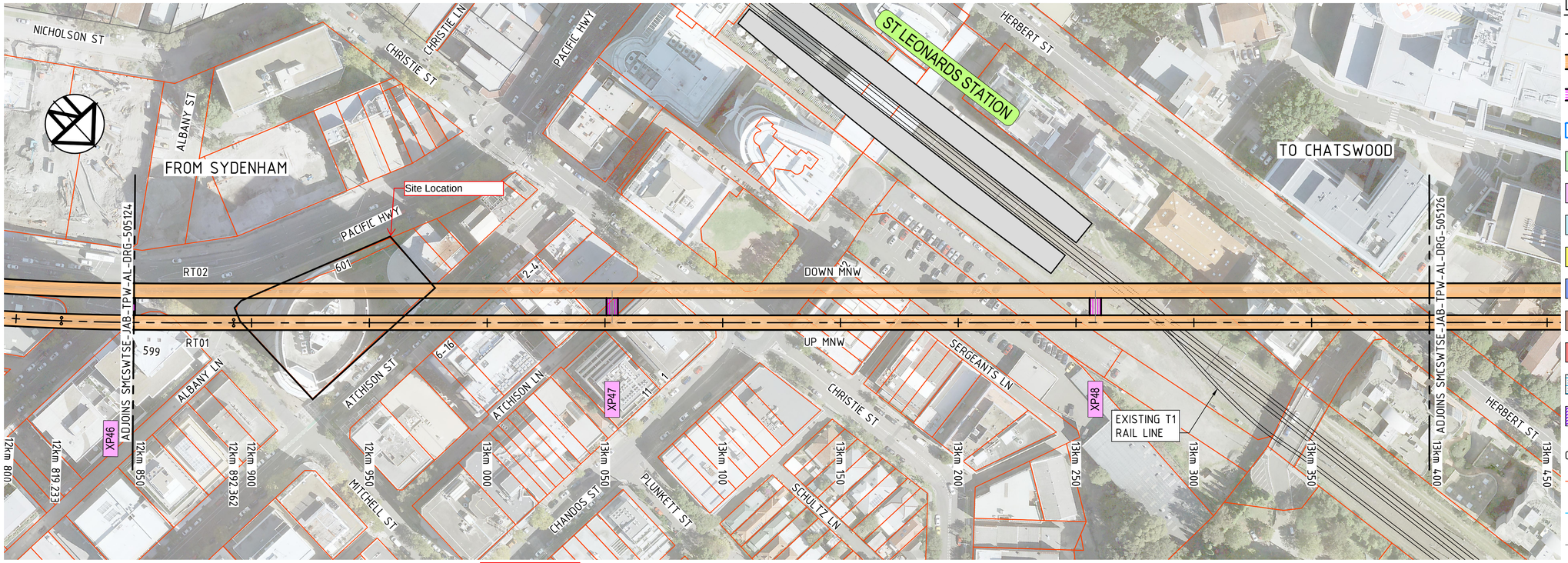
site Area N/A

scale 1:500 @A1

date of survey 25/11/2024

LGA PARRAMATTA

SHEET 2 OF 2



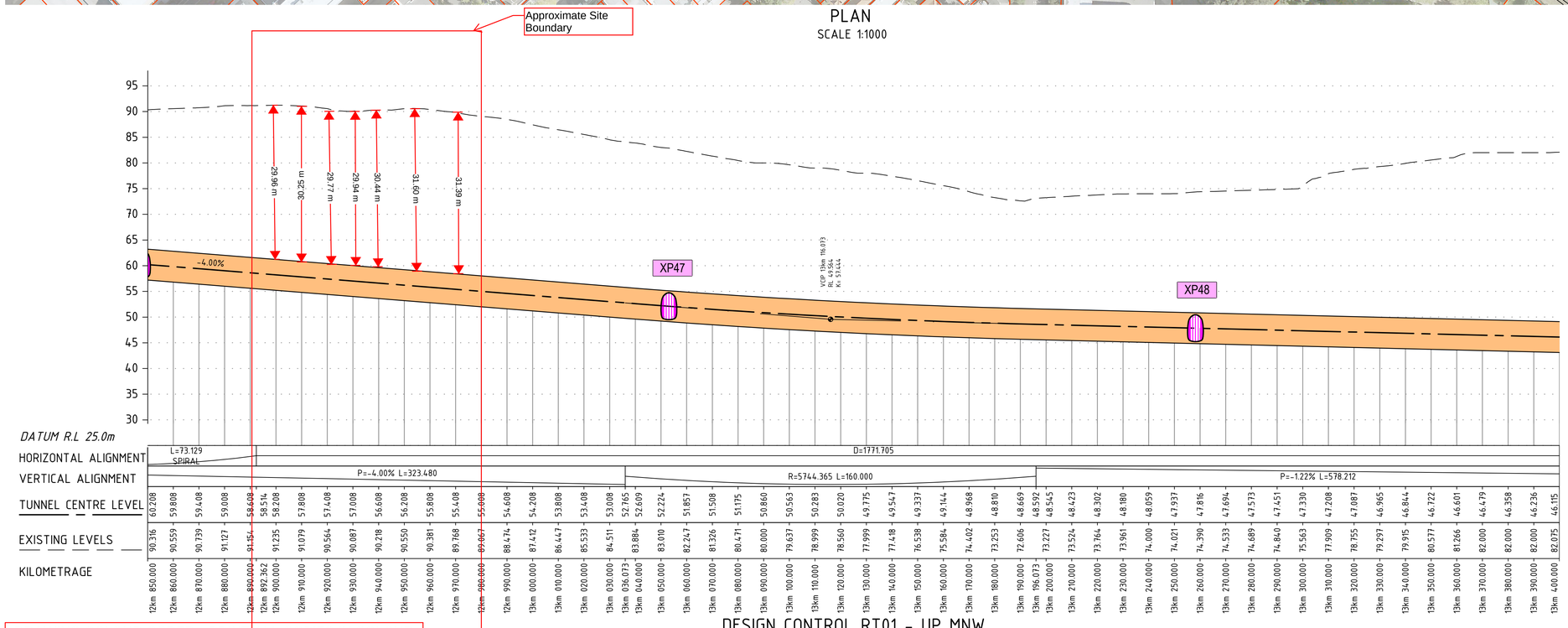
PLAN
SCALE 1:1000

LEGEND

- TUNNEL ALIGNMENT CONTROL LINE
- RUNNING TUNNELS
- CROSS PASSAGES AND CROSS PASSAGES WITH SUMP
- STUB TUNNEL
- DIVE STRUCTURES
- STATION EXCAVATIONS
- NOZZLE ENLARGEMENTS
- CROSSOVER CAVERN
- STATION SHAFTS
- STATION CAVERNS
- STATION ADITS
- SHAFT
- LIFT SHAFTS

CADASTRAL MODEL (BASED ON PR124656-SACM-001-E)

- SURVEY ACCURATE CADASTRAL MODEL
- NEAR SURVEY ACCURATE CADASTRE
- DIGITAL CADASTRAL DATABASE

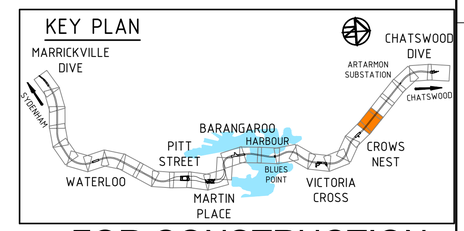


DESIGN CONTROL RT01 - UP MNW
SCALE - HORIZ. 1:1000, VERT. 1:500

NOTE

1. FOR ALL ALIGNMENT NOTES REFER DRAWING NO. SMCSWTSE-JAB-TPW-AL-DRG-505005.

KEY PLAN



DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

FOR CONSTRUCTION

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
00	ASSURED FOR CONSTRUCTION	09.01.18	09.01.18	09.01.18

CO-ORDINATE SYSTEM: MGA | HEIGHT DATUM: AHD | SCALE: 1:1000

SCALES
0 10 20 30 40 50 60m SCALE 1:1000 AT A1 SIZE
0 5 10 15 20 25 30m SCALE 1:500 AT A1 SIZE

IC CERTIFIED - IC CERTIFICATE SMCSWTSE-IC-CER-B2-008-A

CLIENT
NSW GOVERNMENT | Transport for NSW

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SERVICE PROVIDERS: ARCADIS, BG&E, NOMA CONSULTING, HOCHTIEF ENGINEERING, PSM, McMILLEN JACOBS ASSOCIATES

DRAWN	L. AVUK	09.01.18
DESIGNED	TfNSW	-
DRG CHECK	J. MACADANGDANG	09.01.18
DESIGN CHECK	N/A	-
APPROVED	K. LIN	09.01.18

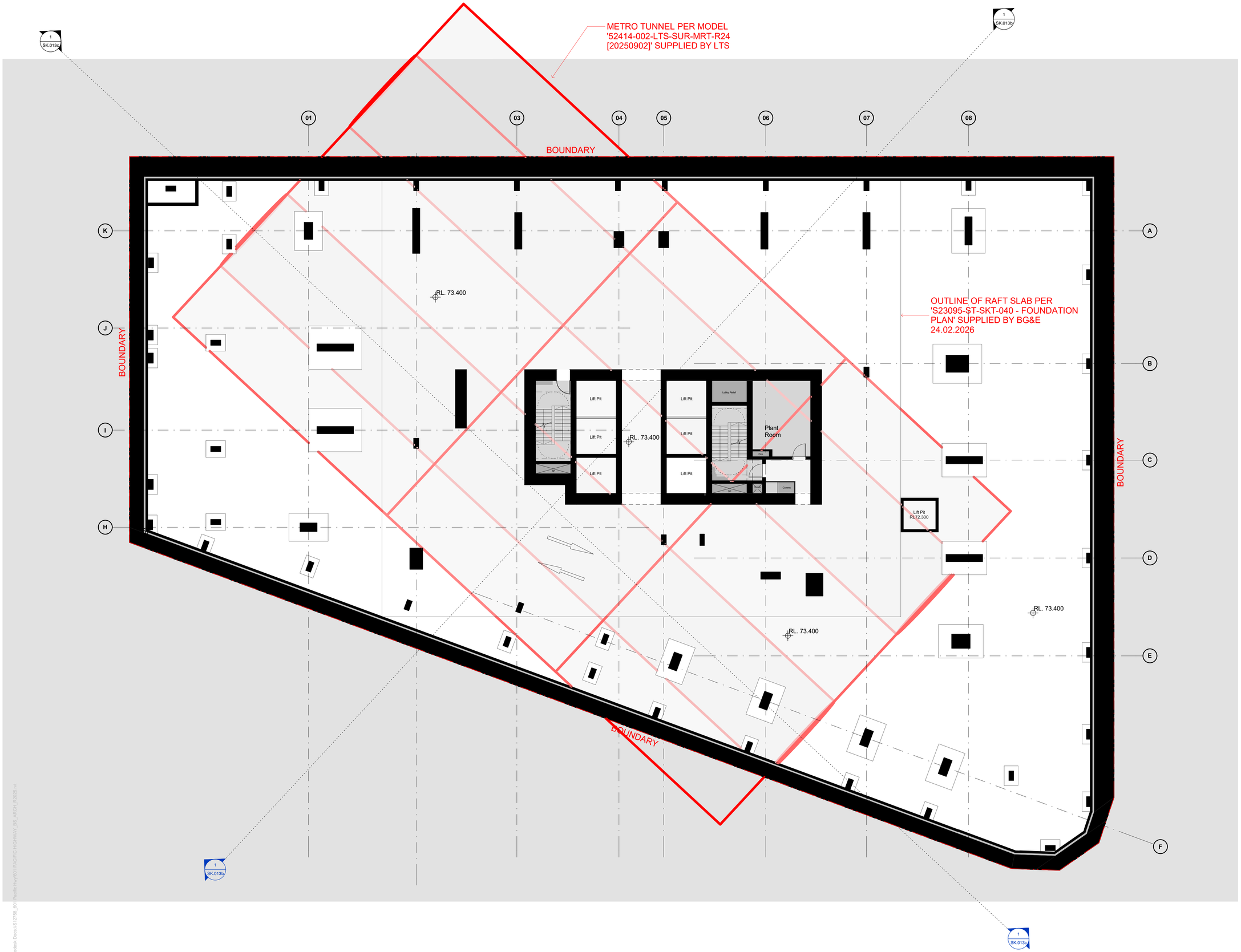
SYDNEY METRO CITY & SOUTHWEST

TSE PROJECT WIDE
ALIGNMENT
GA PLAN AND LONGITUDINAL SECTION
TUNNEL ALIGNMENT CONTROL LINE RT01 - SHEET 25

FILE No. | SHEET: 41 OF 76 | A1
STATUS: FOR CONSTRUCTION | ©
DRG No. SMCSWTSE-JAB-TPW-AL-DRG-505125 | 00 | EDMS No.

DF 801*554

File Plotted C:\SMCSW-TSE-Export\
Plot Date & Time 1/9/2018 2:05 PM
Plotted by JULIUS.MACADANGDANG



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Transformative thinking
for the future city.

Bates Smart Architects Pty Ltd
ABN 68 094 740 986

NSW Nominated Responsible Architects
Kellie Payne 6454. Philip Vivian 6696. Guy Lake 7119. Matt Allen 8498.

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Client

Stockland Development

Current Revision Description

REV 3
25.02.2026

Data Issue Record
Current Revision released by

Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
Metro - B6 Plan Overlay

Phase
SSDA

Status
PRELIMINARY

Scale
1 : 125 @ A1

Drawing no.
SK.013a

Revision

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt



1 SECTION - TUNNEL CROSS SECTION
1 : 200

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt

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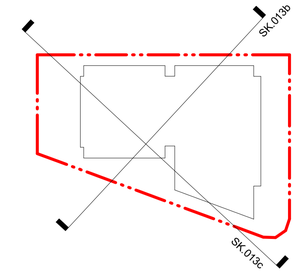

Current Revision Description

REV 3
25.02.2026

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Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
DA10 - Building Sections
Metro Section - Cross Section

Phase
Concept Design

Status
PRELIMINARY

Scale
As indicated @ A1

Drawing no.
SK.013b

Revision



1 SECTION - CENTRELINE RT02
1 : 200

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt

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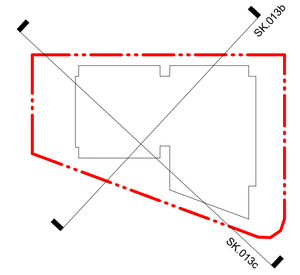


Current Revision Description

REV 3
25.02.2026

Data Issue Record
Current Revision released by

Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
DA10 - Building Sections
Metro Section - Centreline RT02

Phase
Concept Design

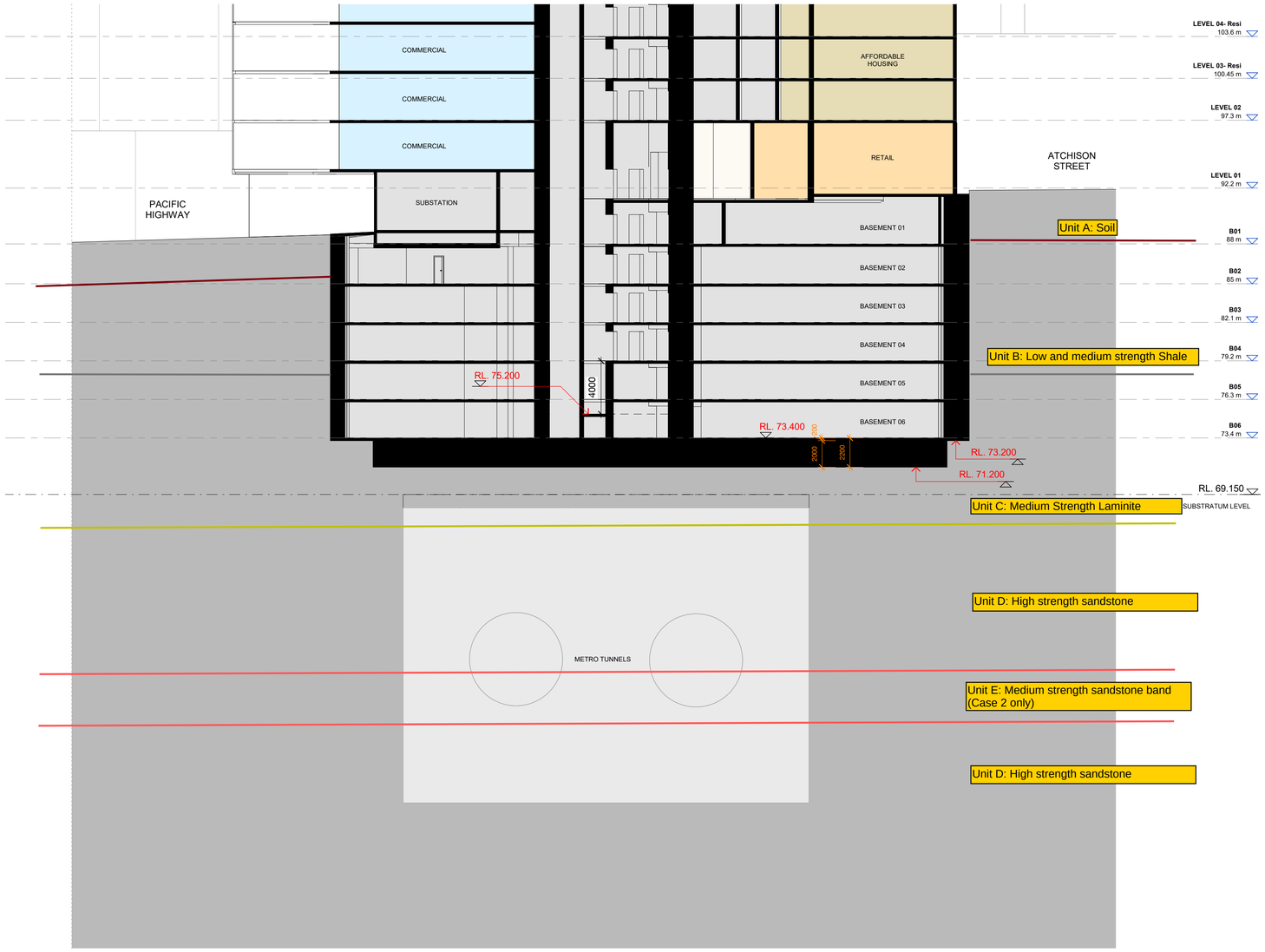
Status
PRELIMINARY

Scale
As indicated @ A1

Drawing no.
SK.013c

Revision

Douglas Geotechnical Model Profile Markup



1 SECTION - TUNNEL CROSS SECTION
1 : 200

Autodesk Docs://S12758_601 Pacific Hwy/601 PACIFIC HIGHWAY_BS_ARCH_R2025.rvt

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Client
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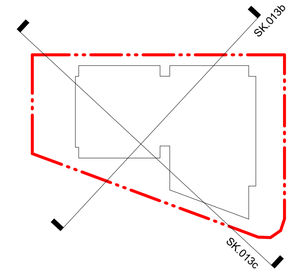


Current Revision Description

REV 3
25.02.2026

Data Issue Record
Current Revision released by

Rev	Date	Description

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

Drawing Title
DA10 - Building Sections
Metro Section - Cross Section

Phase
Concept Design

Status
PRELIMINARY

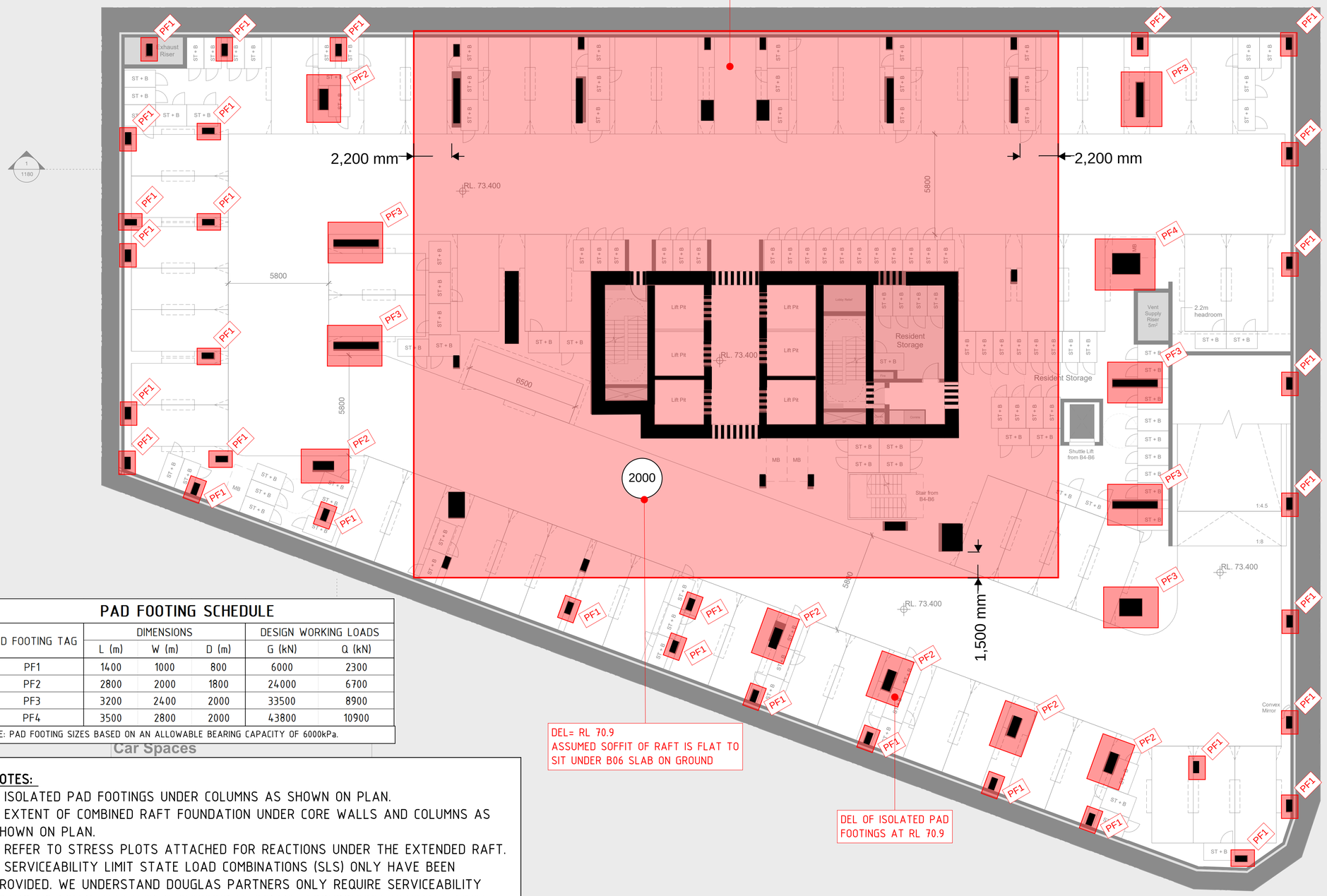
Scale
As indicated @ A1

Drawing no.
SK.013b

Revision

Appendix C

Modelled Geometry and Structural Loads



PAD FOOTING SCHEDULE

PAD FOOTING TAG	DIMENSIONS			DESIGN WORKING LOADS	
	L (m)	W (m)	D (m)	G (kN)	Q (kN)
PF1	1400	1000	800	6000	2300
PF2	2800	2000	1800	24000	6700
PF3	3200	2400	2000	33500	8900
PF4	3500	2800	2000	43800	10900

NOTE: PAD FOOTING SIZES BASED ON AN ALLOWABLE BEARING CAPACITY OF 6000kPa.

NOTES:

- ISOLATED PAD FOOTINGS UNDER COLUMNS AS SHOWN ON PLAN.
- EXTENT OF COMBINED RAFT FOUNDATION UNDER CORE WALLS AND COLUMNS AS SHOWN ON PLAN.
- REFER TO STRESS PLOTS ATTACHED FOR REACTIONS UNDER THE EXTENDED RAFT.
- SERVICEABILITY LIMIT STATE LOAD COMBINATIONS (SLS) ONLY HAVE BEEN PROVIDED. WE UNDERSTAND DOUGLAS PARTNERS ONLY REQUIRE SERVICEABILITY LOADS TO COMPLETE THEIR GEOTECHNICAL IMPACT ASSESSMENT. ULTIMATE LIMIT STATE (ULS) LOADS CAN BE PROVIDED BY BG&E IF REQUIRED.
- LEGEND:
  - G: DEAD LOAD
  - Q: LIVE LOAD
  - W: WIND LOAD
  - EQ: EARTHQUAKE LOAD

FOUNDATION SIZES AND LOADS FOR GEOTECHNICAL MODELLING FOR SYDNEY METRO IMPACT ASSESSMENT

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Bates Smart Architects Pty Ltd
ABN 68 094 740 986

NSW Nominated Responsible Architects
Kellie Payne 6454. Philip Vivian 6696. Guy Lake 7119. Matt Allen 8498.

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Client
Stockland

Current Revision Description

Data Issue Record
Current Revision released by

Rev	Date	Description
P4	14/11/2025	For Information
P3	31/10/2025	For Information
P2	16/10/2025	For Information
P1	08/10/2025	For Information

Project Title
601 Pacific Hwy

First Nations Country
Cammeraygal Country

Project Address
601 Pacific Hwy, St Leonards, NSW

Project No.
S12758

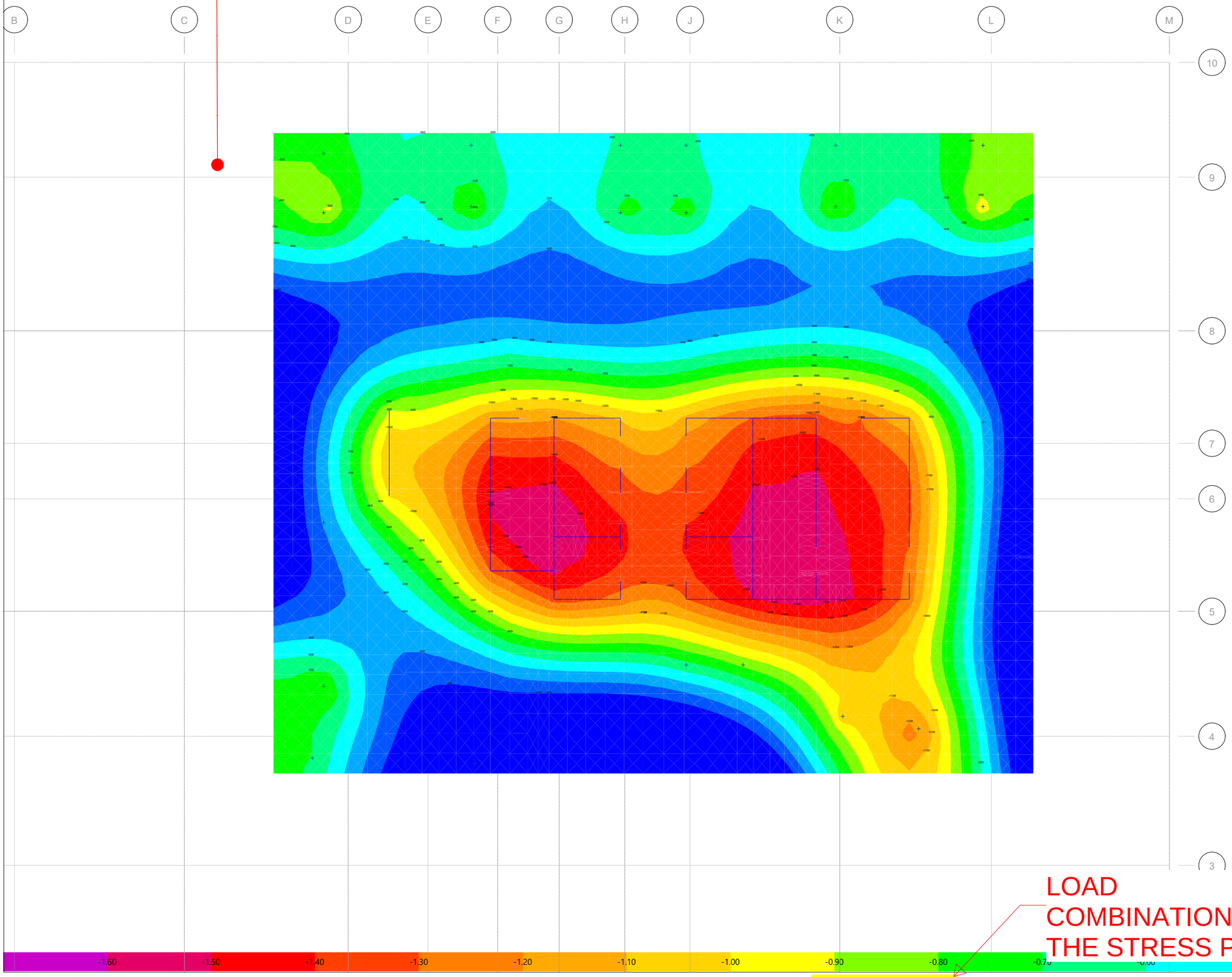
Drawing Title
DA03 - General Arrangements
General Arrangement Plan Level B6

BG&E

DATE	07/01/2026
SCALE	NTS
GRID	
PREPARED	EC
SHEET	

PROJECT: 601 PACIFIC HIGHWAY
TITLE: UPDATED FOOTING LOADS WITH LL REDUCTION FOR GEOTECHNICAL MODELLING
PROJECT No. S23095 | SKETCH No. ST-SKT-031 | REV B

REFER TO PAGE 1 FOR PAD FOOTING LOADS.



- STRESS PLOTS PROVIDED ARE FOR VERTICAL SOIL PRESSURE.
- IN ADDITION TO THE STRESS PLOTS PROVIDED, THE BELOW SHEAR FORCES ARE TO BE APPLIED TO THE CENTROID OF THE RAFT SLAB FOR EACH LOAD COMBINATION. REFERENCE AXES ARE SHOWN ON PLAN.
- STRESS PLOTS AND SHEAR FORCES PROVIDED FOR EARTHQUAKE LOADS IS ULS AS THERE IS NO SLS EARTHQUAKE LOAD FOR RESIDENTIAL BUILDINGS IN AUSTRALIA AS PER AS 1170.4.

LOAD COMBINATION	Vx (kN)	Vy (kN)
S001_ST_G+0.7Q	0	0
S011_LT_G+0.4Q+W(Rep)(1/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(2/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(3/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(4/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(5/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(6/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(7/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(8/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(9/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(10/24)	-1656	-6976
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S011_LT_G+0.4Q+W(Rep)(12/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(13/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(14/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(15/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(16/24)	1420	6627
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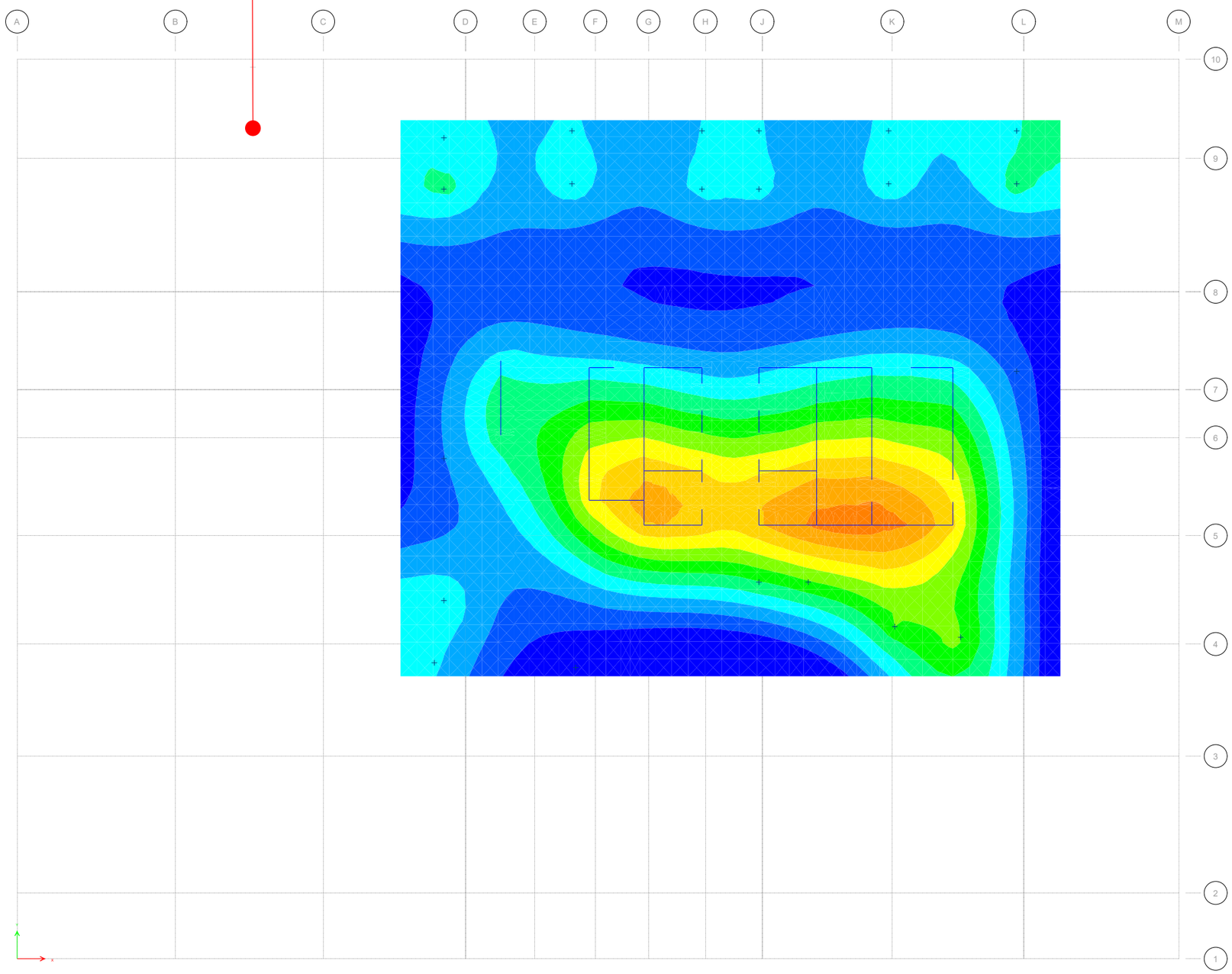
S011_LT_G+0.4Q+W(Rep)(19/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(20/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(21/24)	1420	-3488
S011_LT_G+0.4Q+W(Rep)(22/24)	1893	-3488
S011_LT_G+0.4Q+W(Rep)(23/24)	1420	2093
S011_LT_G+0.4Q+W(Rep)(24/24)	1893	2093
U013_G+0.3Q+EQXY1	18796	5089
U014_G+0.3Q+EQXY2	18796	-5089
U015_G+0.3Q+EQXY3	-18796	5089
U016_G+0.3Q+EQXY4	-18796	-5089
U017_G+0.3Q+EQXY5	5639	16963
U018_G+0.3Q+EQXY6	5639	-16963
U019_G+0.3Q+EQXY7	-5639	16963
U020_G+0.3Q+EQXY8	-5639	-16963

LOAD COMBINATION FOR THE STRESS PLOT

REFER TO PAGE 1 FOR PAD FOOTING LOADS.



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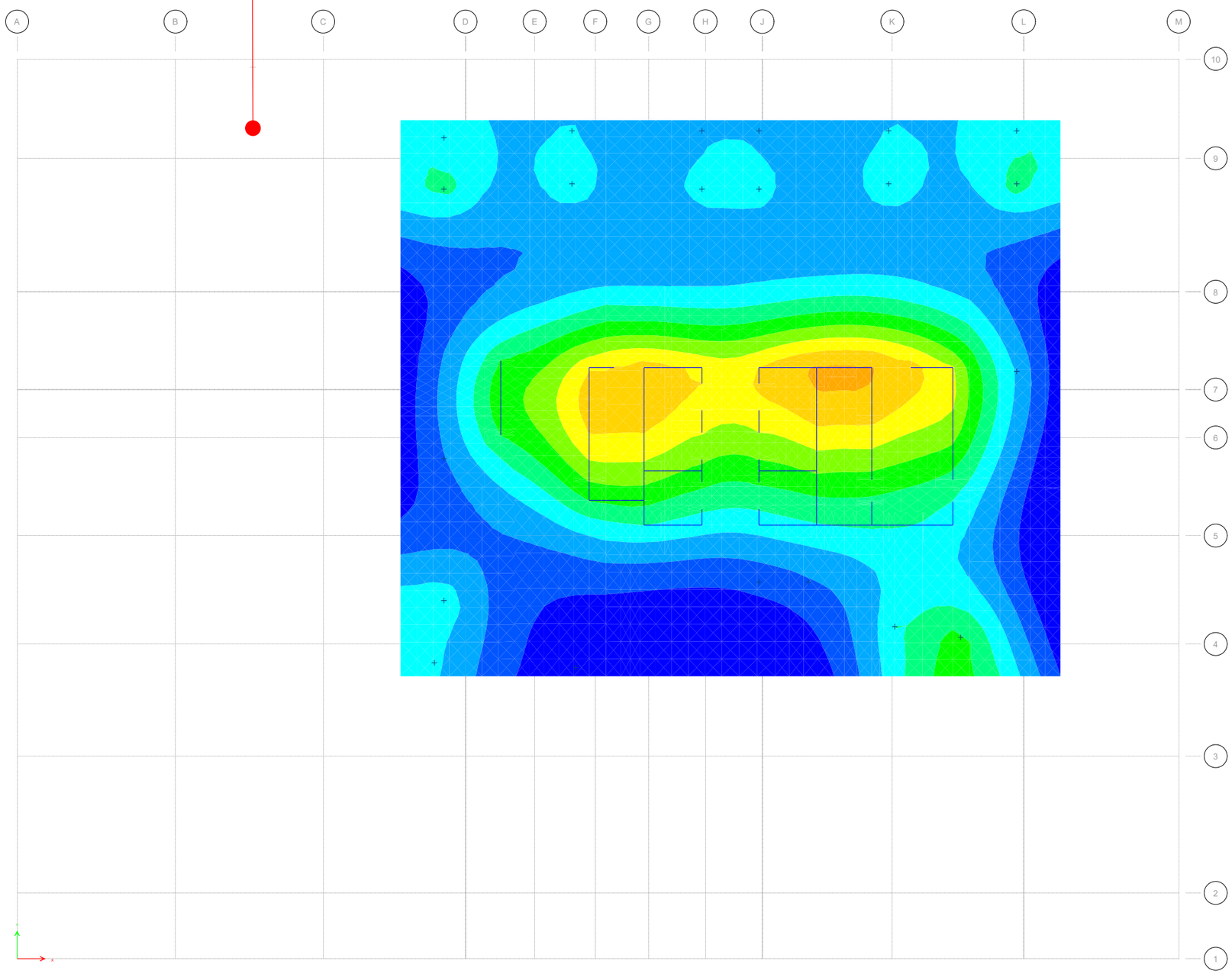
- IN ADDITION TO THE STRESS PLOTS PROVIDED, THE BELOW SHEAR FORCES ARE TO BE APPLIED TO THE CENTROID OF THE RAFT SLAB FOR EACH LOAD COMBINATION. REFERENCE AXES ARE SHOWN ON PLAN.
- STRESS PLOTS AND SHEAR FORCES PROVIDED FOR EARTHQUAKE LOADS IS ULS AS THERE IS NO SLS EARTHQUAKE LOAD FOR RESIDENTIAL BUILDINGS IN AUSTRALIA AS PER AS 1170.4.

LOAD COMBINATION	Vx (kN)	Vy (kN)
S001_ST_G+0.7Q	0	0
S011_LT_G+0.4Q+W(Rep)(1/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(2/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(3/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(4/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(5/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(6/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(7/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(8/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(9/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(10/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(11/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(12/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(13/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(14/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(15/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(16/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(17/24)	-2603	-3488
S011_LT_G+0.4Q+W(Rep)(18/24)	-2603	-3488
S011_LT_G+0.4Q+W(Rep)(19/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(20/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(21/24)	1420	-3488
S011_LT_G+0.4Q+W(Rep)(22/24)	1893	-3488
S011_LT_G+0.4Q+W(Rep)(23/24)	1420	2093
S011_LT_G+0.4Q+W(Rep)(24/24)	1893	2093
U013_G+0.3Q+EQXY1	18796	5089
U014_G+0.3Q+EQXY2	18796	-5089
U015_G+0.3Q+EQXY3	-18796	5089
U016_G+0.3Q+EQXY4	-18796	-5089
U017_G+0.3Q+EQXY5	5639	16963
U018_G+0.3Q+EQXY6	5639	-16963
U019_G+0.3Q+EQXY7	-5639	16963
U020_G+0.3Q+EQXY8	-5639	-16963



REFER TO PAGE 1 FOR PAD FOOTING LOADS.



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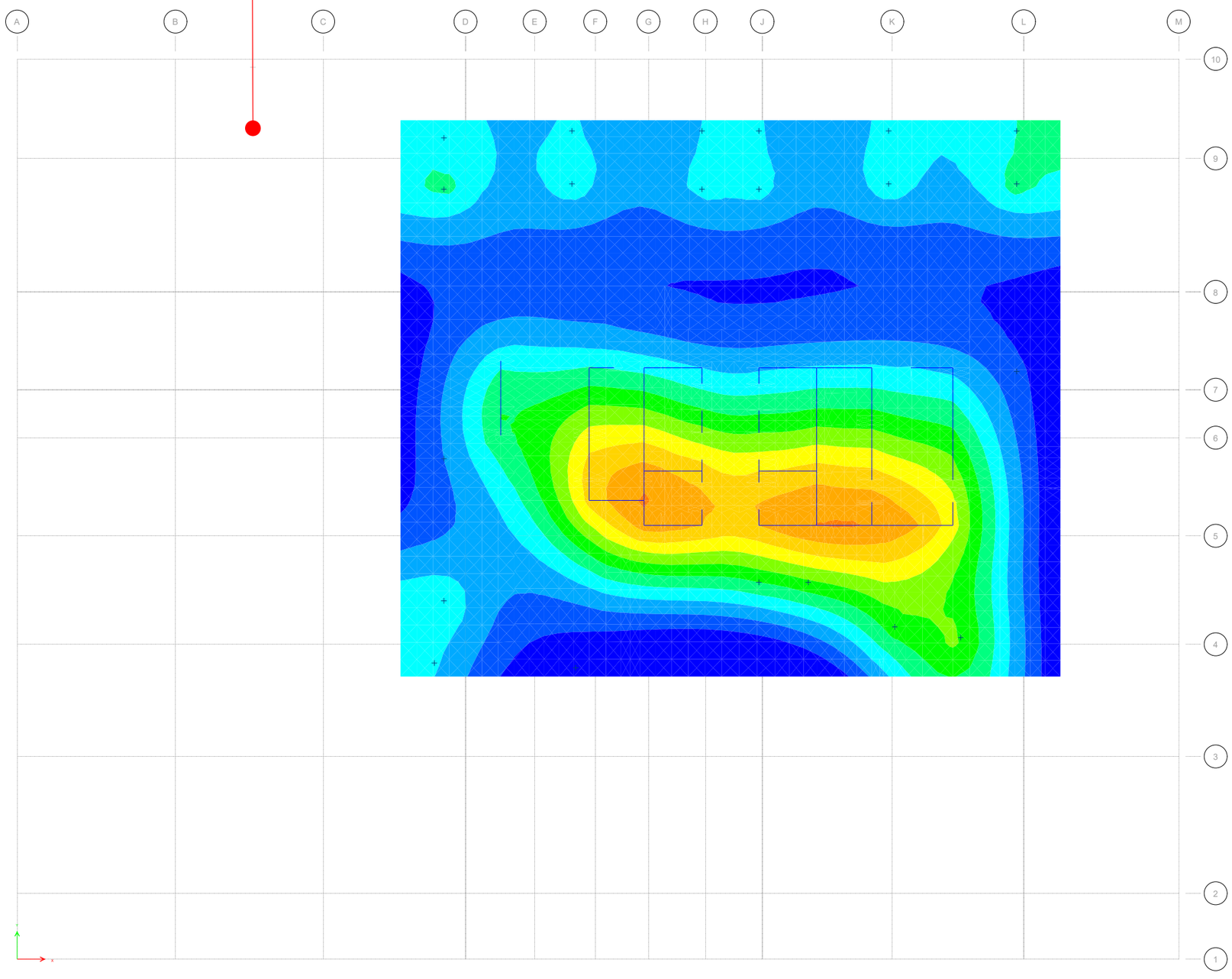
LOAD COMBINATION	Vx (kN)	Vy (kN)
S001_ST_G+0.7Q	0	0
S011_LT_G+0.4Q+W(Rep)(1/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(2/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(3/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(4/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(5/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(6/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(7/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(8/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(9/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(10/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(11/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(12/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(13/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(14/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(15/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(16/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(17/24)	-2603	-3488
S011_LT_G+0.4Q+W(Rep)(18/24)	-2603	-3488
S011_LT_G+0.4Q+W(Rep)(19/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(20/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(21/24)	1420	-3488
S011_LT_G+0.4Q+W(Rep)(22/24)	1893	-3488
S011_LT_G+0.4Q+W(Rep)(23/24)	1420	2093
S011_LT_G+0.4Q+W(Rep)(24/24)	1893	2093
U013_G+0.3Q+EQXY1	18796	5089
U014_G+0.3Q+EQXY2	18796	-5089
U015_G+0.3Q+EQXY3	-18796	5089
U016_G+0.3Q+EQXY4	-18796	-5089
U017_G+0.3Q+EQXY5	5639	16963
U018_G+0.3Q+EQXY6	5639	-16963
U019_G+0.3Q+EQXY7	-5639	16963
U020_G+0.3Q+EQXY8	-5639	-16963



REFER TO PAGE 1 FOR PAD FOOTING LOADS.



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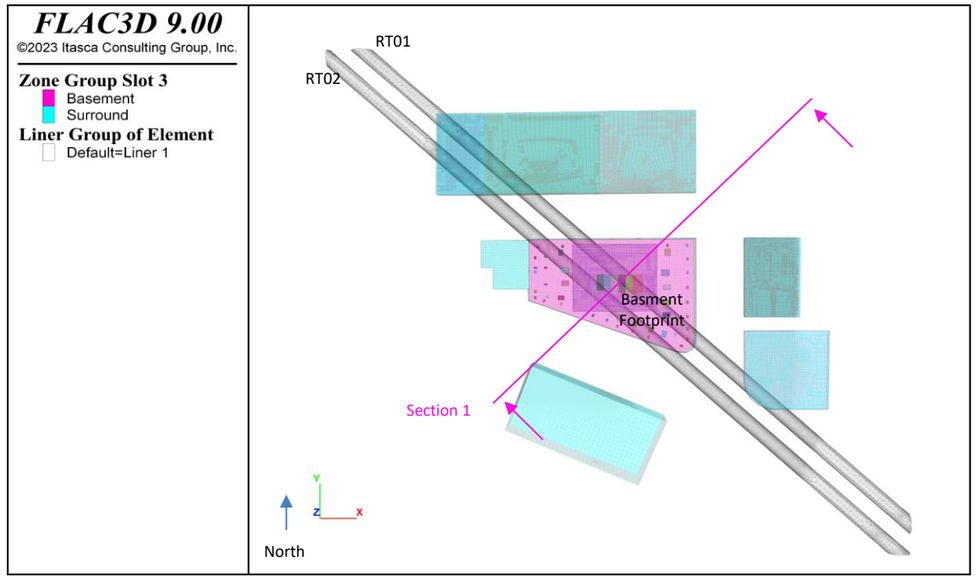
LOAD COMBINATION	Vx (kN)	Vy (kN)
S001_ST_G+0.7Q	0	0
S011_LT_G+0.4Q+W(Rep)(1/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(2/24)	-4732	-3488
S011_LT_G+0.4Q+W(Rep)(3/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(4/24)	-4732	2093
S011_LT_G+0.4Q+W(Rep)(5/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(6/24)	3786	-2093
S011_LT_G+0.4Q+W(Rep)(7/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(8/24)	3786	3139
S011_LT_G+0.4Q+W(Rep)(9/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(10/24)	-1656	-6976
S011_LT_G+0.4Q+W(Rep)(11/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(12/24)	-1420	6627
S011_LT_G+0.4Q+W(Rep)(13/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(14/24)	1420	-6976
S011_LT_G+0.4Q+W(Rep)(15/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(16/24)	1420	6627
S011_LT_G+0.4Q+W(Rep)(17/24)	-2603	-3488
S011_LT_G+0.4Q+W(Rep)(18/24)	-2603	-3488
S011_LT_G+0.4Q+W(Rep)(19/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(20/24)	-2603	2093
S011_LT_G+0.4Q+W(Rep)(21/24)	1420	-3488
S011_LT_G+0.4Q+W(Rep)(22/24)	1893	-3488
S011_LT_G+0.4Q+W(Rep)(23/24)	1420	2093
S011_LT_G+0.4Q+W(Rep)(24/24)	1893	2093
U013_G+0.3Q+EQXY1	18796	5089
U014_G+0.3Q+EQXY2	18796	-5089
U015_G+0.3Q+EQXY3	-18796	5089
U016_G+0.3Q+EQXY4	-18796	-5089
U017_G+0.3Q+EQXY5	5639	16963
U018_G+0.3Q+EQXY6	5639	-16963
U019_G+0.3Q+EQXY7	-5639	16963
U020_G+0.3Q+EQXY8	-5639	-16963

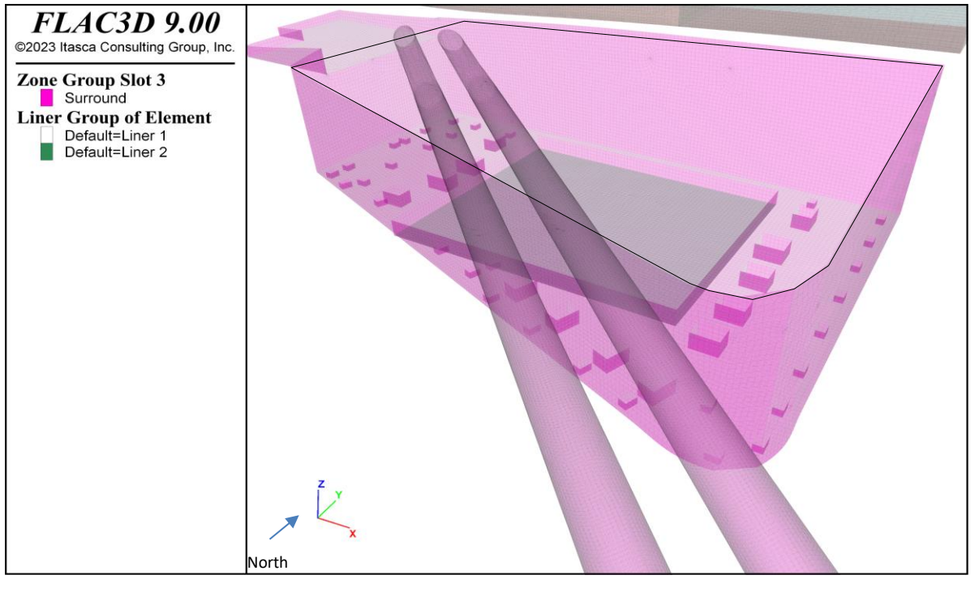


Appendix D

Results of Numerical Analysis



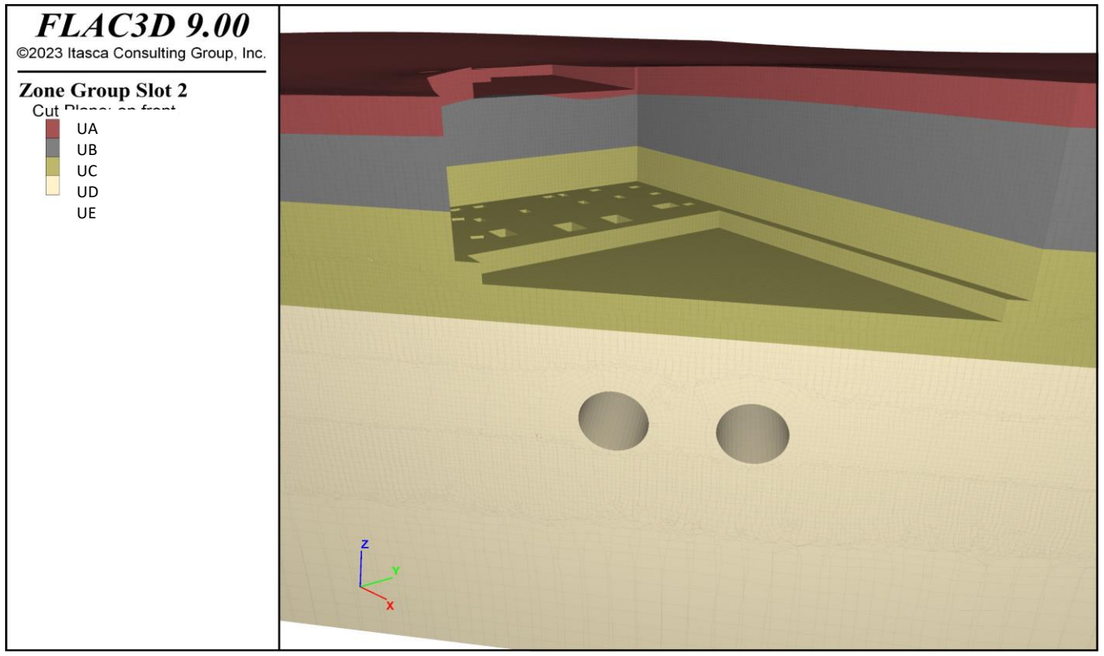
Plan View



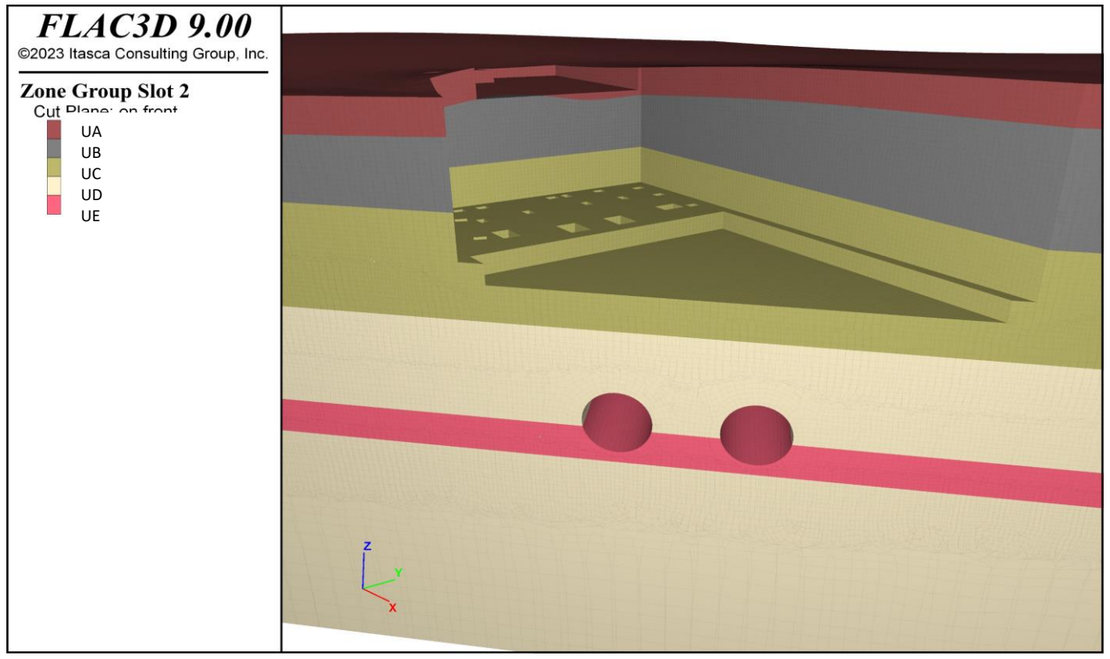
Perspective View

**North is positive y-direction. East is positive x-direction.*

Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: Stockland Commercial Property	TITLE: **3D Model Geometry**	PROJECT No: 86230.02
	OFFICE: Sydney	**Plan and Perspective View**	PLOT No: 1
	DATE: 20 Feb 2026	**601 Pacific Highway, St Leonards**	REVISION: 1



Case 1: Section of Geotechnical Profile

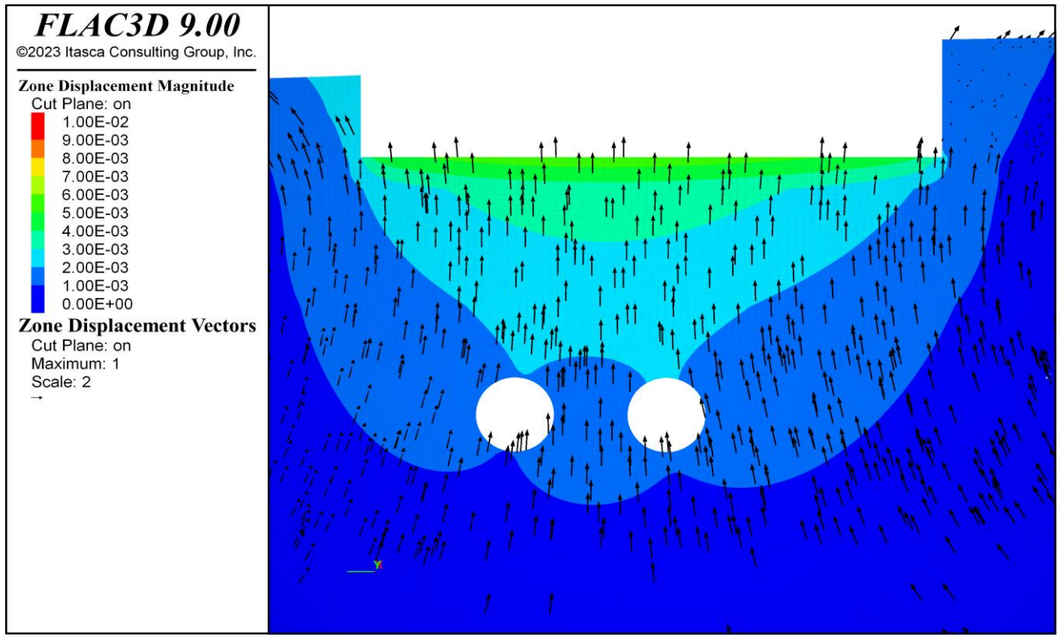


Case 2: Section of Geotechnical Profile

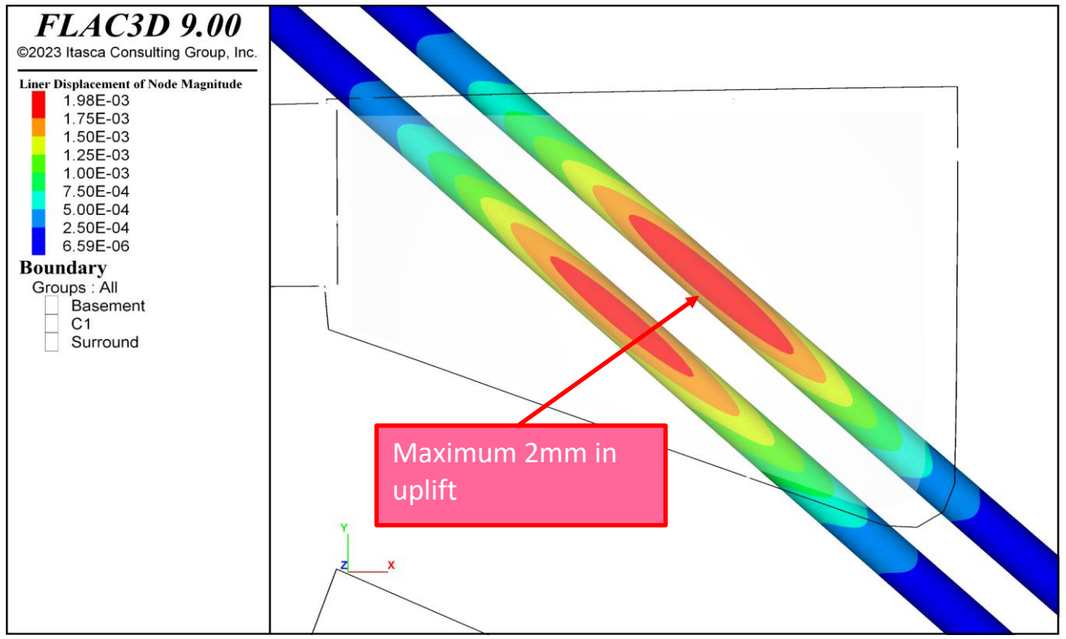
**North is positive y-direction. East is positive x-direction.*

Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: Stockland Commercial Property	TITLE: **Geotechnical Profile**	PROJECT No: 86230.02
	OFFICE: Sydney	**Perspective View along Section 1**	PLOT No: 2
	DATE: 20 Feb 2026	**601 Pacific Highway, St Leonards**	REVISION: 1

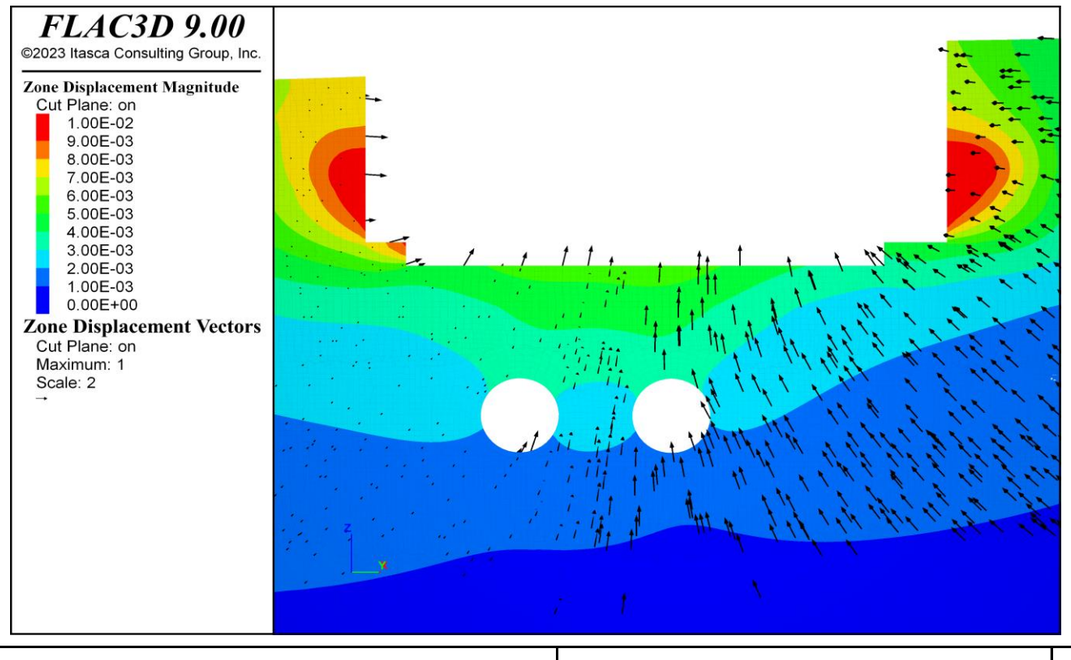
Stage 1a Demolition - Total Displacement - Section 1



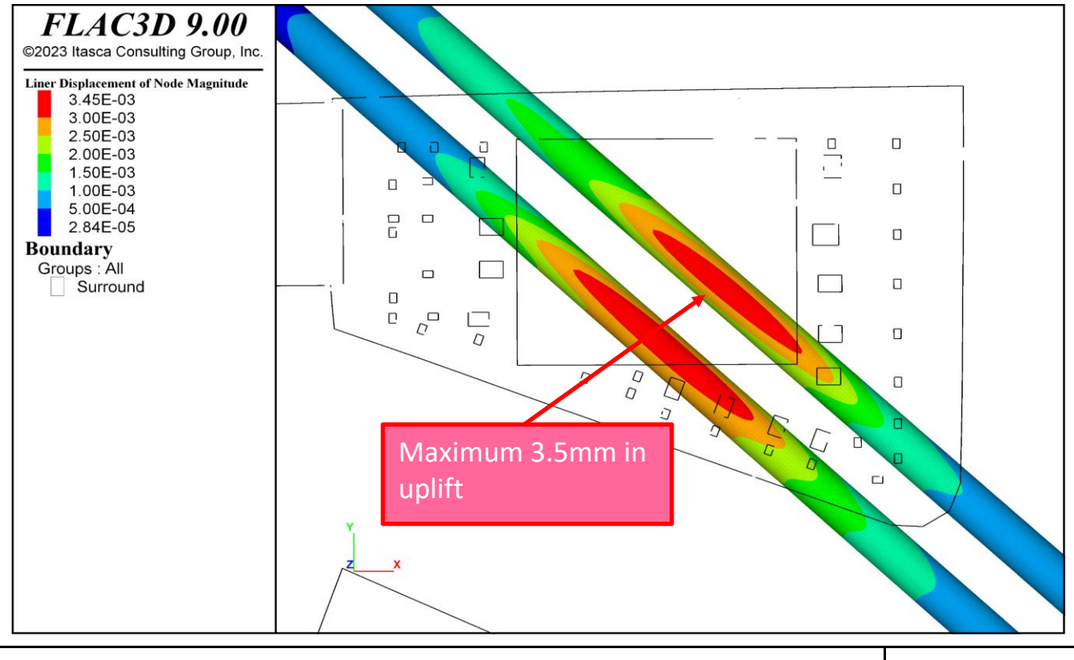
Stage 1a Demolition - Total Liner Displacement



Stage 1b Excavation - Total Displacement - Section 1



Stage 1b Excavation - Total Liner Displacement



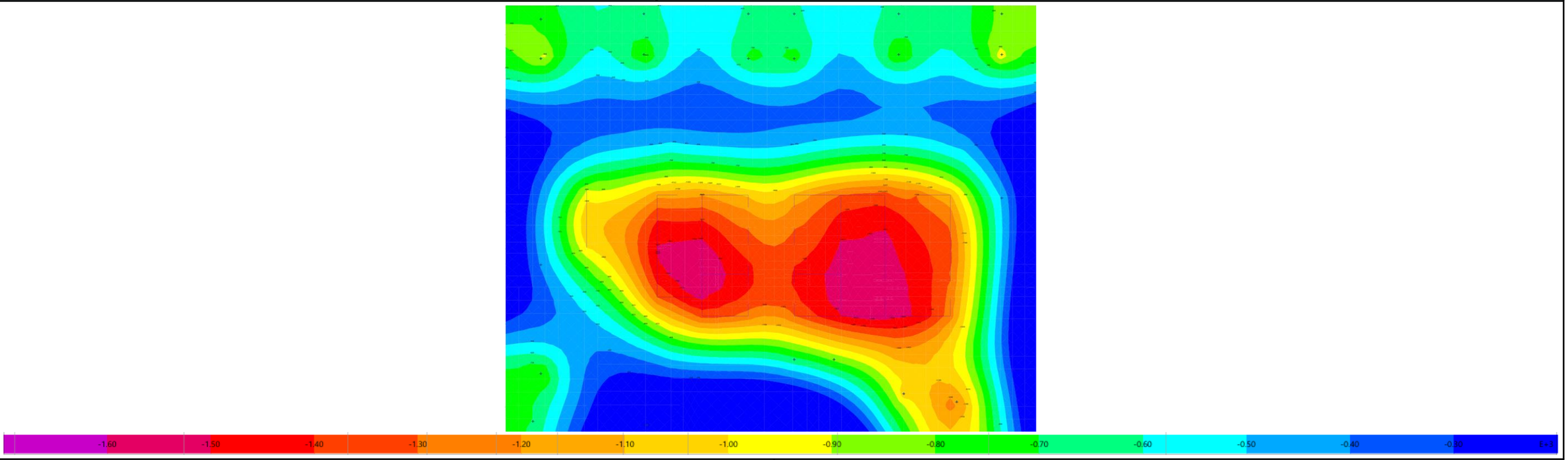
Douglas PARTNERS | GROUNDED EXPERTISE

CLIENT:	Stockland Commercial Property
OFFICE:	Sydney
DATE:	20 Feb 2026

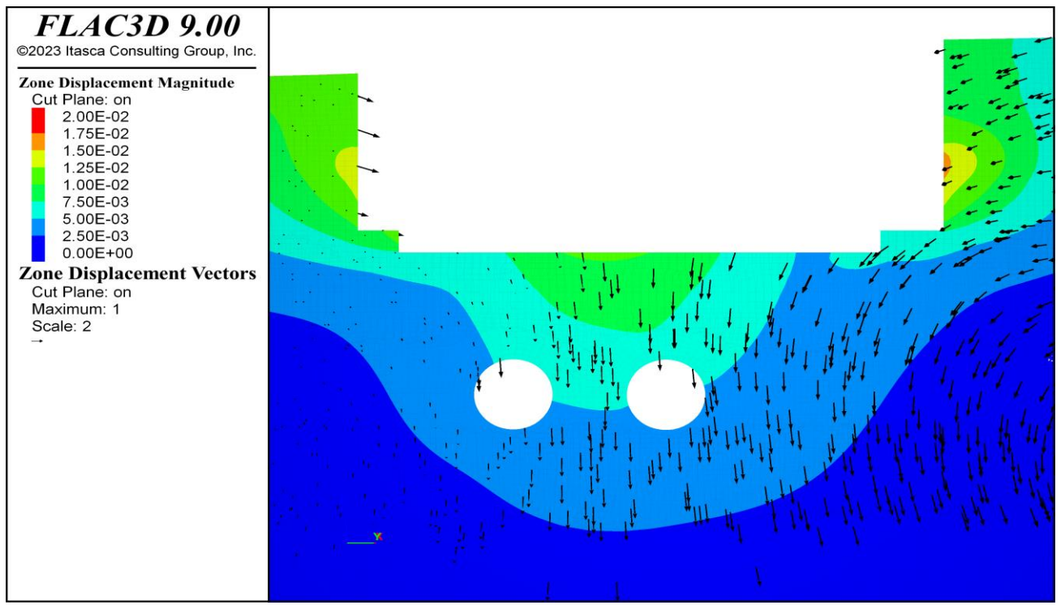
TITLE: **Total Rock Mass and Liner Displacement (m)**
Case 1 Stage 1a and 1b - Section 1 and Plan View
601 Pacific Highway, St Leonards

PROJECT No:	86230.02
PLOT No:	3
REVISION:	1

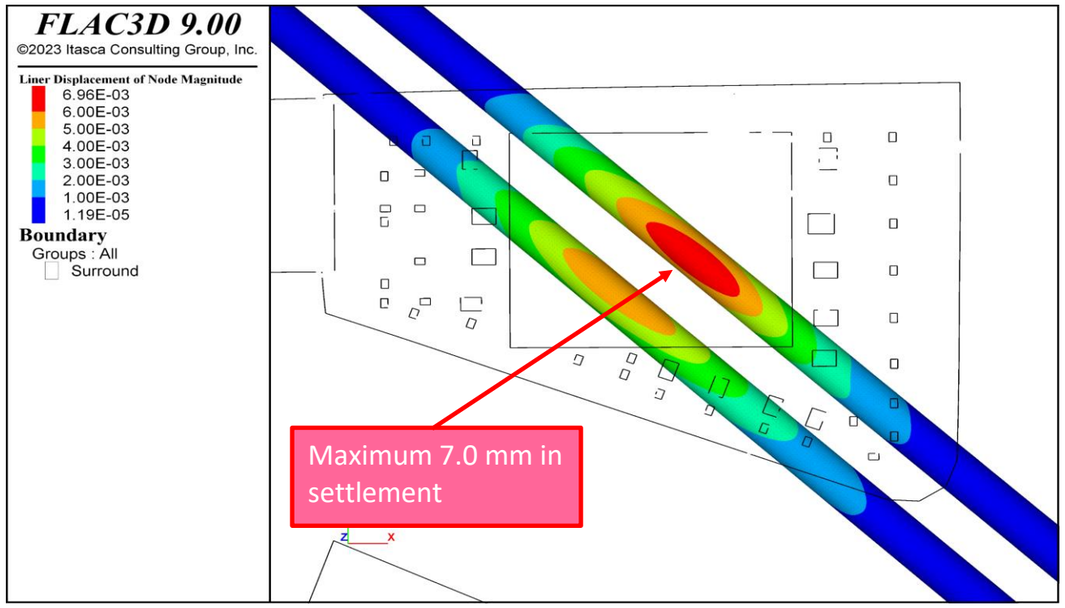
Stage 2 Load - Load Case G+0.7Q Pressures



Stage 2 Loading - Total Displacement - Section 1

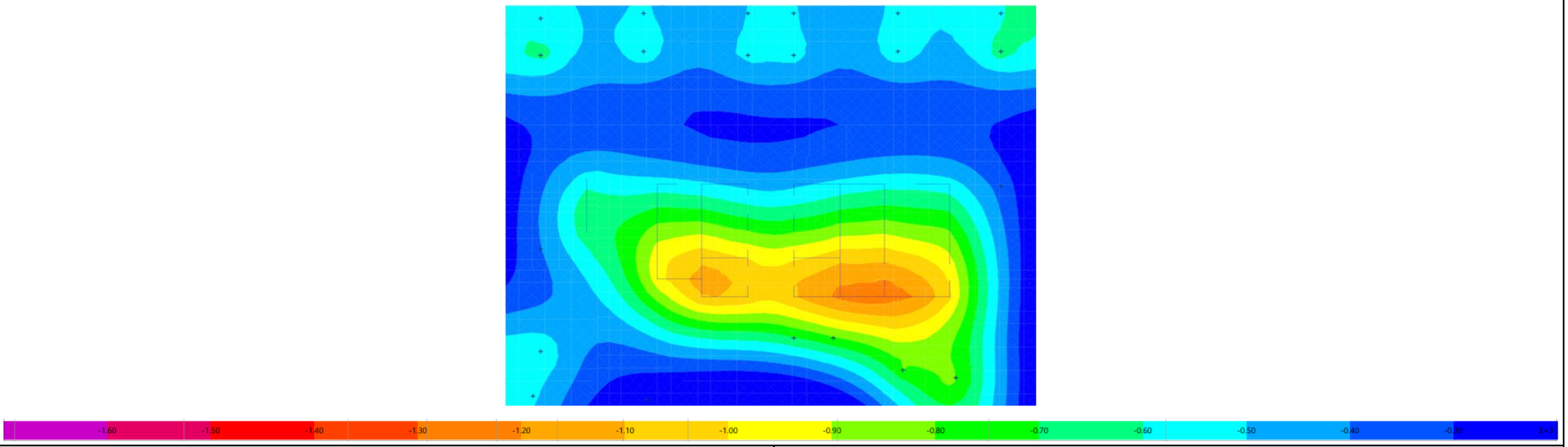


Stage 2 Loading - Total Liner Displacement

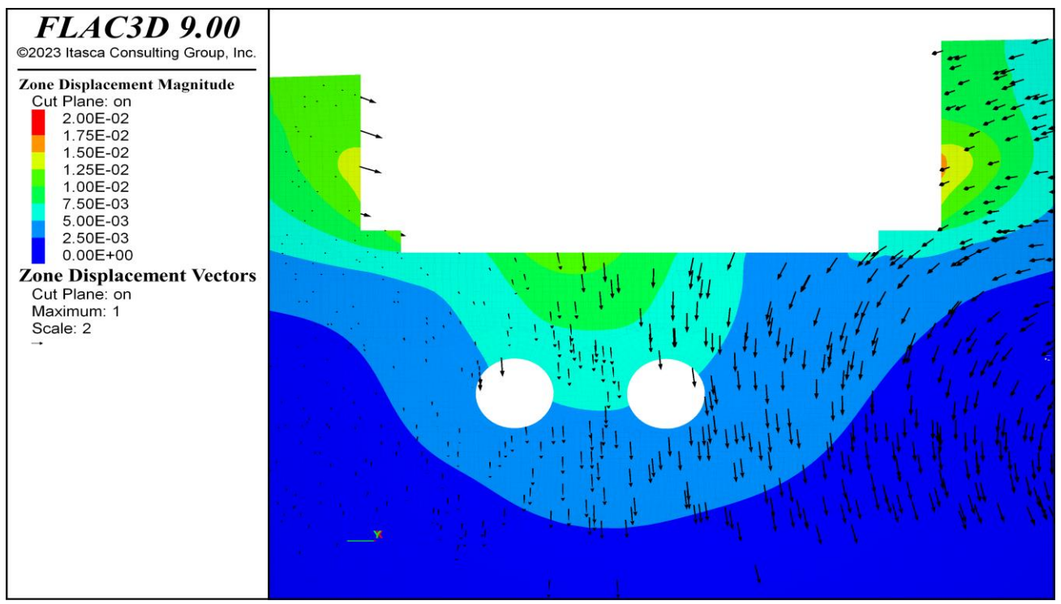


Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: Stockland Commercial Property	TITLE: **Raft Pressure and Total Rock Mass and Liner Displacement (m)**	PROJECT No: 86230.02
	OFFICE: Sydney	**Case 1 - Stage 2 - Load Case G+0.7Q - Section 1 and Plan View**	PLOT No: 4
	DATE: 20 Feb 2026	**601 Pacific Highway, St Leonards**	REVISION: 1

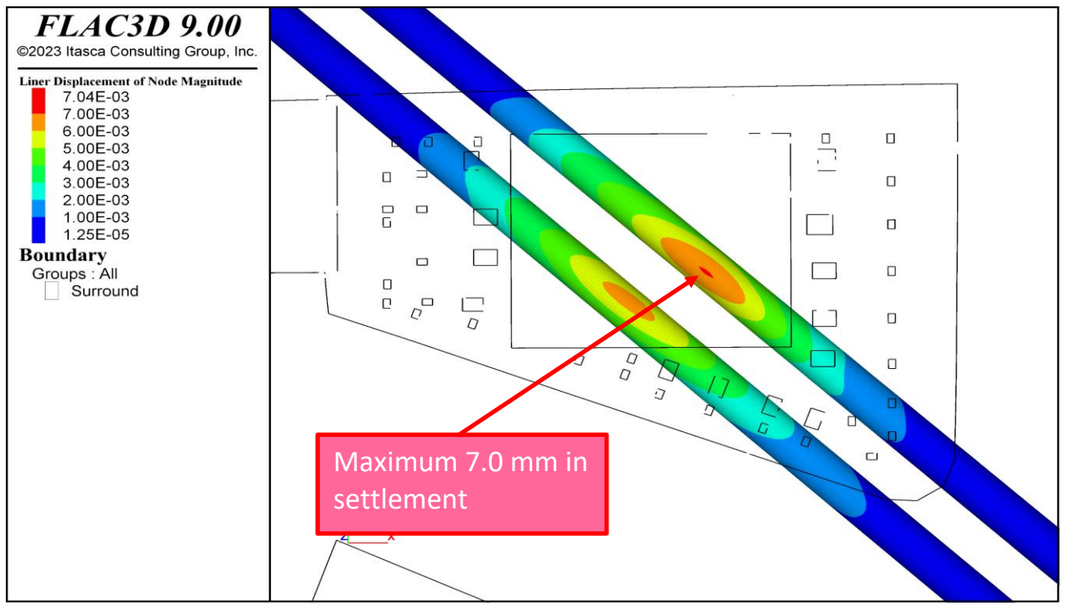
Stage 2 Load - Load Case 11 Pressures



Stage 2 Loading - Total Displacement - Section 1

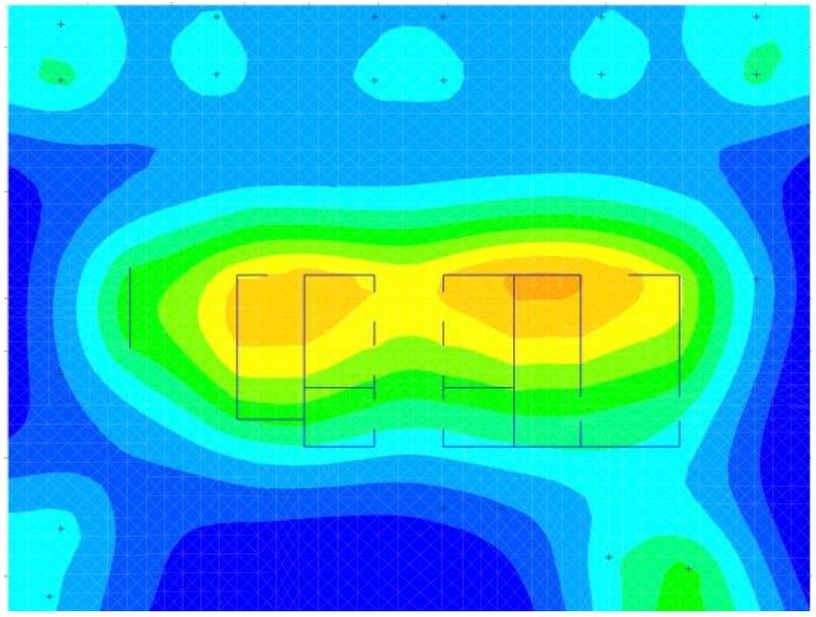


Stage 2 Loading - Total Liner Displacement



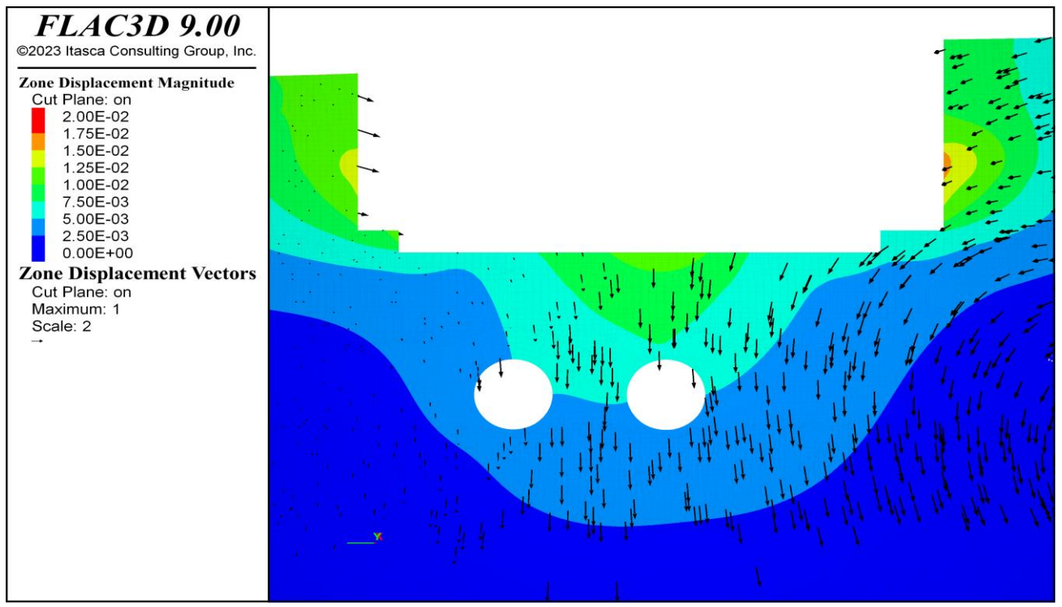
Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: Stockland Commercial Property	TITLE: **Raft Pressure and Total Rock Mass and Liner Displacement (m)**	PROJECT No: 86230.02
	OFFICE: Sydney	**Case 1 - Stage 2 - Load Case 11 - Section 1 and Plan View**	PLOT No: 5
	DATE: 20 Feb 2026	**601 Pacific Highway, St Leonards**	REVISION: 1

Stage 2 Load - Load Case 14 Pressures

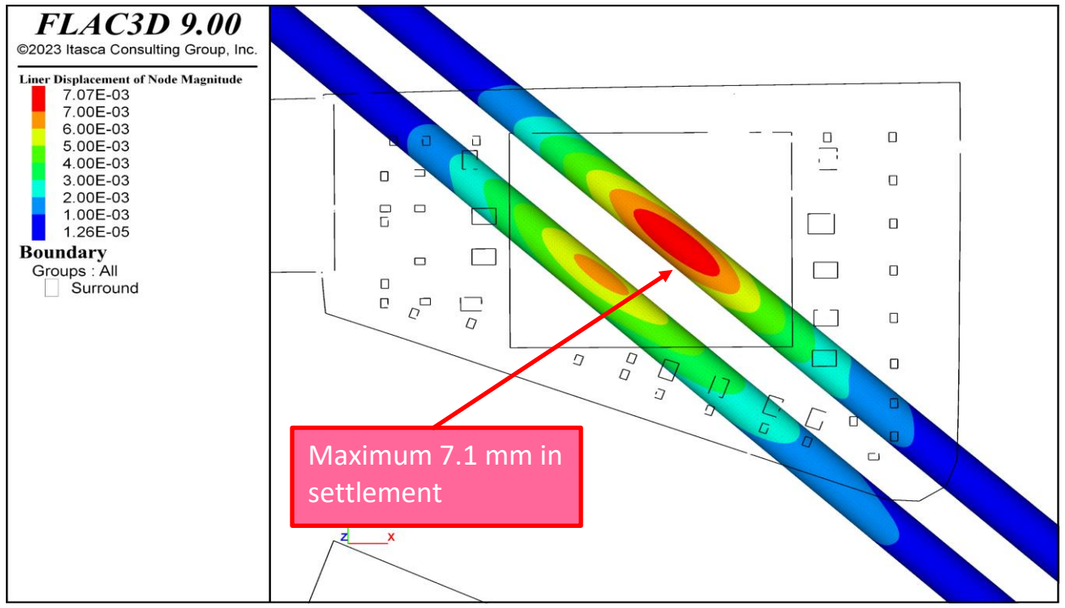




Stage 2 Loading - Total Displacement - Section 1

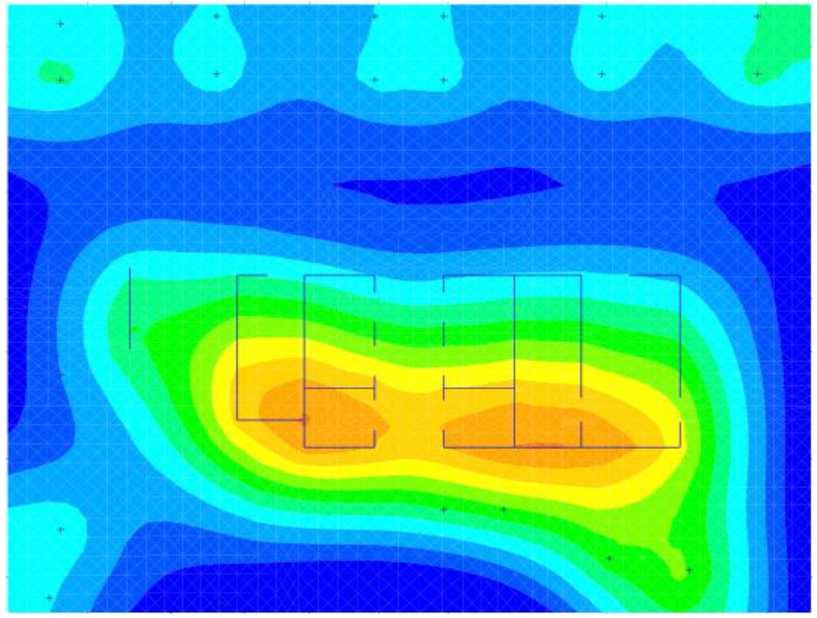


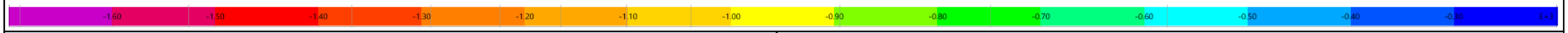
Stage 2 Loading - Total Liner Displacement



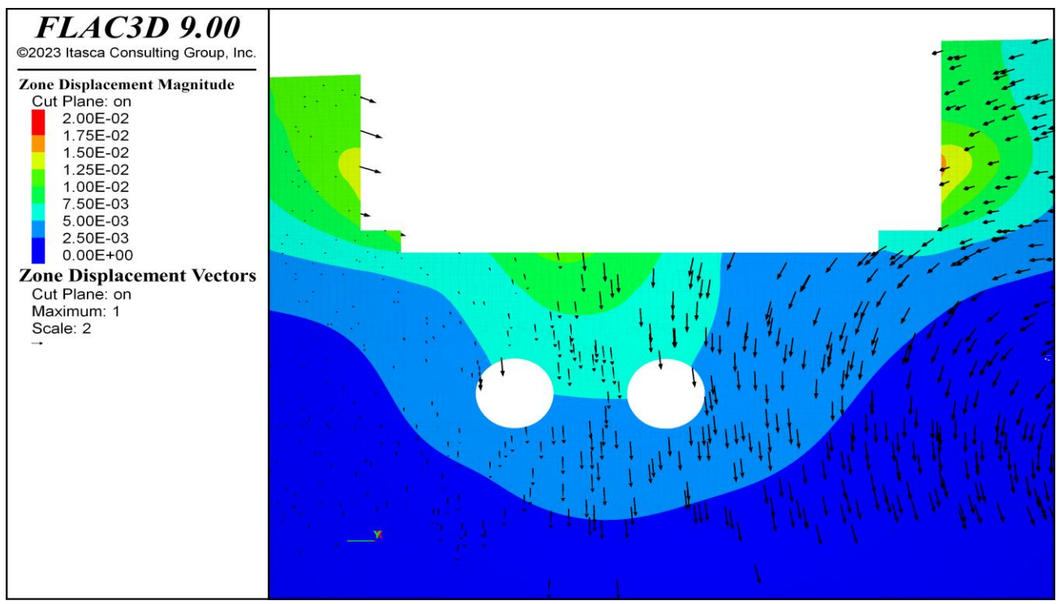
Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: Stockland Commercial Property	TITLE: **Raft Pressure and Total Rock Mass and Liner Displacement (m)**	PROJECT No: 86230.02
	OFFICE: Sydney	**Case 1 - Stage 2 - Load Case 14 - Section 1 and Plan View**	PLOT No: 6
	DATE: 20 Feb 2026	**601 Pacific Highway, St Leonards**	REVISION: 1

Stage 2 Load - Load Case 15 Pressures

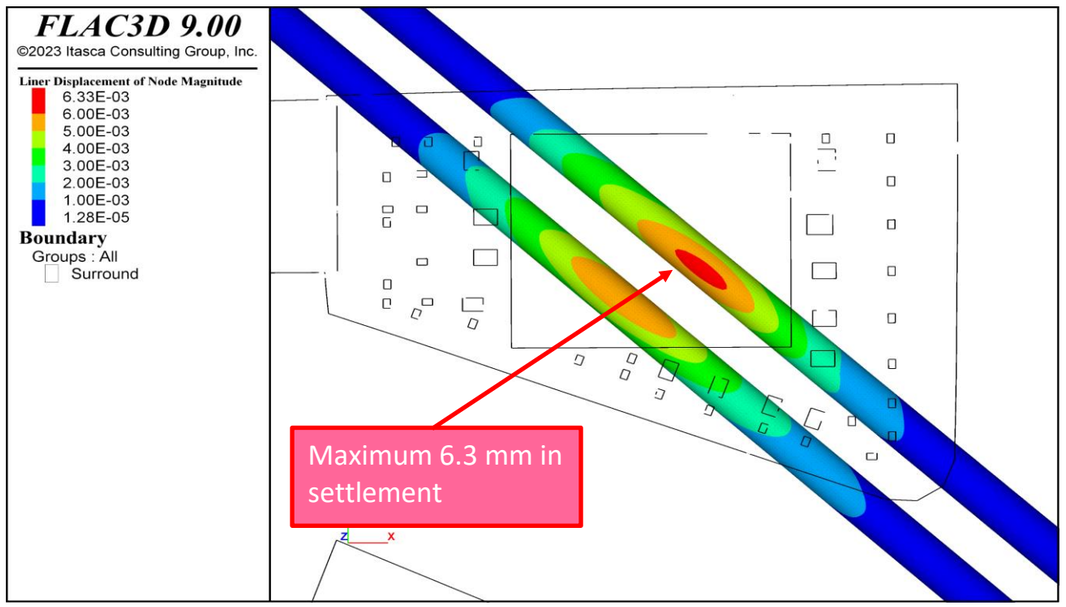




Stage 2 Loading - Total Displacement - Section 1

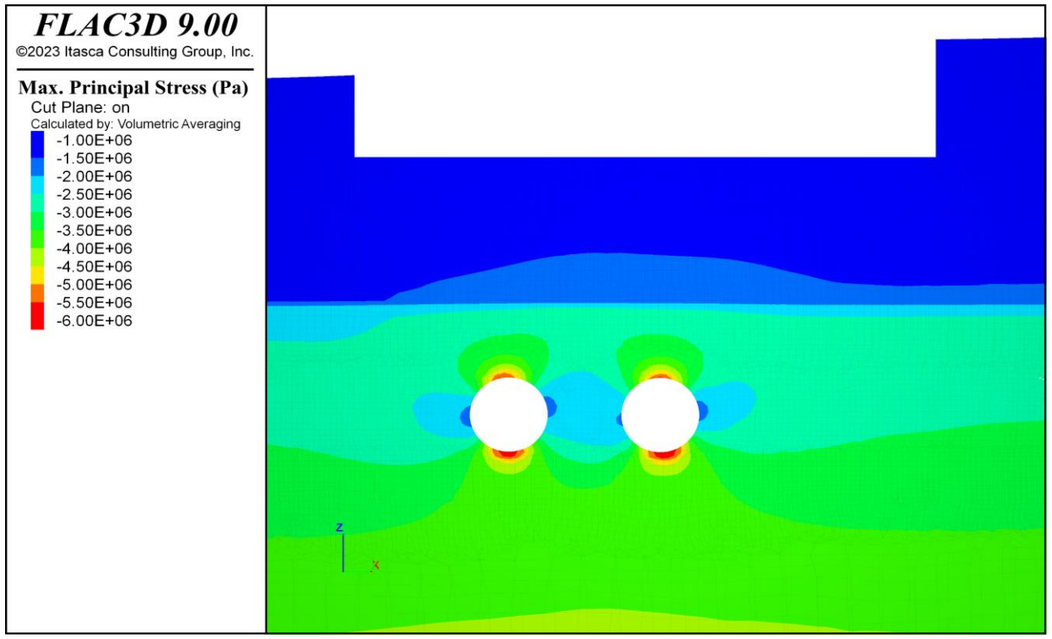


Stage 2 Loading - Total Liner Displacement

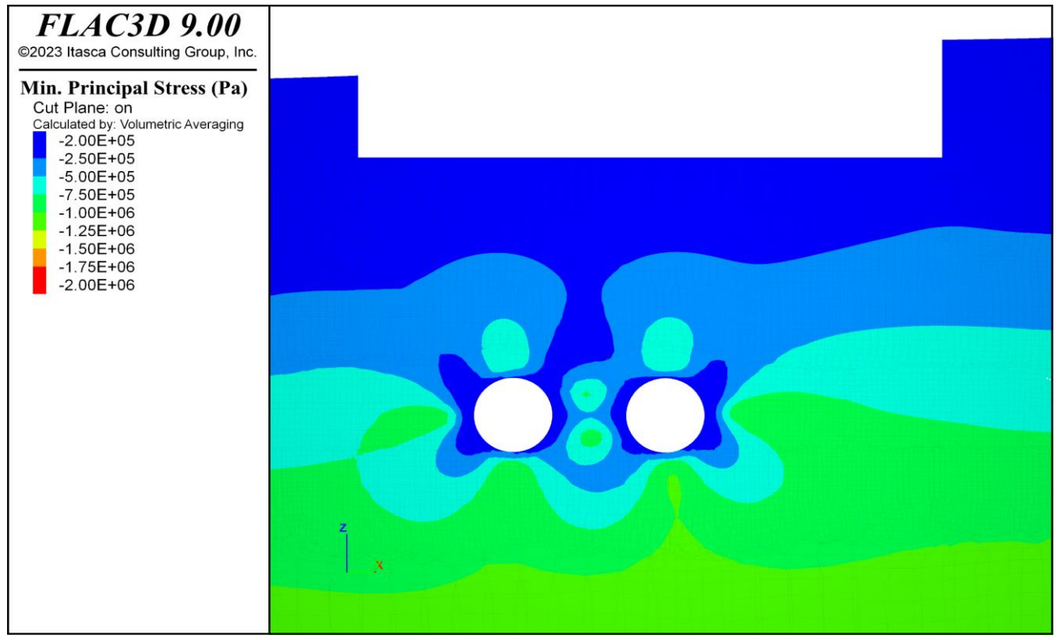


Douglas PARTNERS GROUNDED EXPERTISE	CLIENT: Stockland Commercial Property	TITLE: **Raft Pressure and Total Rock Mass and Liner Displacement (m)**	PROJECT No: 86230.02
	OFFICE: Sydney	**Case 1 - Stage 2 - Load Case 15 - Section 1 and Plan View**	PLOT No: 7
	DATE: 12 Jan 2026	**601 Pacific Highway, St Leonards**	REVISION: 1

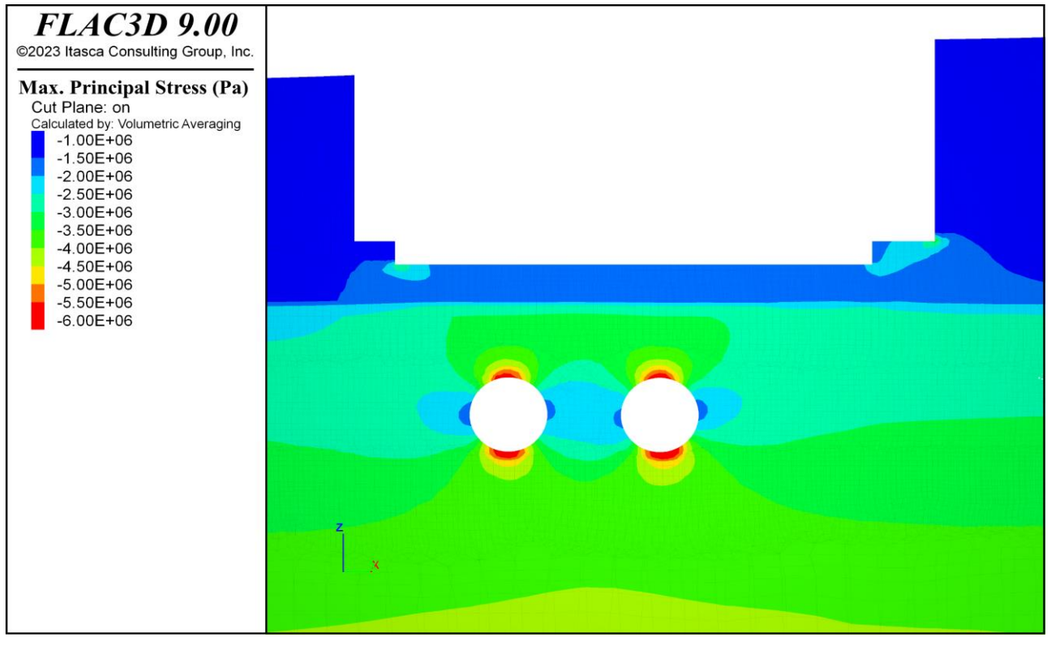
Stage 0 - Maximum Principal Stress



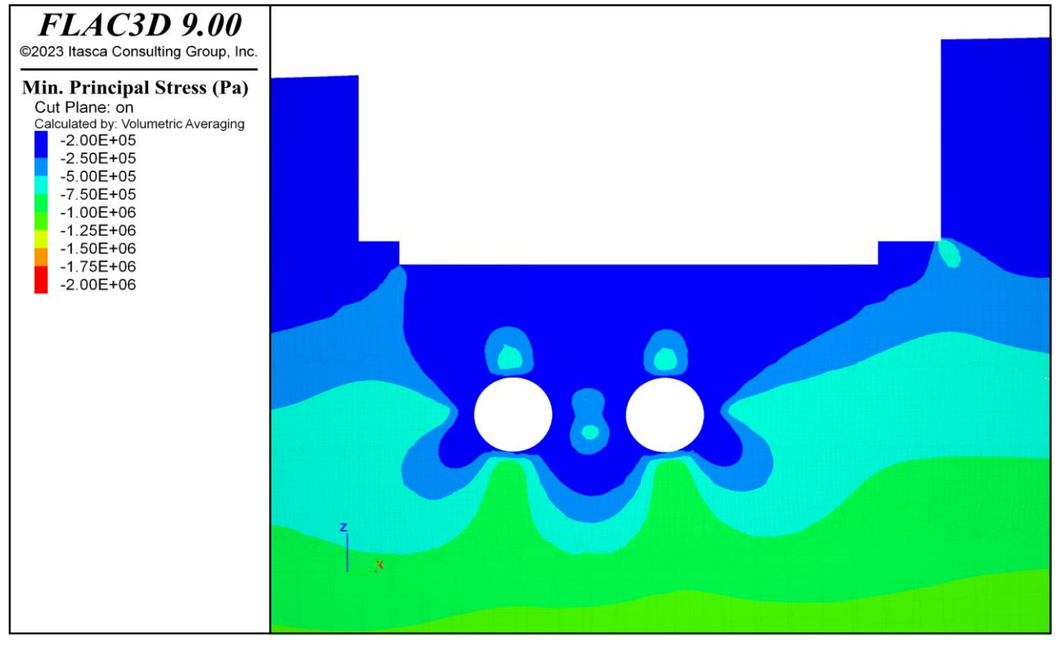
Stage 0 - Minimum Principal Stress



Stage 1 - Maximum Principal Stress



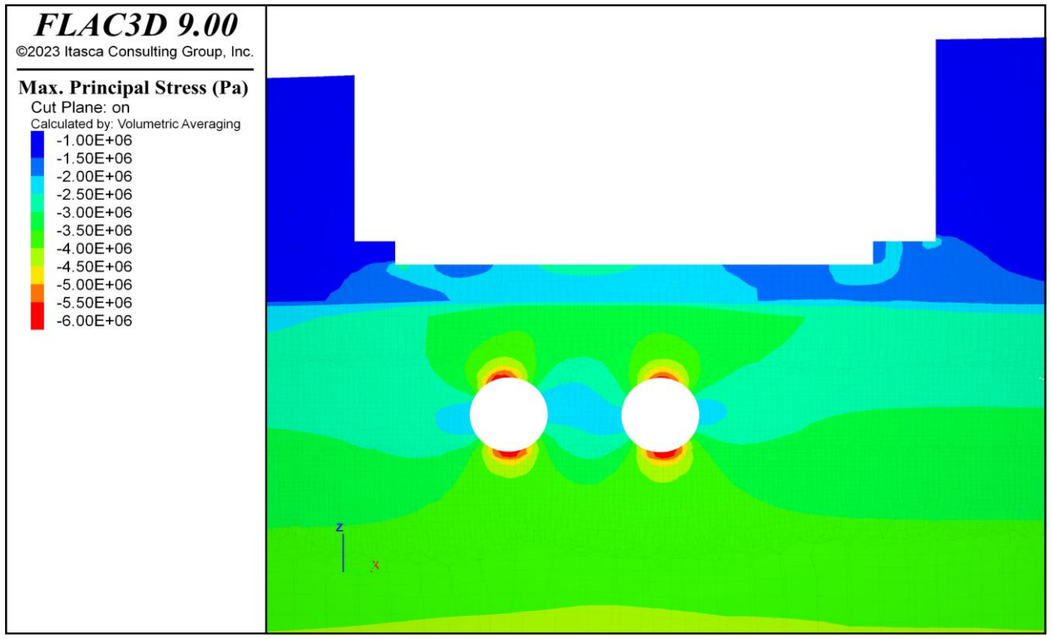
Stage 1 - Minimum Principal Stress



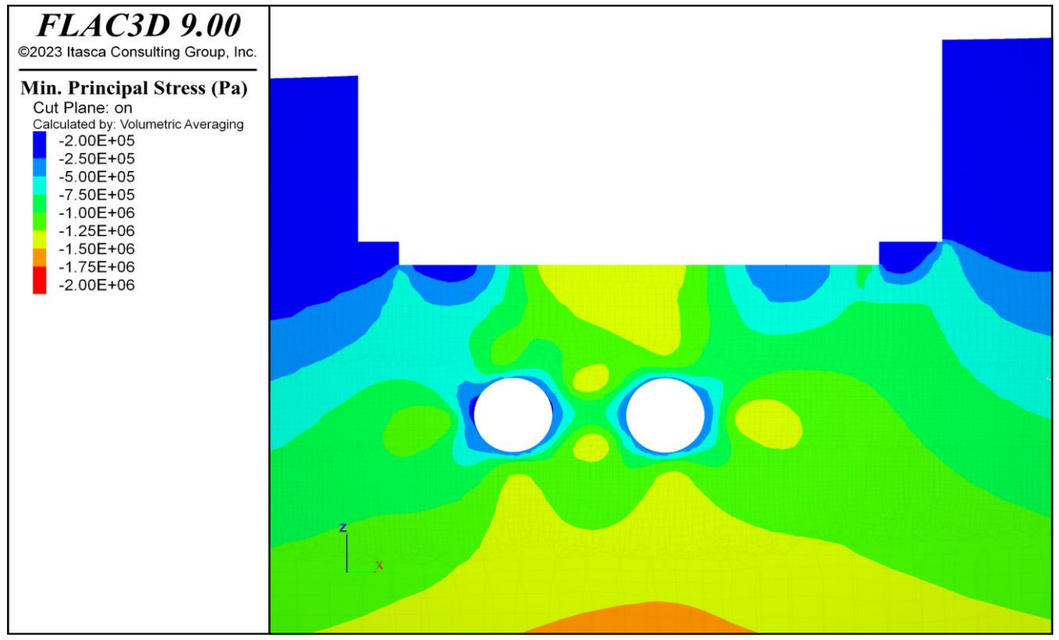
Douglas PARTNERS | GROUNDED EXPERTISE

CLIENT:	Stockland Commercial Property	TITLE:	**Maximum and Minimum Principal Stress (Pa)**	PROJECT No:	86230.02
OFFICE:	Sydney		**Case 1 - Stage 0 & 1 - Section 1**	PLOT No:	8
DATE:	20 Feb 2026		**601 Pacific Highway, St Leonards**	REVISION:	1

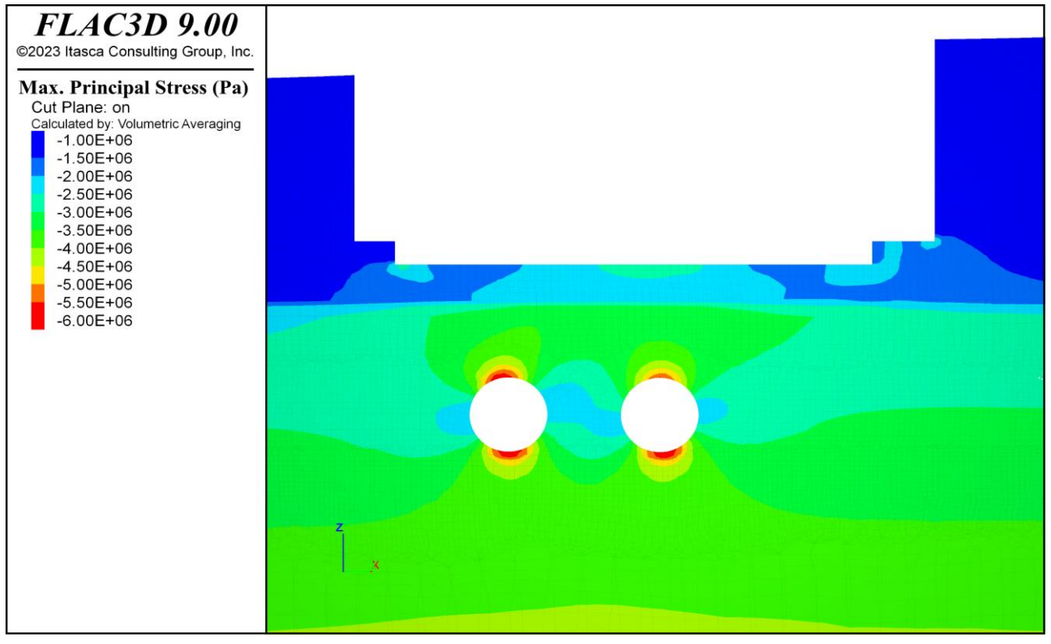
Load Case G+0.7Q - Maximum Principal Stress



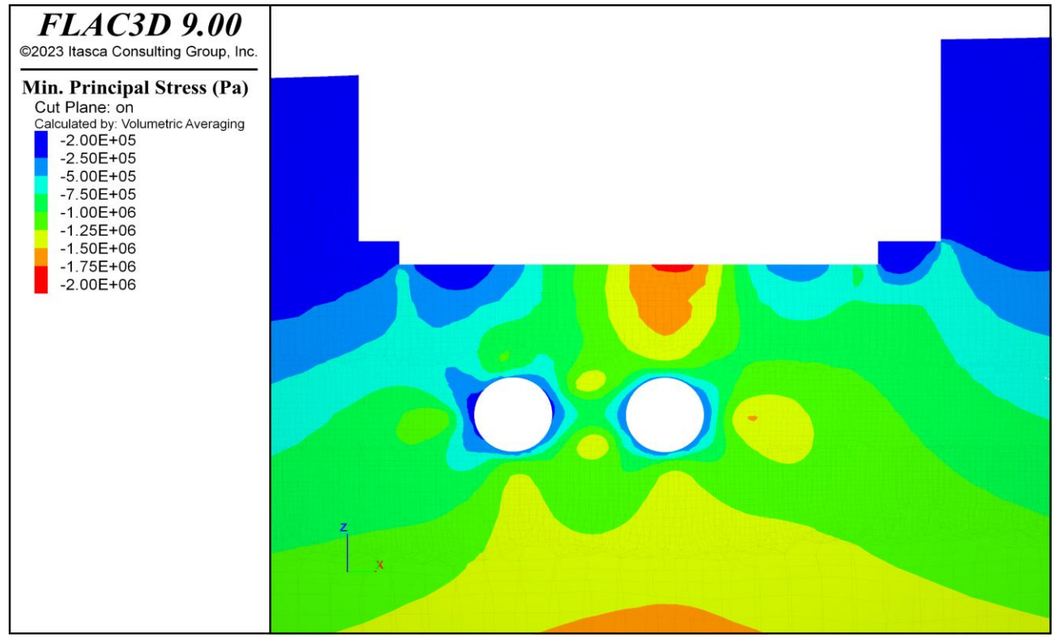
Load Case G+0.7Q - Minimum Principal Stress



Load Case 14 - Maximum Principal Stress



Load Case 14 - Minimum Principal Stress



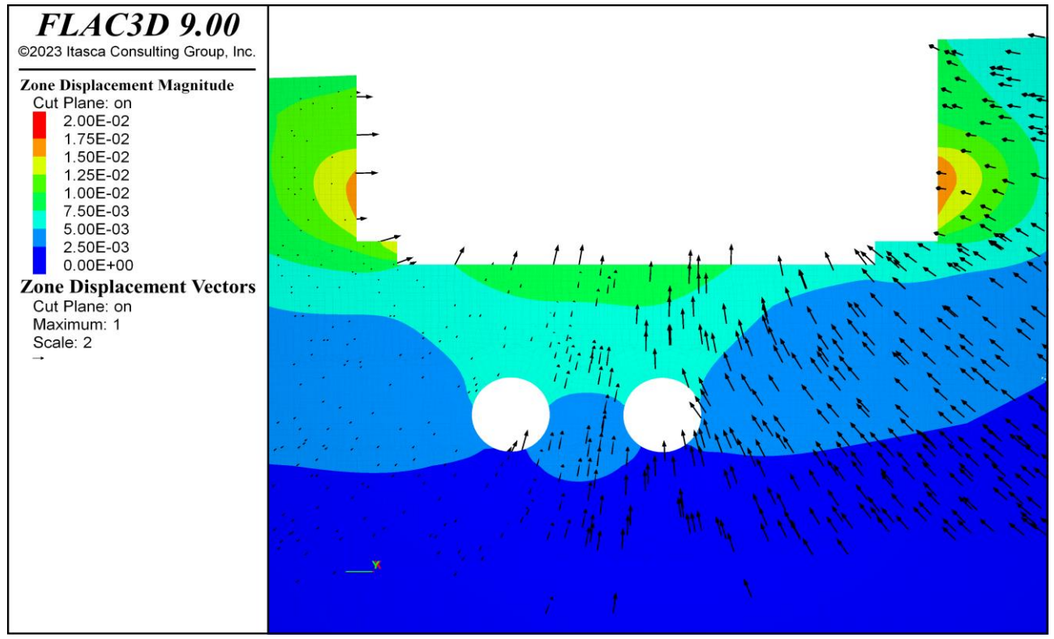
Douglas PARTNERS | GROUNDED EXPERTISE

CLIENT:	Stockland Commercial Property
OFFICE:	Sydney
DATE:	20 Feb 2026

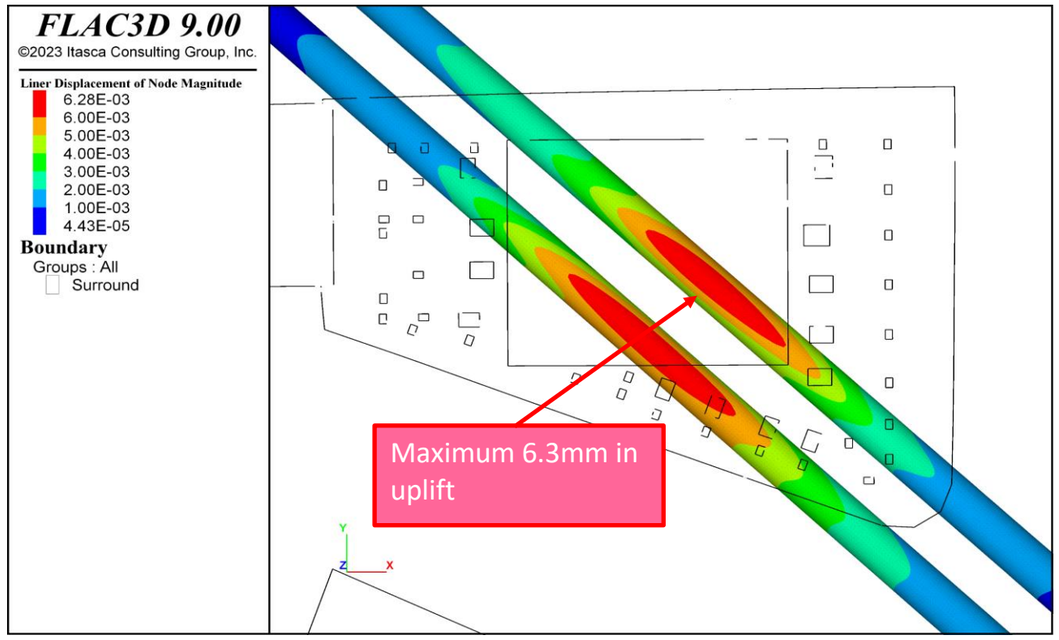
TITLE: **Maximum and Minimum Principal Stress (Pa)**
Case 1 - Stage 2 - Load Case G+0.7Q & 14 - Section 1
601 Pacific Highway, St Leonards

PROJECT No:	86230.02
PLOT No:	9
REVISION:	1

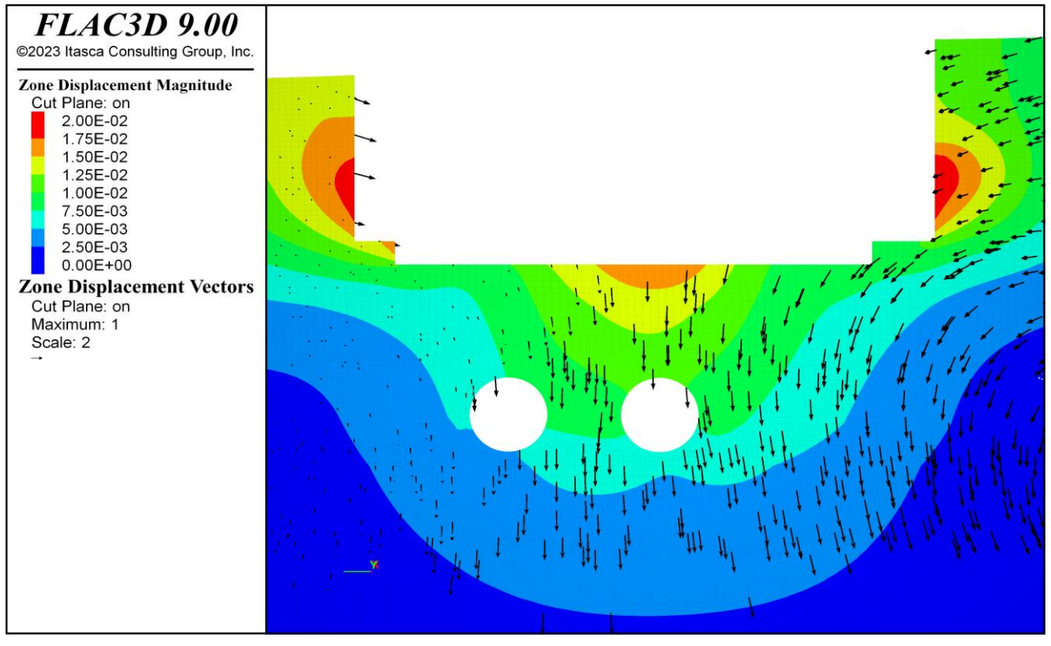
Stage 1 Excavation - Total Displacement - Section 1



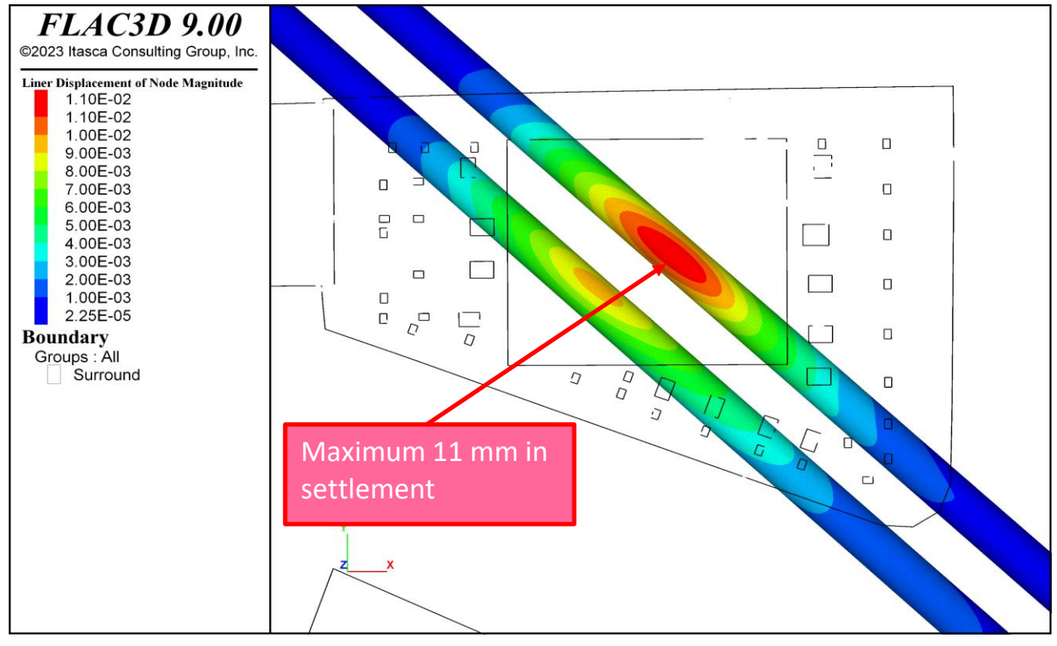
Stage 1 Excavation - Total Liner Displacement



Stage 2 Load Case 14 - Total Displacement - Section 1



Stage 2 Load Case 2 - Total Liner Displacement



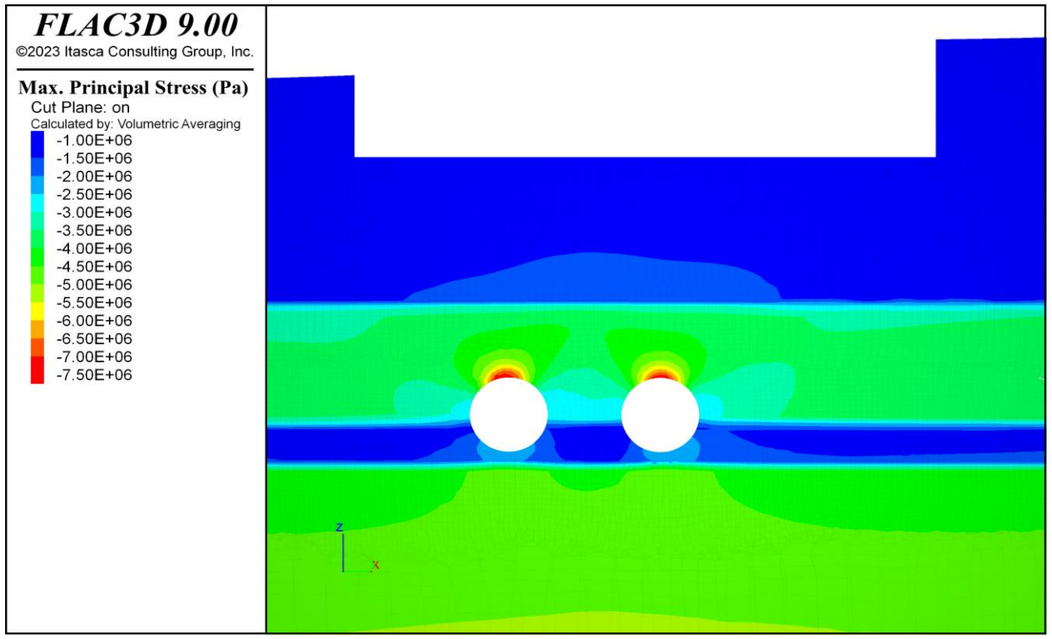
Douglas PARTNERS | GROUNDED EXPERTISE

CLIENT:	Stockland Commercial Property
OFFICE:	Sydney
DATE:	20 Feb 2026

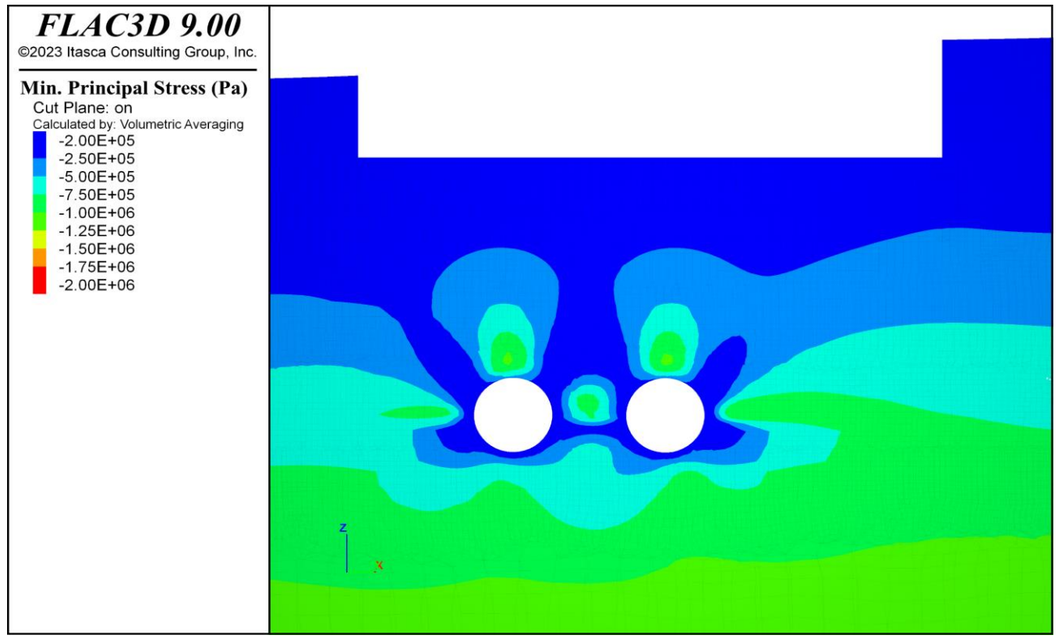
TITLE: **Raft Pressure and Total Rock Mass and Liner Displacement (m)**
Case 2 - Stage 1 & 2 (Load Case 14) - Section 1 & Plan View
601 Pacific Highway, St Leonards

PROJECT No:	86230.02
PLOT No:	10
REVISION:	1

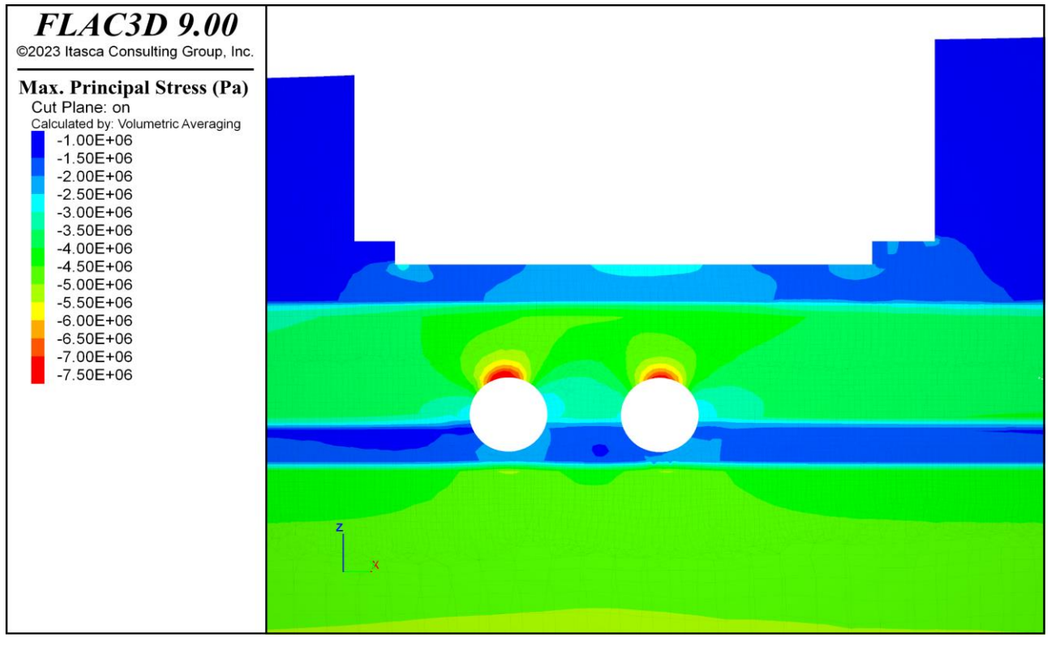
Stage 0 - Maximum Principal Stress



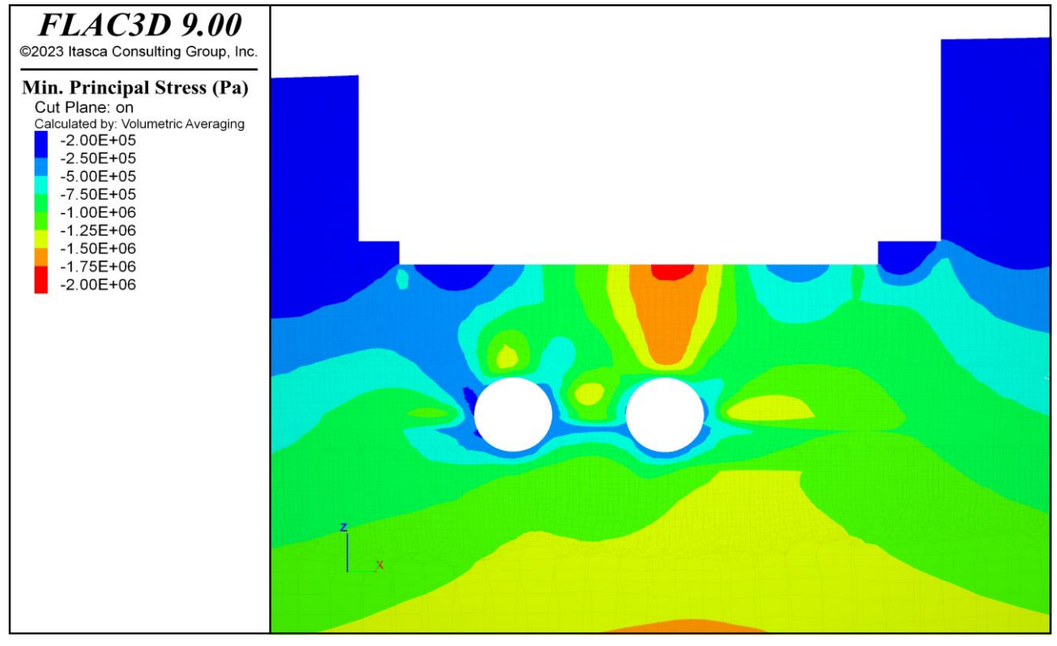
Stage 0 - Minimum Principal Stress



Stage 2 - Maximum Principal Stress



Stage 2 - Minimum Principal Stress



Douglas PARTNERS | GROUNDED EXPERTISE

CLIENT:	Stockland Commercial Property	TITLE:	**Maximum and Minimum Principal Stress (Pa)**	PROJECT No:	86230.02
OFFICE:	Sydney		**Case 2 Stage 0 & 2 (Load Case 14) - Section 1**	PLOT No:	11
DATE:	20 Feb 2026		**601 Pacific Highway, St Leonards**	REVISION:	1

Appendix E – Tunnel Engineering Impact Assessment

Engineering Impact Assessment Report for Sydney Metro
Proposed Residential Building 601 Pacific Highway, St Leonards NSW



Engineering Impact Assessment Report

Proposed Residential Building 601 Pacific Highway, St Leonards NSW

Structural Impact Assessment for Sydney Metro

19 March 2026

Reference: T4P-25WP028-REP001

Proposed Residential Building 601 Pacific Highway, St Leonards NSW

Structural Impact Assessment for Sydney Metro

Identification sheet	
Project owner	Stockland Commercial Property
Project	Proposed Residential Building 601 Pacific Highway, St Leonards NSW
Study	Structural Impact Assessment for Sydney Metro
Document date	19 March 2026
File name	Engineering Impact Assessment Report_mm.docx
Reference	T4P-25WP028-REP001
N°. of pages	158

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4 March 2026

Approval					
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1 INTRODUCTION

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1.1. PROJECT OVERVIEW

In this Structural Impact Assessment Report, the potential structural and operational impact on the underlying Sydney Metro assets of the proposed high-rise development at 601 Pacific Highway, St Leonards, NSW (the Site) is evaluated. The development site is positioned directly above the RT01 (Easternmost) and RT02 (Westernmost) running tunnels of the Sydney Metro network, as illustrated in Figure 1-1.

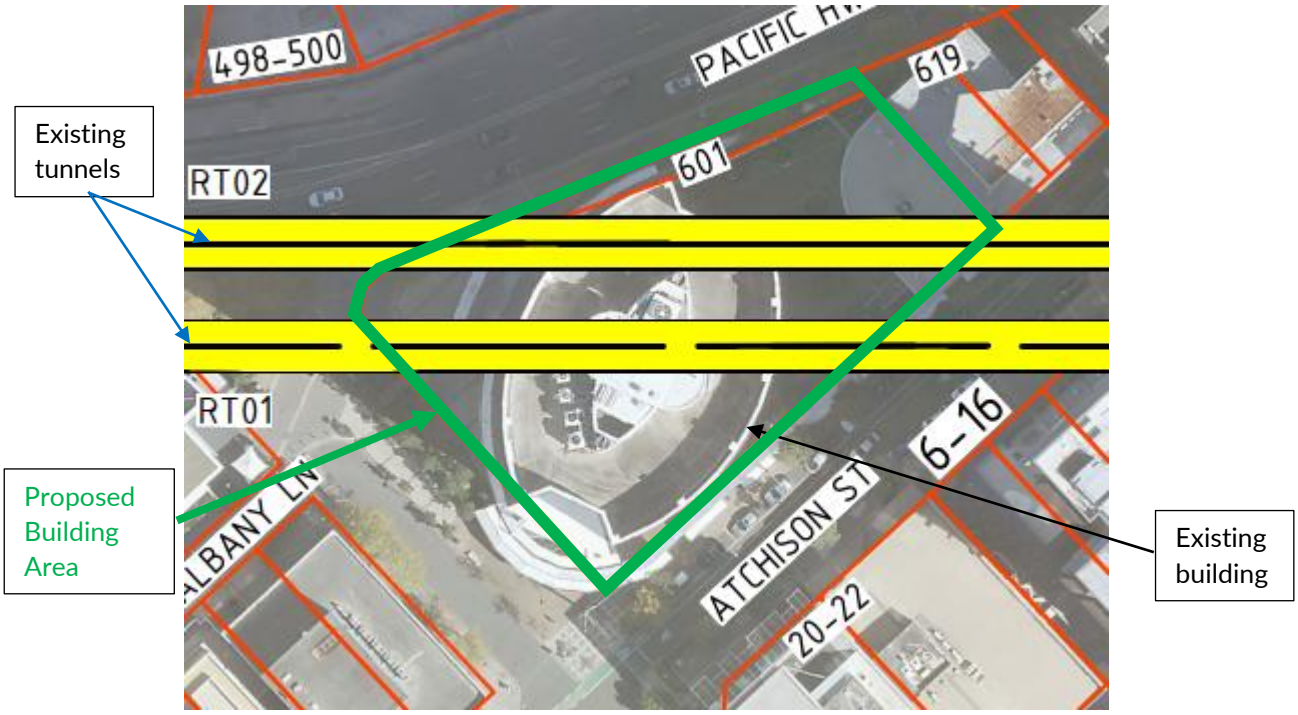

Figure 1-1 General arrangement illustrating the existing 601 Pacific Highway 14-storey commercial building, and the Sydney Metro tunnels RT01/RT02.

The site is currently occupied by a 14-storey commercial building which imposes a static load on the existing tunnels. The existing building has a basement structure that extends approximately 10m below ground level with a variable slab formation level around 79m above datum and a central core extending to around 77m above datum. The proposed development involves the following construction sequence:

- Demolition Phase: complete demolition of the existing 14-storey structure including four partial basement levels, resulting in significant "unloading" (ground heave potential) above the tunnels.
- Deep Excavation Phase (Unloading): Bulk excavation down to RL 71.2m, being an additional 6-8 meters below the current basement level, sufficient to enable creation of a unified six-level basement. This excavation will further unload the rock mass above the tunnels.
- Construction & Loading Phase: Construction of a 52-storey mixed use building with 6 level basement.

This report must be read in conjunction with Douglas Partners Pty Ltd report 86230.02.R.001 [1.]

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1.2. OBJECTIVE OF THE REPORT

The objective of this assessment is to:

- Perform 2D geotechnical Finite Element Analyses (FEA) to calculate forces on the existing tunnel lining and confirm that their capacity is sufficient to withstand the stages of building demolition, excavation, and new construction. The 2D analysis provides a simplified check of the magnitude of the loads that have been provided by Douglas Partners Pty Ltd in their FLAC 3D analysis , as outlined in report 86230.02.R.001 [1.]
- Perform a detailed 3D structural analysis to assess the existing tunnel lining capacity based on the internal forces obtained from the FLAC 3D analysis performed in Douglas Partners Pty Ltd report [1.]. This model takes into account the lining segmentation and models the true geometry of longitudinal (segment to segment) joints and the behaviour of dowels at the circumferential (ring to ring) joints.

1.3. REFERENCES

1.3.1. STANDARDS AND REGULATIONS

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- AS Australian Standard 5100.5-2017 Bridge design, Part 5: Concrete
- AS Australian Standard 4678, Earth-retaining structures
- Sydney Metro Underground Corridor Protection Technical Guidelines, Version 3 (1 August 2025)
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- Transport for NSW. TS 03505 - Track Monitoring Requirements for Undertrack Excavation
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[2.] Sydney Metro City & Southwest – TSE (Tunnel and Station Excavation): Design Package: DP-T-010 – Segmental Lining TD1/3 (Structural Design Report). Document No: SMCSWTSE-JHO-TPW-DN-RPT-900001, Rev 04, Dated 11/10/2018. Prepared by JCG JV (John Holland, CPB Contractors, Ghella Joint Venture).

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[5.] Bates Smart Architects: 601 Pacific Highway - Architectural Drawing Set (SSDA Package) Rev 3, 25th February 2026.

[6.] BG&E (2025): DA Footing Loads for Geotechnical Modelling for Sydney Metro - 601 Pacific Highway (Project No: S23095, Sketch No: ST-SKT-026, Rev B, dated 07/01/2026)

[7.] LTS Lockley (Registered Surveyors NSW): Plan of Sydney Metro Reserves and Proposed Boreholes over Lot 71 in DP 749690 known as 601 Pacific Highway, St Leonards. Reference Number: 52414 001, Dated 25/11/2025. Prepared for Douglas Partners.

[8.] The circular tunnel in elastic ground, A. M. Muir Wood, Geotechnique 25, No. 1, pp. 115-127, 1975.

[9.] Duddeck H. & Erdmann J. (1985): On Structural Design Models for Tunnels in Soft Soil, Underground Space Vol. 9.

[10.] Menozzi A., Tiberi B., Maturi D. & Comini R. 2024. Integrated design of precast concrete linings for mechanized tunnels. Proceedings of ITA-AITES World Tunnel Congress, Shenzen, China.

[11.] Sydney Metro Underground Corridor Protection Technical Guidelines Version 3 (July 2025)

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2 SITE CONDITIONS AND INTERACTION WITH THE EXISTING TUNNELS

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2.1. EXISTING SITE CONDITIONS

The proposed development site is located at 601 Pacific Highway, St Leonards, NSW. The site is bounded by Aitchison Street to the north, Mitchell Street to the east, and Pacific Highway to the south.

In the absence of original as-built architectural drawings for the current structures, all baseline site information has been adopted from the Douglas Partners Geotechnical Impact Assessment Report [1.] and is summarised as follows:

- **Existing Structure:** A 14-storey commercial building occupies the eastern portion, while a single-storey retail building is located on the western side.
- **Current Basement:** The existing basement consists of four partial levels in a spiralling arrangement, with the main slab level reaching RL 81.3m and a central lift core extending approximately 2m lower.
- **Retention System:** The current excavation is supported by a soldier pile wall with shotcrete infill panels.
- **Topography:** Surface levels across the site generally slope towards the west, falling from RL 93 m to RL 88 m relative to the Australian Height Datum (AHD).

2.2. SYDNEY METRO TUNNEL INFRASTRUCTURE

The project site is situated directly above the Sydney Metro City & Southwest corridor. The tunnel alignment passes beneath the site footprint at the following approximate chainages:

- **RT01 (Easternmost Tunnel):** Between pk 12+900 and 12+980.
- **RT02 (Westernmost Tunnel):** Between pk 12+840 and 12+900.

All technical data pertaining to the tunnel assets has been derived from the original Sydney Metro drawings (**SMCSWTSE-JHO-TPW-DN-DRG-9**) (see Figure 2-1 Sydney Metro Tunnels (RT02) Longitudinal Section at 601 Pacific Highway) and is summarised below.

2.2.1. TUNNEL GEOMETRY AND ORIENTATION

- **Orientation:** The tunnels cross the site diagonally, following a southeast-to-northwest trajectory.
- **Vertical Position:** The tunnel crowns are located at approximately RL 61 m in the western portion and RL 59 m in the eastern portion of the site.

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- **Lining Dimensions:** The geometry of the precast segmental lining is as follows:
  - Internal Diameter (ID): 6.17 m.
  - External Diameter: 6.96 m.
  - Lining Thickness: 260 mm.
  - Ring Length: 1.7 m.
  - Segmentation: 6 + 0 universal ring system with a 33 mm taper.

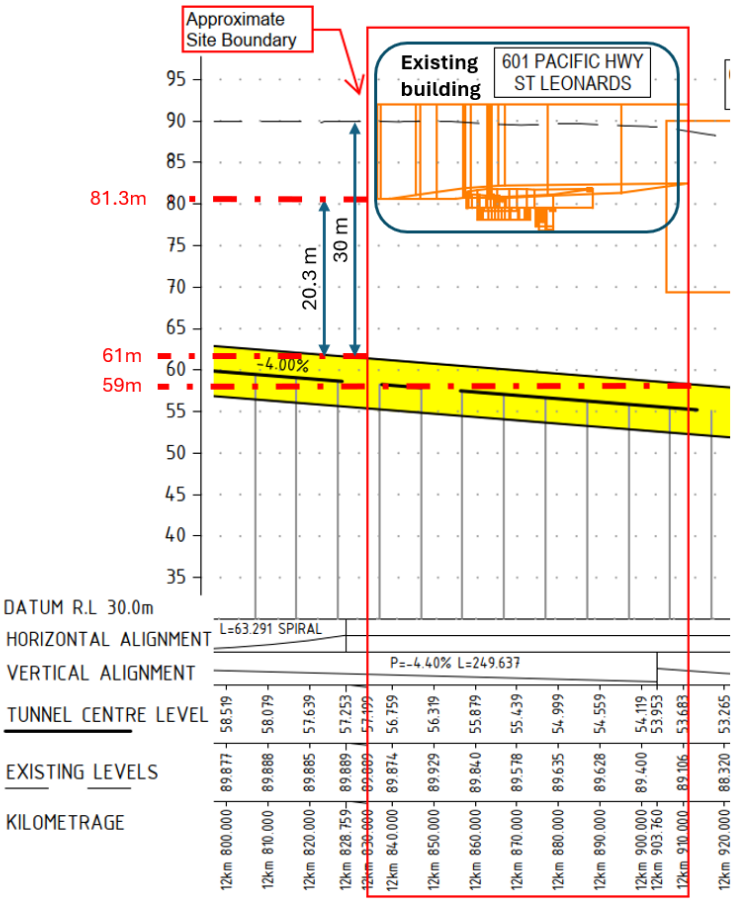

Figure 2-1 Sydney Metro Tunnels (RT02) Longitudinal Section at 601 Pacific Highway

2.2.2. MATERIAL PROPERTIES

In accordance with Sydney Metro Design Package DP-T-010, the precast segmental lining is SFRC only (Steel Fibre Reinforced Concrete) at the area of 601 Pacific Highway. The structural properties are presented below:

2.2.2.1. Precast concrete

Precast concrete characteristics are summarised below:

- Minimum required 28 days characteristic compressive cylinder strength = 50MPa

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- Young's modulus = 34800MPa
- Fibre Concrete Class F1.6/1.0

2.2.2.2. SFRC

SFRC 28 day characteristic flexural and tensile strengths are summarised below:

- Peak flexural tensile strength to EN 14651 = 5.2MPa
- Residual flexural tensile strengths to EN 14651 f_{R1} = f_{R3} = 3MPa
- Tensile splitting strength = 5MPa

2.3. PROPOSED DEVELOPMENT

The proposed redevelopment of 601 Pacific Highway involves a high-intensity structural transformation of the site. All data regarding the proposed geometry, basement levels, and excavation depths is derived from the Bates Smart architectural drawings [5.].

The construction sequence and its interaction with the underlying metro corridor is summarised below:

- **Demolition (Unloading Phase).** The project initiates with the complete removal of the existing 14-storey and single-storey structures. This phase results in significant "unloading" of the rock mass above Tunnels RT01 and RT02.
- **Deep Basement Excavation (Unloading Excavation):** To accommodate a unified six-level basement, the current footprint will be deepened with bulk excavation extending to 6-8 meters below the current basement level. The existing soldier pile shoring wall will be retained, supplemented by a secondary soldier pile wall installed in front of the legacy system to provide support for the new basement levels.
- **Foundation and Raft Details:** A 2m deep central raft and pad footings will distribute the vertical loads and lateral loads resulting from wind actions into the ground. The foundation is located directly above the Sydney Metro tunnels with an overburden of approximately 9.9m between the deepest point of the proposed excavation and the tunnel crown. (It should be noted that the tunnels are on a 4.4% grade at this point with the cover increasing by approximately 2m along the length of the proposed basement structure
- **New building construction (Reloading Phase):** A 52-storey building with 6 level basement is constructed.

2.4. PROTECTION RESERVES AND STATUTORY CONSTRAINTS

The extents of the Sydney Metro Protection Reserves are established in accordance with the 'Sydney Metro Underground Corridor Protection Technical Guidelines'. For the specific area covered in this report, the protection boundaries have been formally determined by LTS Lockley [7.]. These limits are based on the LTS Lockley Survey Records (Ref: 52414 001BH), which incorporate the legal stratum ownership defined in DP1231638 and DP1221638.

Based on these surveys and architectural overlays, the protection zones are defined as follows:

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- First Protection Reserve (Exclusion Zone): The upper boundary of the First Reserve beneath the site is defined by the Rail Stratum Upper Limit (UL). This limit ranges from RL 69.15m in the western portion to RL 67.15m in the eastern portion of the site footprint. In accordance with statutory constraints, no permanent structural elements, foundations, or unauthorized excavation activities are permitted to encroach into this zone.
- Second Protection Reserve (Assessment Zone): The entire development site is identified as being located within the Second Protection Reserve. This classification mandates a detailed Engineering Impact Assessment (EIA) and high-fidelity numerical modelling to verify that the proposed excavation and high rise tower with 6 level basement do not adversely affect the metro assets.

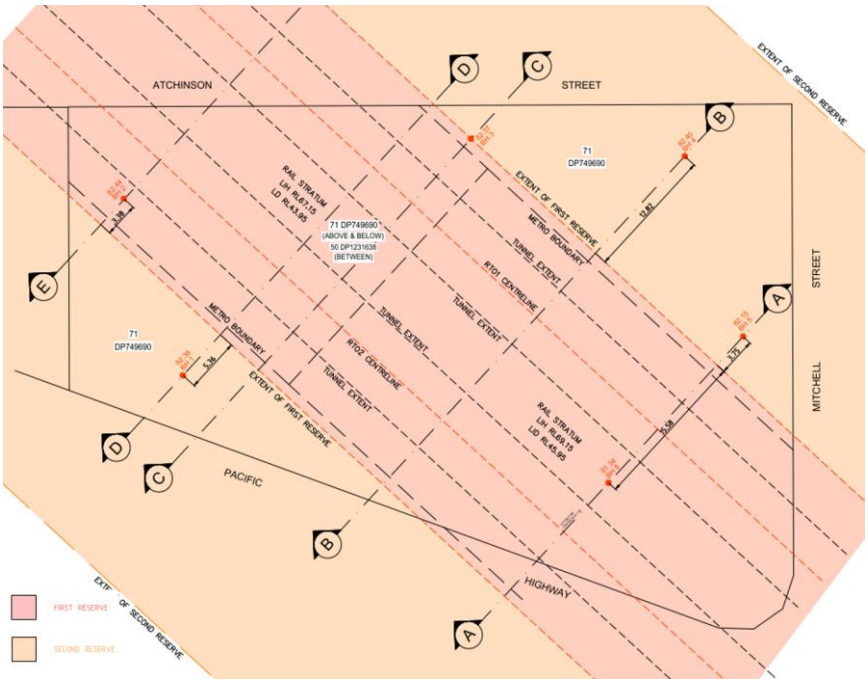

Figure 2-2 Sydney Metro Tunnels and Protection Reserves beneath the site (LTS Lockley 52414 001BH)

- **Compliance Verification:** The proposed six-level basement formation level (RL 73.1m) and the 2m deep raft slab (lowest RL 71.2m) remain entirely outside the surveyed First Reserve. A minimum vertical safety buffer of approximately 2.05m to 4.05m is maintained between the proposed structural elements and the surveyed Stratum Upper Limit.

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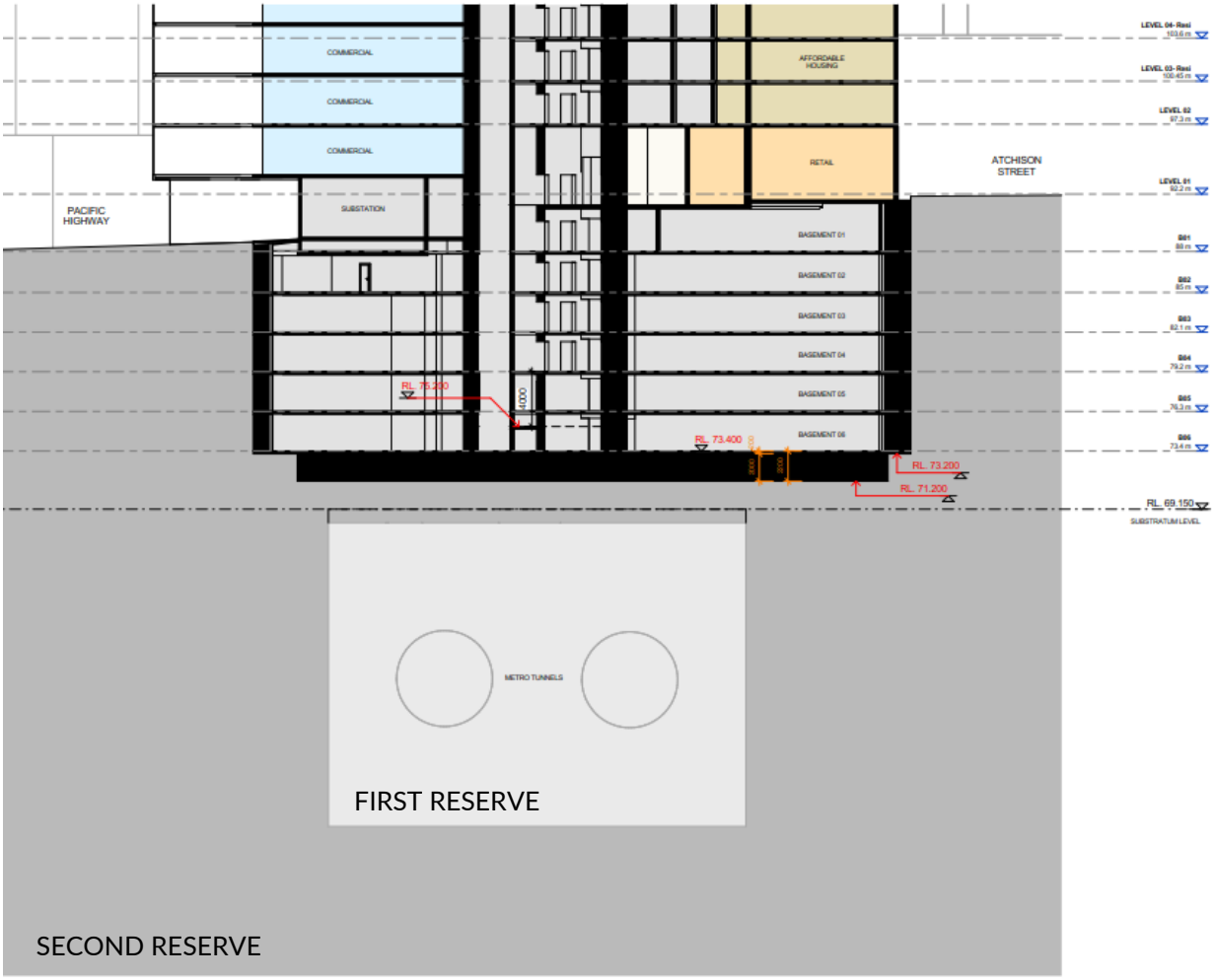

Figure 2-3 Sydney Metro Tunnels and Protection Reserve Cross Section

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3 2D GEOTECHNICAL FEM ANALYSIS

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3.1. INTRODUCTION

The 2D finite element software PLAXIS 2D has been used to independently assess the impact of the proposed development at 601 Pacific Highway, St Leonards NSW. The assessment evaluates the multi-stage construction sequence—comprising demolition, bulk excavation, and high-rise structural loading— on the underlying Sydney Metro assets.

This 2D analysis enables the structural effects of the Case 1 (Base Case) ground conditions and load combinations to be more easly analysed compared to the more detailed FLAC 3D analysis that has been carried out by Douglas Partners. The 2D analyses also include an assessment of the worst case condition i.e. Case 2 – Sencstivity Case).

The PLAXIS 2D framework enables sophisticated soil-structure interaction analysis by modelling structural elements and complex rock mass behavior simultaneously. This report evaluates both the temporary (construction phase) and permanent (post-construction) conditions of the site.

Numerical analyses are carried out across the critical cross-sections identified in Figure 3-1 to evaluate the impact on the RT01 and RT02 Sydney Metro tunnels.

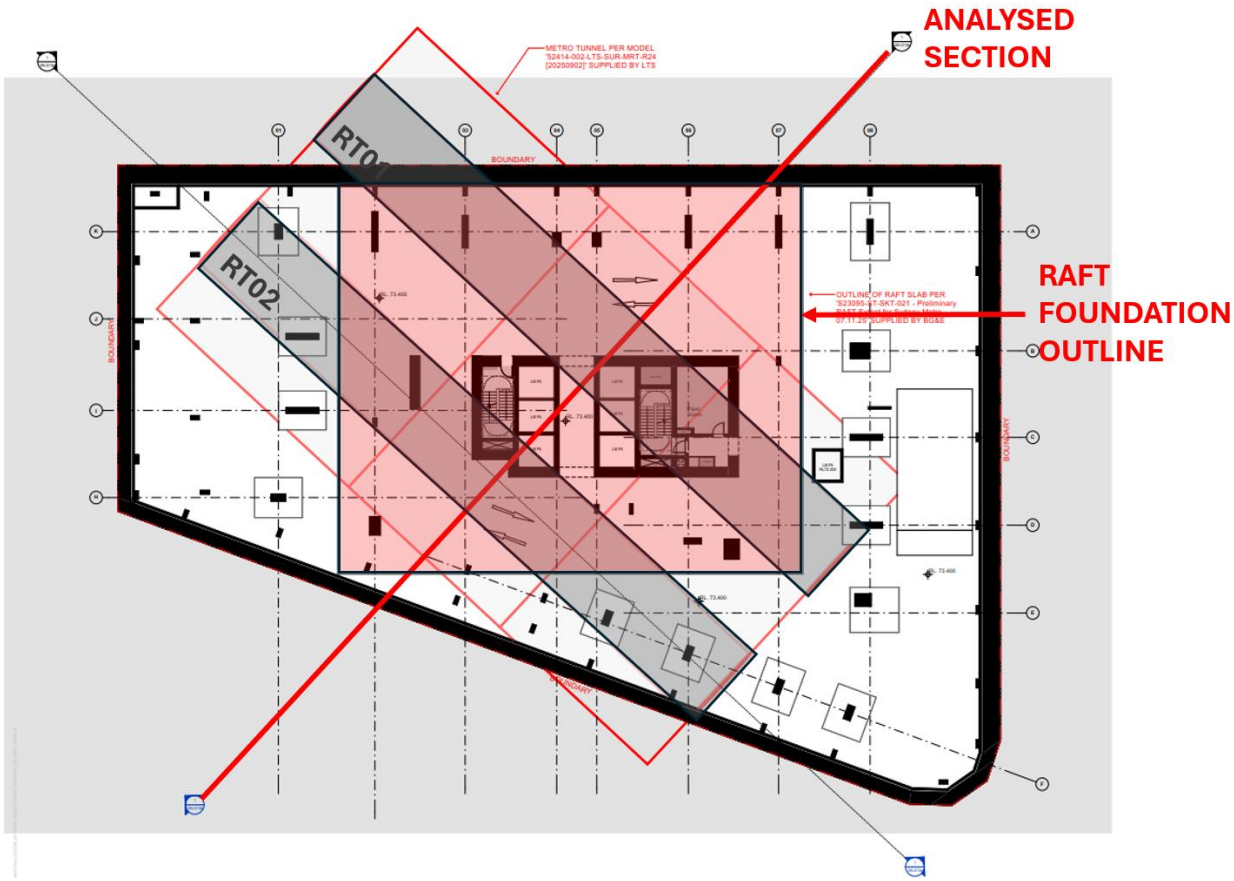

Figure 3-1 Design section and location of the raft foundation

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3.2. GEOTECHNICAL MODEL AND PROPERTIES

The geotechnical subsurface profile and parameters were established by reviewing both the Sydney Metro Geotechnical Interpretive Report (GIR) [4.] for the area and the study performed by Douglas Partners specifically on 601 Pacific Highway. The parameters defined by Douglas Partners have been adopted for this analysis as they were found to be more conservative than those used in the original Sydney Metro design.

As for the Douglas Partners analyses, two scenarios are investigated:

- **Case 1 (Base Case):** This scenario considers typical serviceability properties and standard in-situ stress relationships to model the expected ground response.
- **Case 2 (Sensitivity Case):** This is a conservative scenario incorporating a medium-strength sandstone band at the tunnel invert level. It adopts lower-bound rock mass moduli for units surrounding the tunnel and upper-bound in situ stress, aligning with typical Sydney metro tunnel design standards.

As shown in Table 3-1 below, the subsurface is divided into five primary geotechnical units, ranging from near-surface fill to the high-strength bedrock that hosts the metro tunnels:

Property	Unit A	Unit B	Unit C	Unit D	Unit E*
Behaviour	Linear Elastic	Linear Elastic	Mohr-Coulomb (Elasto-Plastic	Mohr-Coulomb (Elasto-Plastic	**Mohr-Coulomb (Elasto-Plastic**
Material	Soil (Fill & Stiff Clay)	Low and Medium Strength Shale	Medium strength Laminite	High Strength Sandstone	Medium Strength Sandstone Band
Level [m]	93-88.5	88.5-78	78-67	67-23	(56-52)
Uniaxial Compressive Strength [MPa]	-	2	12	20	(6)
GSI	-	40	65 (55)	75 (65)	(60)
Unit Weight [kN/m^3]	20	23	24	24	(24)
Soil/Rock Mass Elastic Modulus [MPa]	20	200	1500 (1000)	2500 (1700)	(800)
Poisson's Ratio	0.35	0.3	0.25	0.2	(0.25)
Friction Angle [°]	-	-	48	53	(40)
Cohesion [kPa]	-	-	400	800	(300)
Tension [kPa]	-	-	70	250	(44)

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Property	Unit A	Unit B	Unit C	Unit D	Unit E*
North-south horizontal stress σ_1[MPa]	0.5 x σ_v	1.0 x σ_v	0.9 +1.3 x σ_v (1.0 +1 x σ_v)	1.5 +2 x σ_v (2.5 +2 x σ_v)	(0.5 + 0.7 σ_v)
East-west horizontal stress σ_2[MPa]	0.5 x σ_v	1.0 x σ_v	0.63 x σ_v (0.7 x σ_v)	0.63 x σ_v (0.7 x σ_v)	(0.7 x σ_v)
Vertical stress σ_3[MPa]	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	$\sigma_v = \gamma$ x H	($\sigma_v = \gamma$ x H)

** Used in sensitivity case (Case 2) only.*

( ) Bracketed values are used for Case 2.

Table 3-1 Geotechnical Profile and ground properties

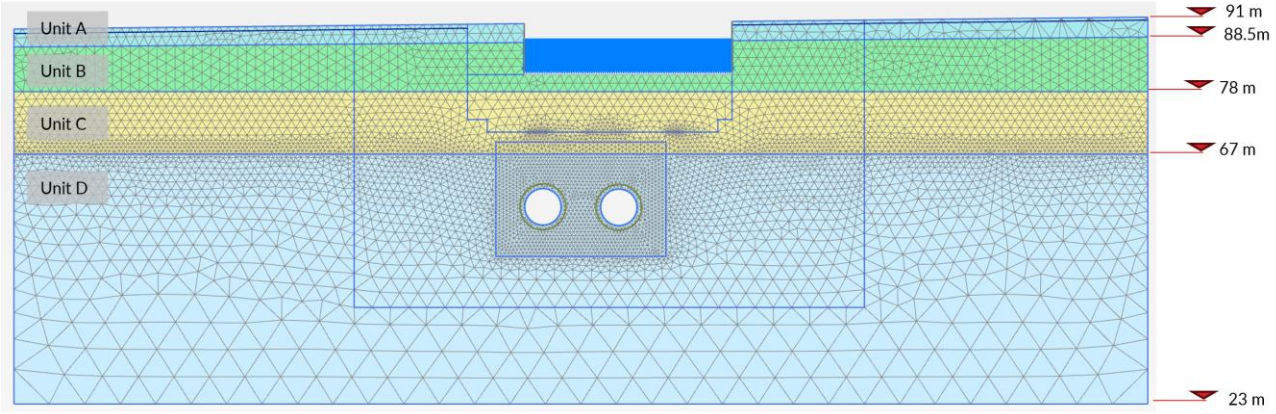

Figure 3-2 Case 1 - Stratigraphy

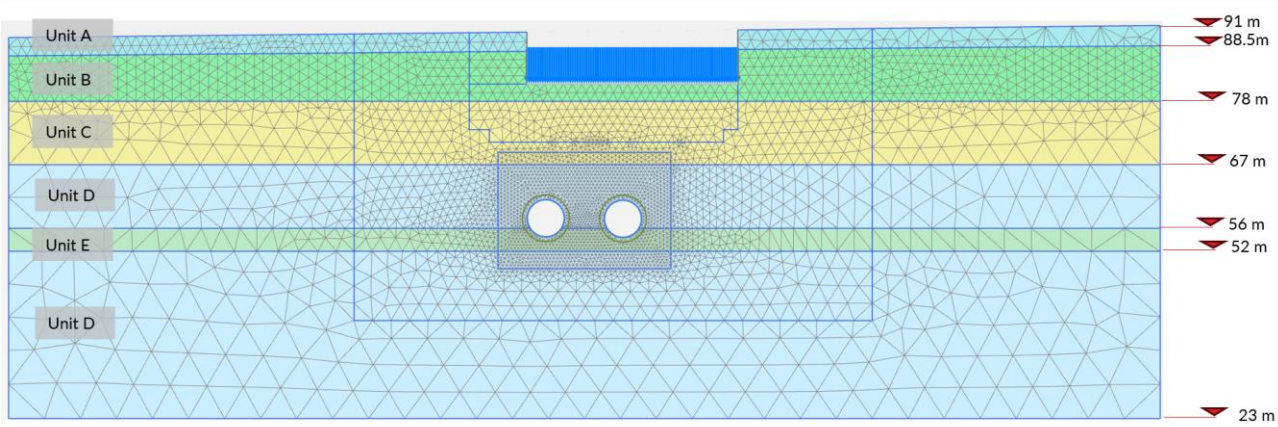

Figure 3-3 Case 2 - Stratigraphy

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3.3. GROUNDWATER TABLE

The Sydney Metro design reports [2.] & [4.] consider three different groundwater conditions for the area near 601 Pacific Highway, as shown in in Table 3-2 below.

Chainage (RT01)	Description	Rock Class	Worst Credible GW-Level Above Crown (m) (FGW1)	Typical GW-Level Above Crown (m) (FGW2)	Minimum GW-Level Above Invert (m) (FGW3)
13+000	6-10 Atchison Street	Sandstone Class I-II	30	16	**0**
13+030	2-4 Atchison Street	Sandstone Class I-II	29	17	0

Table 3-2 Groundwater Levels considered in the Sydney Metro design reports

The original design of the segmental lining already accounts for three critical water level scenarios to ensure structural robustness:

- **Worst Credible (FGW1):** Assumed at ground surface or maximum creek levels.
- **Typical (FGW2):** Expected hydrostatic pressure over the 120-year design life.
- **Low (FGW3):** Assumed as zero water pressure to account for potential construction depressurisation.

To identify the most critical conditions for the metro assets, all three groundwater levels have been considered for Case 1 (Base Case) with detailed comparison tables and the results presented in Annex 1.

The minimum water level (FGW3, 0 m) is identified as the most critical for structural stability, as it leads to reduced axial loading, increasing the tensile stresses on the lining. The higher water levels (FGW1 and FGW2) provide a beneficial axial compression that enhances the segment capacity.

3.4. SYDNEY METRO TUNNELS

In PLAXIS 2D the tunnel lining is modelled as an elastic plate element. To accurately simulate the structural behaviour of a segmental lining—which is inherently more flexible than a continuous monolithic structure due to its joints—the Muir Wood approach has been adopted [8.].

Furthermore, the Elastic Modulus of the concrete has been reduced to 80% of its short-term value. This adjustment incorporates long-term creep effects, as defined in the Sydney Metro structural design criteria, providing an 'effective stiffness' for the analysis.

The structural properties adopted for the lining elements are summarized in Table 3-3 below.

Type	Unit Weight [kN/m^3]	Elastic Modulus [GPa]	Poisson's Ratio	EA [MN/m]	EI [MNm^2/m]
Tunnel Lining	**25**	**27.8**	**0.2**	**7284**	**29.6**

Table 3-3 Tunnel lining properties

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3.5. LOADS

The loads considered in the numerical analysis are presented in this section.

3.5.1. GROUND LOAD AND STRESS RELAXATION

The model simulates ground loads on the lining accounting for the initial stress relaxation that occurs during the original tunnel construction. Based on the interpretation of the original tunnel design reports, the liner is activated in the PLAXIS model only after 90% of the stress relaxation has occurred. This methodology ensures a realistic representation of the stress state before the new development.

3.5.2. ROCK WEDGE LOADS

In accordance with the Sydney Metro design criteria, potential rock wedge instability on the tunnel crown has been evaluated to ensure structural integrity against local instability. These representative rock wedges simulate localised rock units that could potentially detach and exert additional gravity loads on the tunnel lining during or after the excavation.

Based on Sandstone Class I rock conditions, two distinct wedge types are incorporated into the numerical assessment:

- **Exceptional Wedge:** A triangular-shaped wedge located centrally over the tunnel crown with a depth of **1.25m** at the tunnel centre.
- **Typical Wedge:** A rectangular-shaped wedge, typically located at the tunnel vaults, with a depth of **0.5m**.

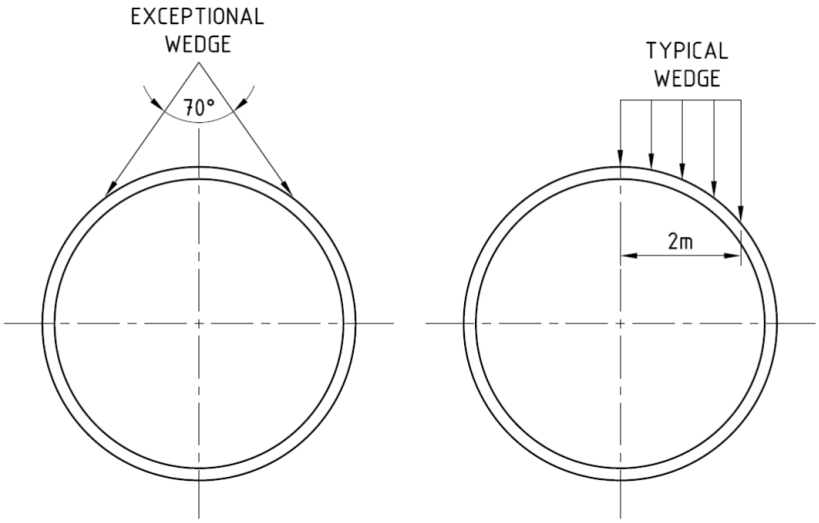

Figure 3-4 Rock Wedge Load

Load application and load factors

To ensure consistency with the structural checks and the global load factor (1.5) applied to the FEM model results, the following input loads were considered:

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- Exceptional Wedge Load: The peak crown load for this load is calculated as 1.25 * 24 / 1.5 = 20 kN/m². The exceptional load is divided by the load factor of the predominant earth pressure 1.5 to get correct load combination results.
- Typical Wedge Load: The maximum crown load for this load is 0.5* 24 = 12 kN/m².

For the circular shaped tunnel crown, the exceptional wedge is taken as a triangular shaped wedge, located centrally over the tunnel crown. The typical wedge is rectangular in shape and located at the tunnel vaults. Placing typical wedges on the side of the building's concentrated loads ensures the model captures the locally eccentric loading that can occur.

The two loads are illustrated in Figure 3-5 and Figure 3-6 below.

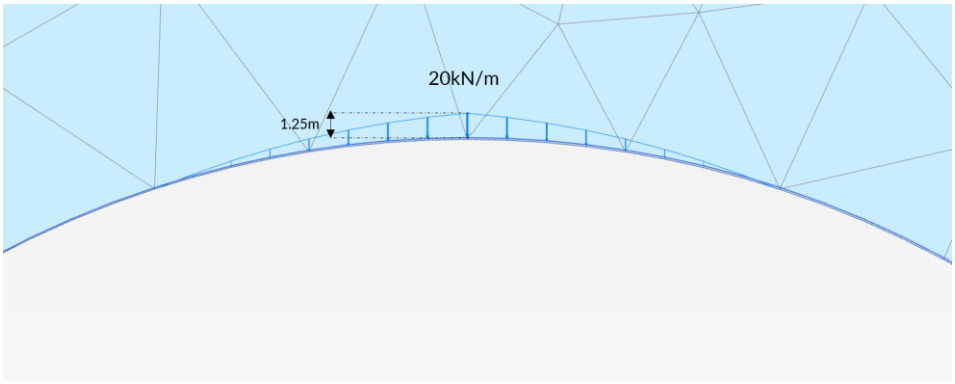

Figure 3-5 Exceptional wedge in Sandstone Class I

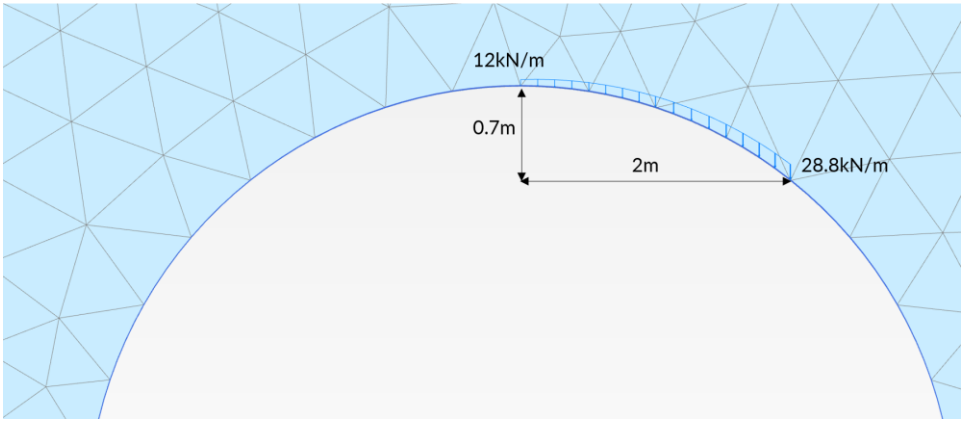

Figure 3-6 Typical wedge in Sandstone Class I

3.5.3. EXISTING BUILDING LOAD

The load of the existing 14-storey building and its 4-level basement are considered in the model. Based on an estimated pressure of 10 kPa per floor, a uniform surcharge load of 180 kPa has been applied at the existing basement level.

3.5.4. PROPOSED BUILDING LOAD

The foundation pressures for the new 52-storey tower and 6 level basement have been integrated into the PLAXIS 2D model based on the BG&E structural model foundation pressures provided in [6.]. Following

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technical discussions with the structural engineers, the analysis focuses on the most critical serviceability load cases to evaluate the maximum impact on the tunnels:

- Serviceability Gravity Load (G+0.7Q): BG&E case #S001_ST_G+0.7Q-NL.
- Serviceability Wind Load Case 11: BG&E case #S011_LT_G+0.4Q+W(Rep)(11/24)-NL.
- Serviceability Wind Load Case 14: BG&E case #S011_LT_G+0.4Q+W(Rep)(14/24)-NL.
- Serviceability Wind Load Case 15: BG&E case #S011_LT_G+0.4Q+W(Rep)(15/24)-NL.

The foundation pressures and relative loading on the geotechnical model are illustrated in Figure 3-7.

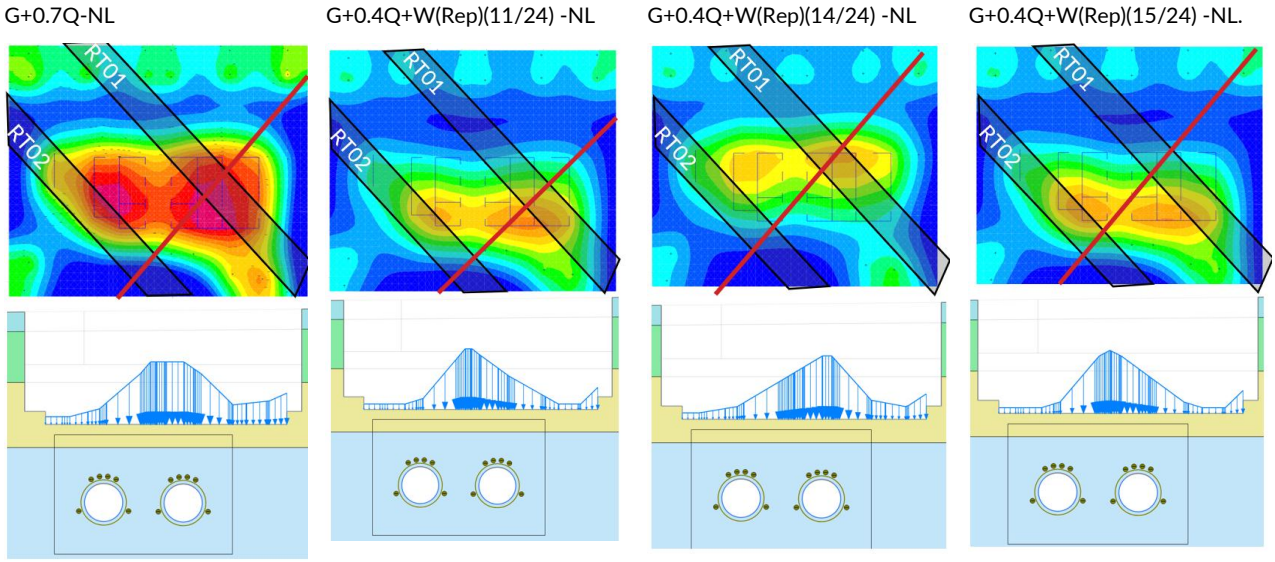

Figure 3-7 Vertical Pressure Distribution Profiles for Critical Loading Cases. Foundation bearing stresses from the structural model (above) and loading as applied on the 2D geotechnical FEM model (below).

3.6. MODELLING ASSUMPTIONS

The numerical analysis in PLAXIS 2D is based on a number of structural and geotechnical assumptions and simplifications to ensure a realistic yet conservative assessment:

- **Critical Section Alignment:** The model focuses on the location with the highest non-homogeneous vertical stresses from the building core acting above the tunnel. As the analysis is two dimensional, these peak foundation pressures are assumed to be continuous and infinite along the entire longitudinal axis of the tunnel. This approach provides a safe "upper bound" for the lining stresses and ground movements. This is a significant simplification compared to the more comprehensive 3D modelling of the loading has been captured by Douglas Partners [1.].
- **Independent Shoring Design:** The shoring system for the building basement is assumed to be designed independently with adequate bracing to maintain stability. The system is defined as being sufficiently rigid to restrict maximum horizontal displacements to within acceptable horizontal displacements. It is not a purpose of this model to model the shoring system in detail.

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- **Tension-Free Interface Modelling:** During the unloading phases (demolition and excavation), a specific interface with low cohesion (1 kPa) and a friction angle (20°) is applied around the tunnel lining. This modelling approach is consistent with the tangential slip condition described by Duddeck & Erdmann (1985), which assumes that the lining is not physically bonded to the surrounding medium in a way that resists tensile separation. It ensures the simulation does not generate unrealistic tensile stresses across the soil-structure boundary.

3.7. CONSTRUCTION SEQUENCES

The numerical analysis considers three primary stages to capture the transition from existing site conditions to the final structural loading of the 52-storey tower. To ensure a comprehensive assessment, the Exceptional Wedge (EW) and Typical Wedge (TW) loads are defined as sub-stages immediately following each specific building load combination in Stage 2.

The load stages considered are illustrated in Figure 3-8.

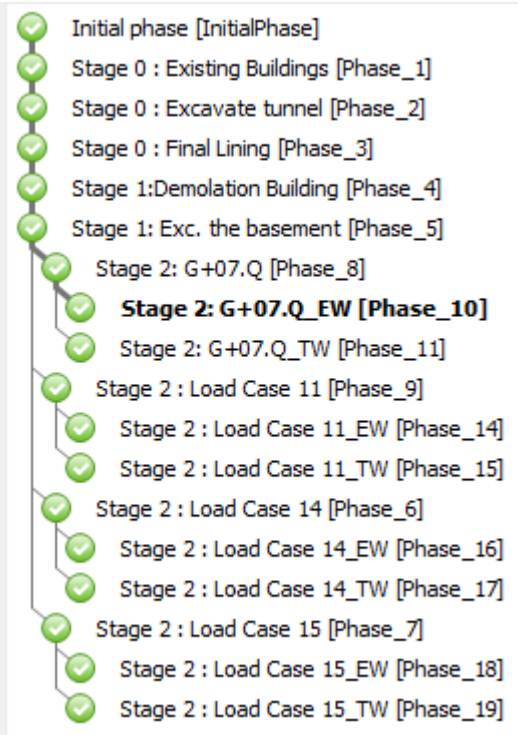

Figure 3-8 Phases explorer from Plaxis

Cases 1 and 2 have the same sequence; however, as indicated in Section 3.2, Case 2 incorporates lower modulus ground and slightly reduced strength parameters (see Table 3-1), higher in-situ stresses, and a weak seam near the tunnel invert.

Construction phases and load cases are illustrated below:

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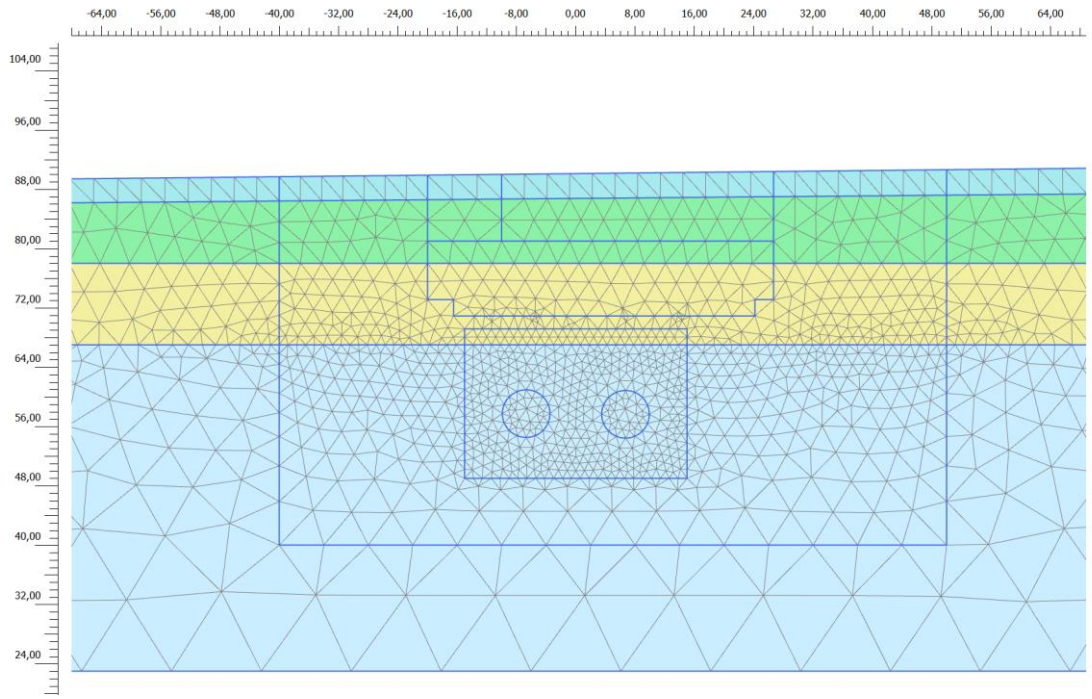
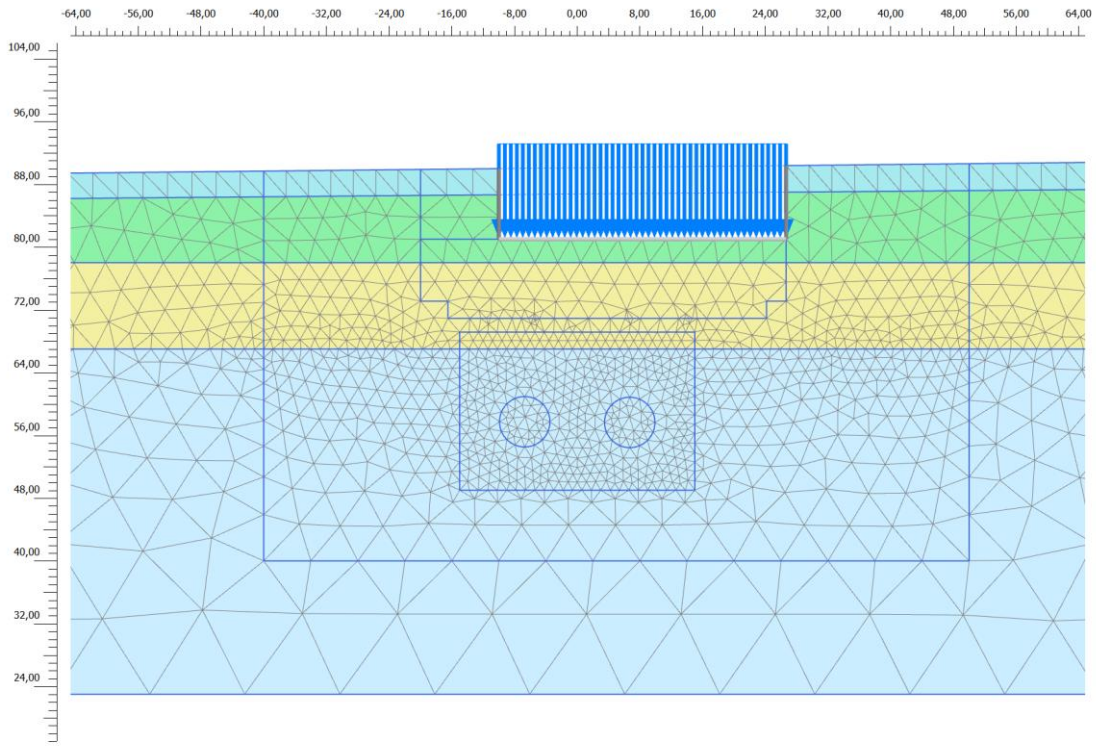
Stage 0: Initialisation of the stress field



Stage 0: Simulation of the existing building: 180 kPa surcharge at the existing basement level



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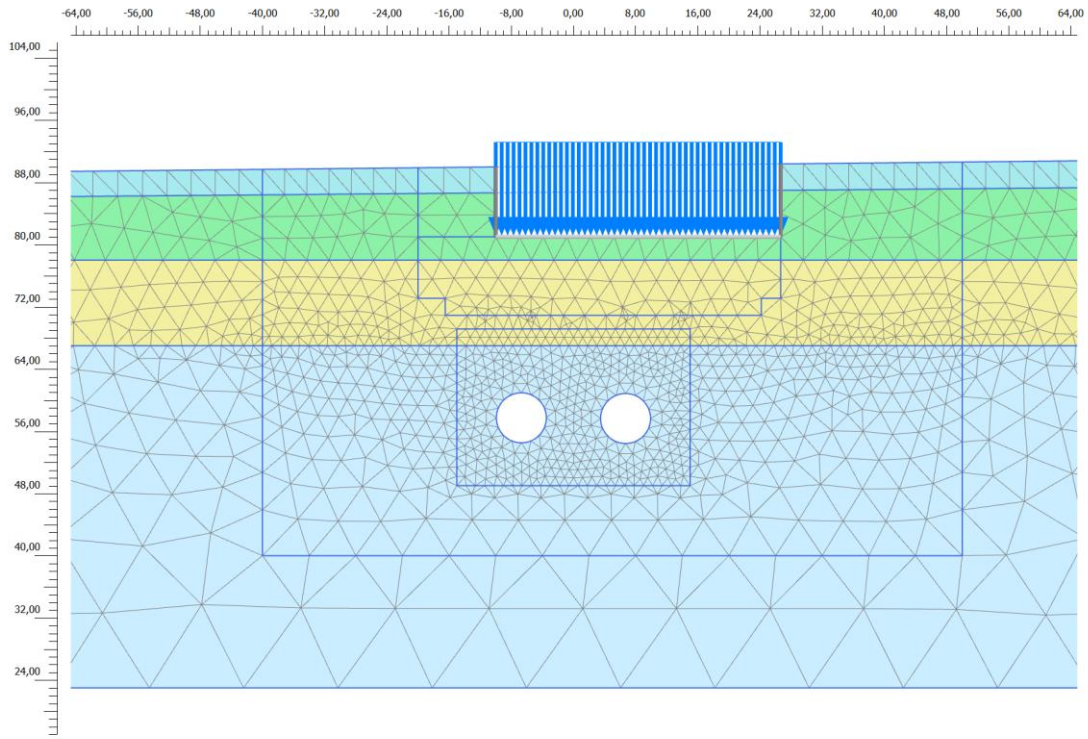
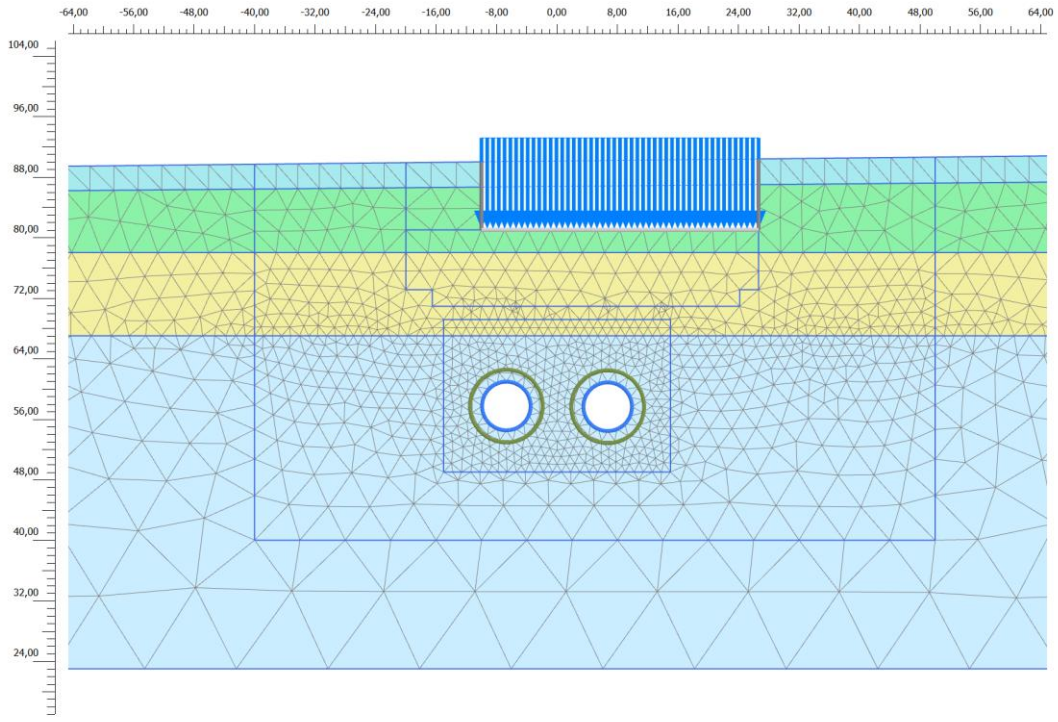
Stage 0: Excavate Metro tunnels & relaxation 90%



Stage 0: Metro tunnels lining installation (Load Case 1)



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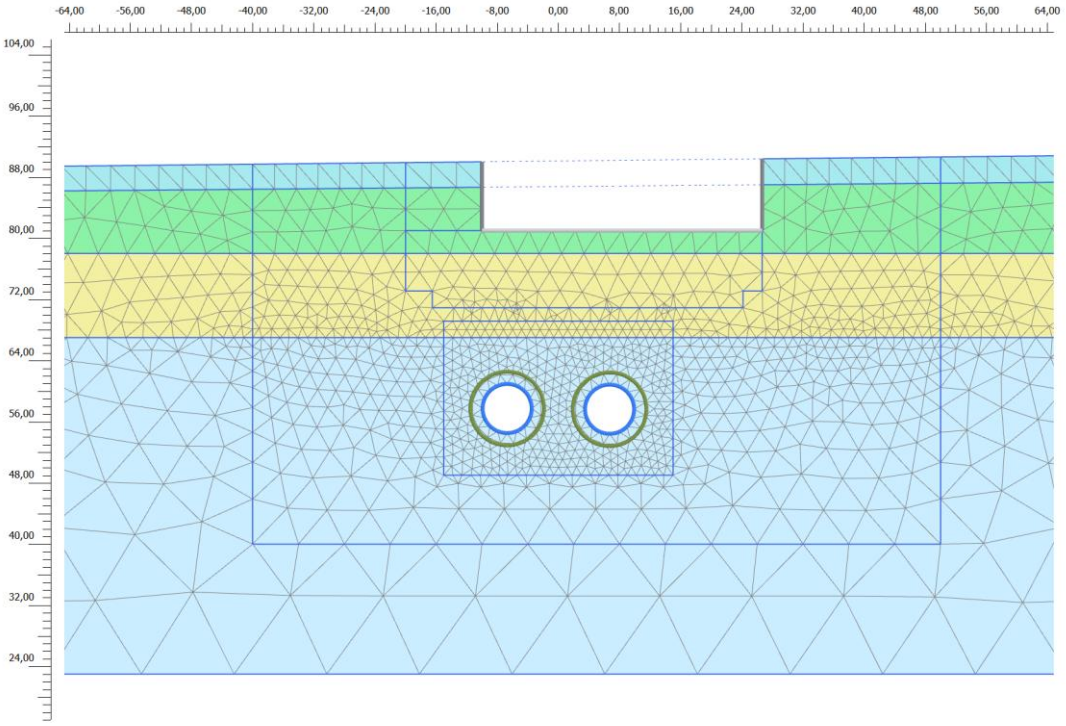
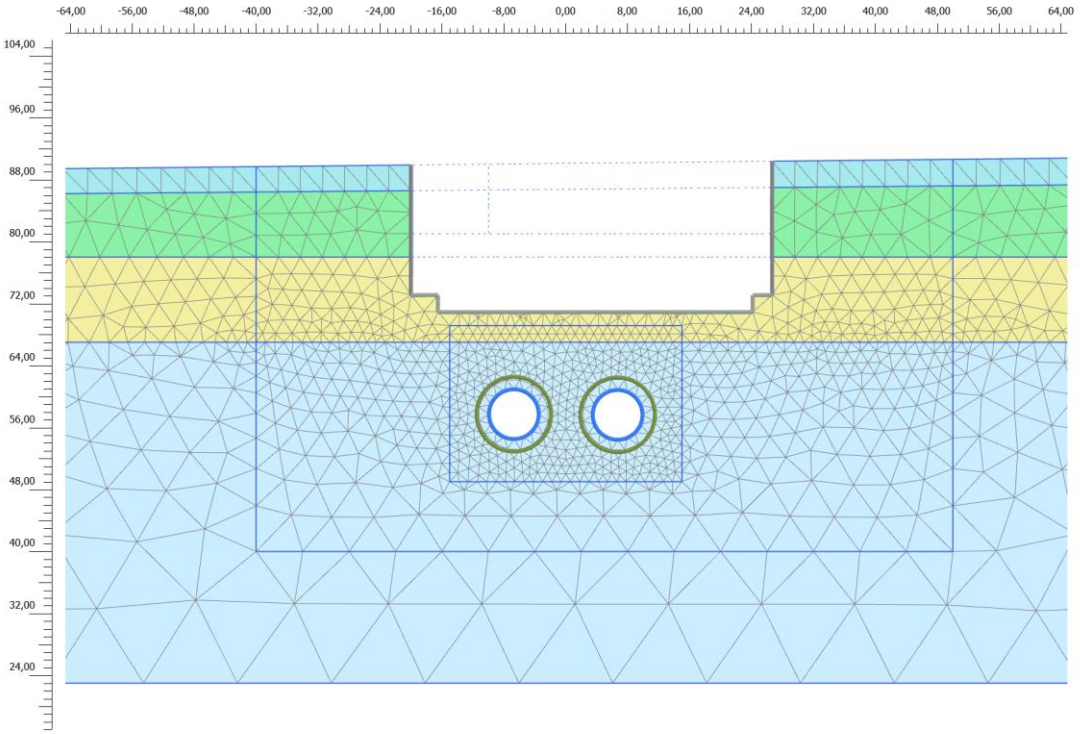
Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



Stage 1: Excavate proposed basement (Load Case 3)



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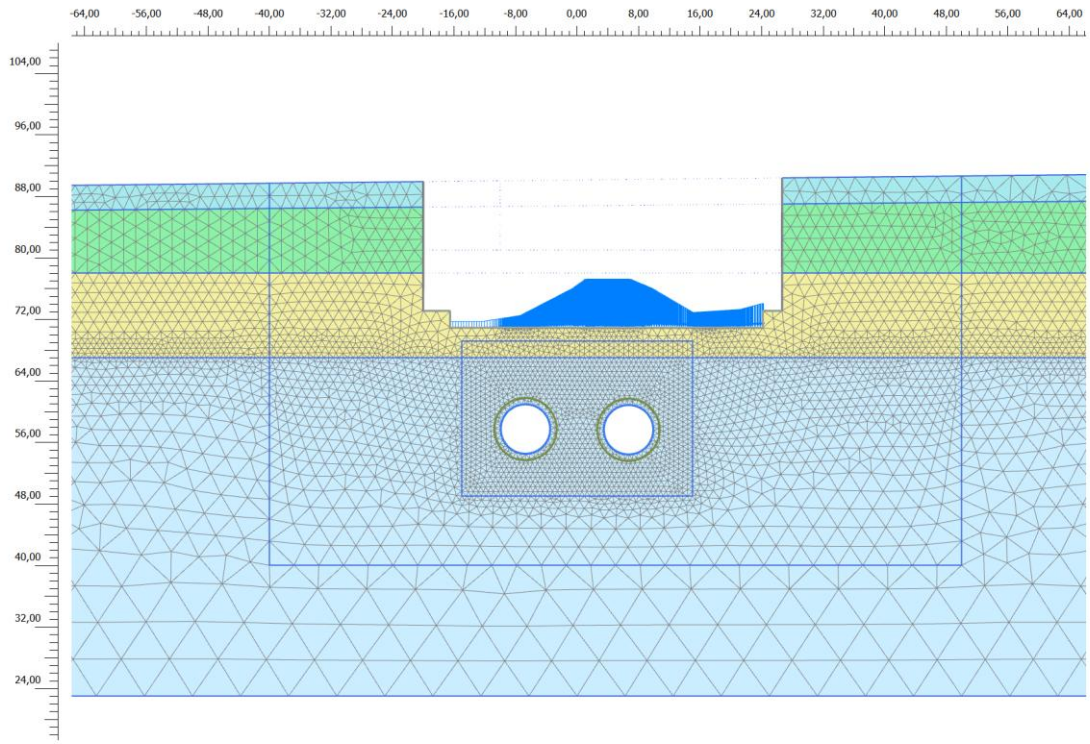
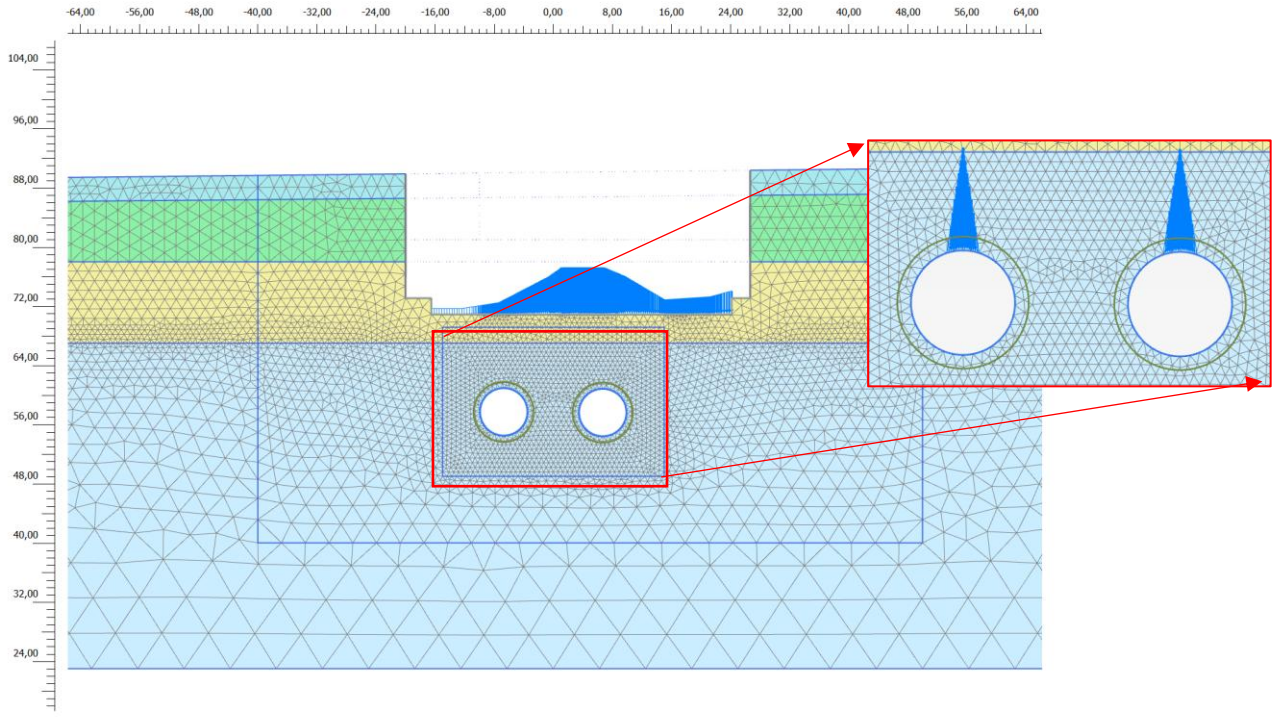
Stage 2: Apply new G+0.7Q building load (Load Case 4)



Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



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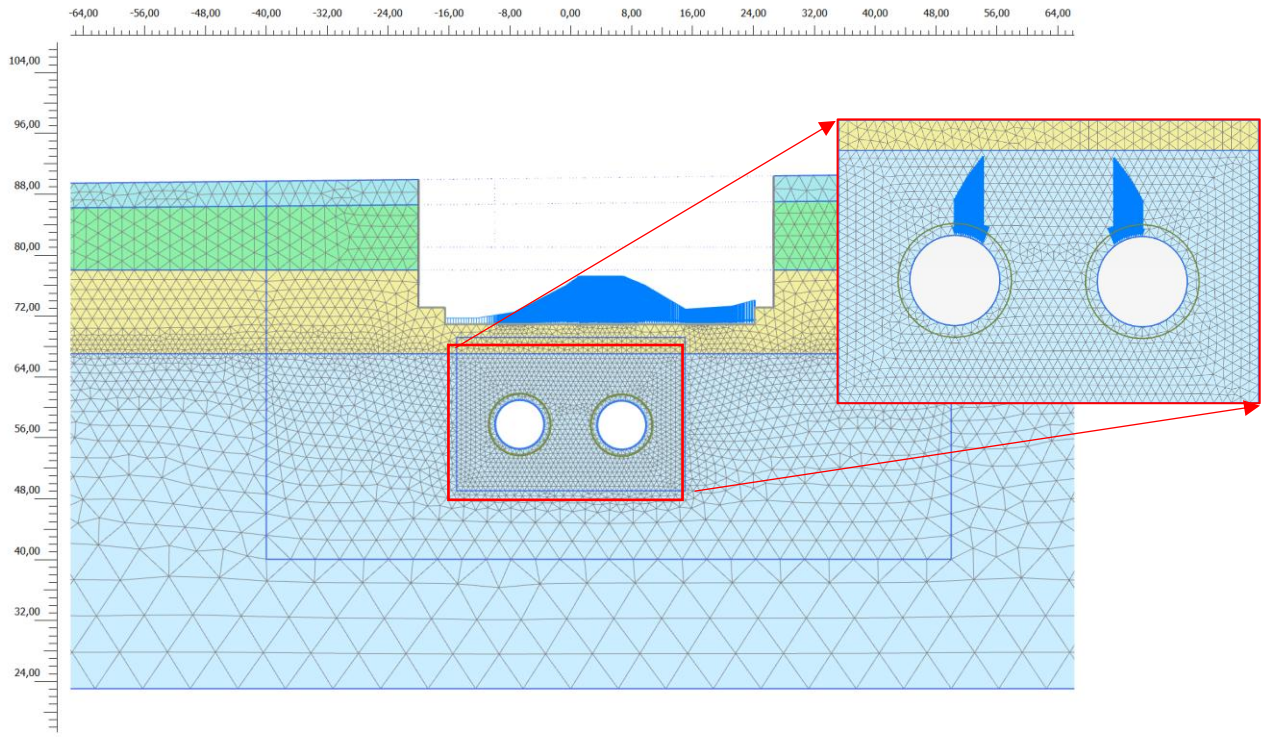
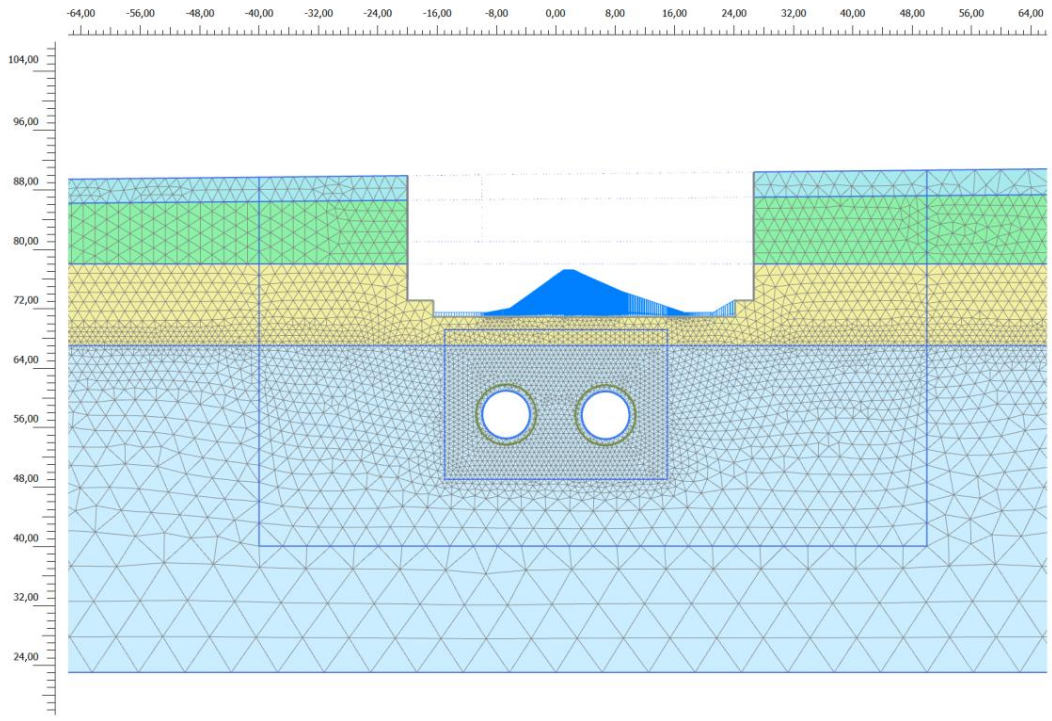
Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



Stage 2: Apply wind building load case 11 (Load Case 5)



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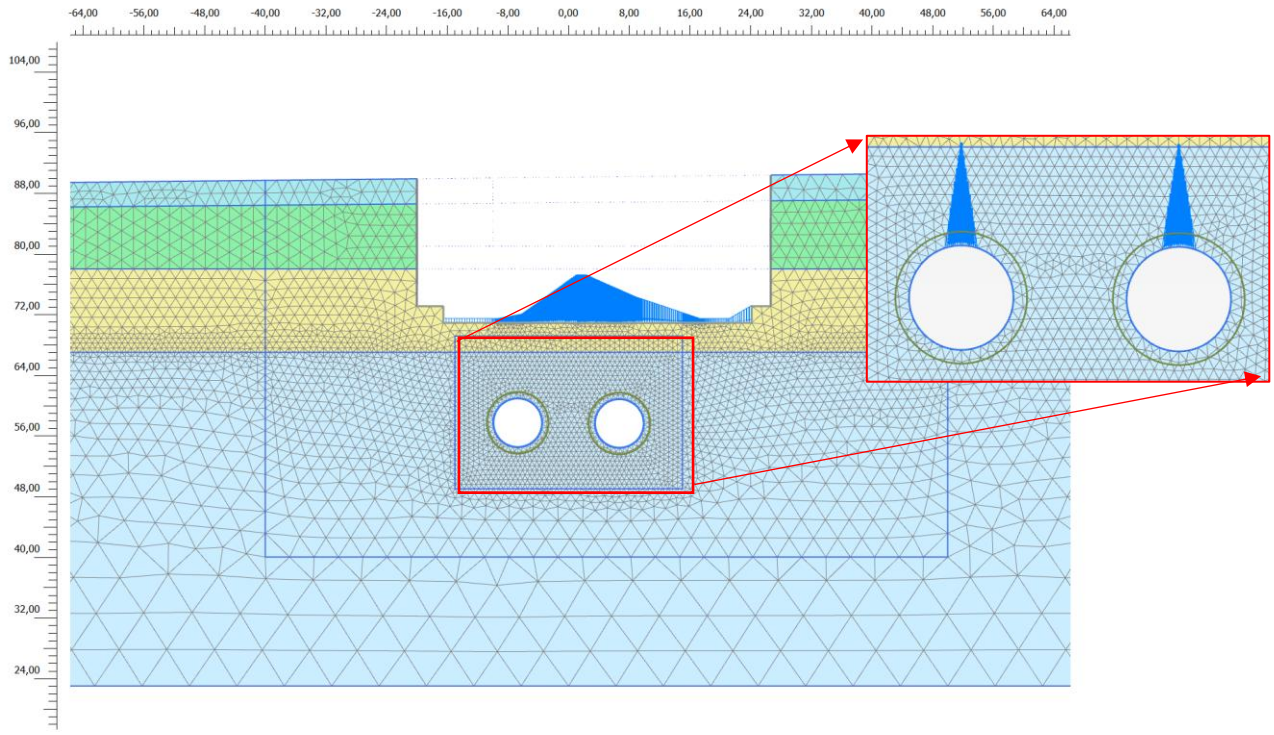
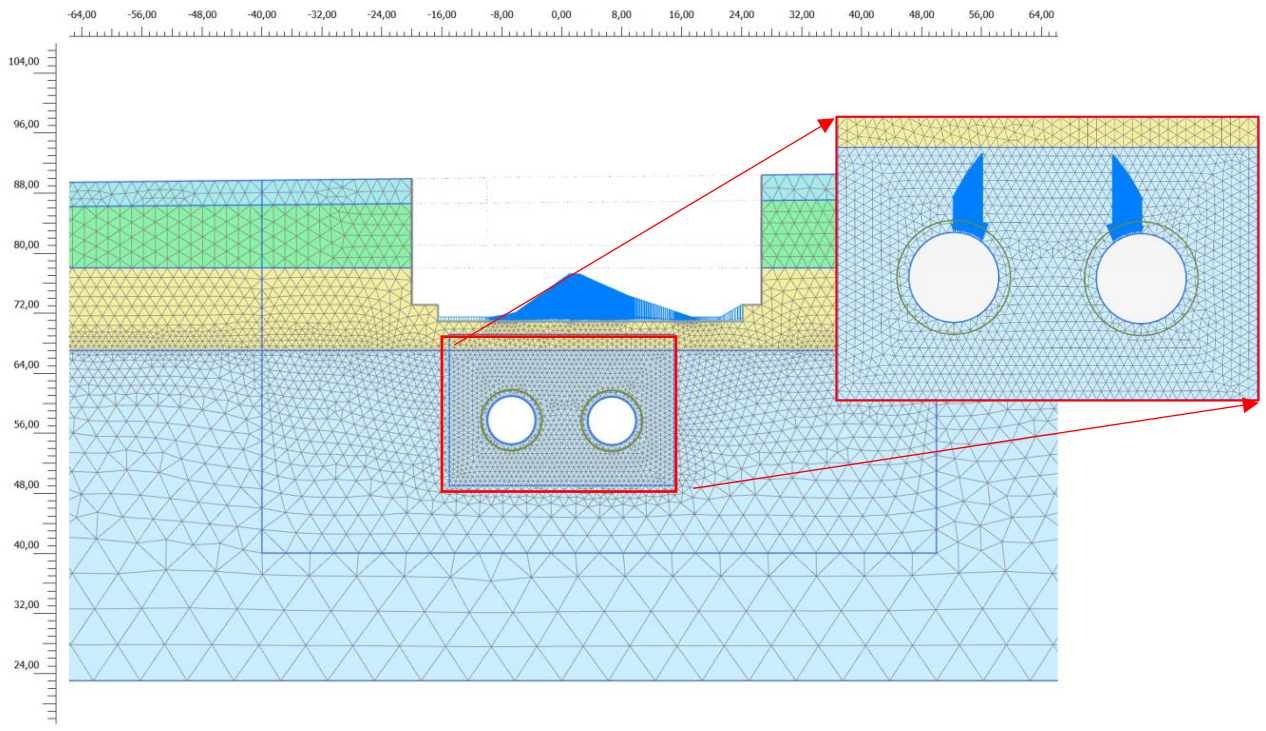
Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



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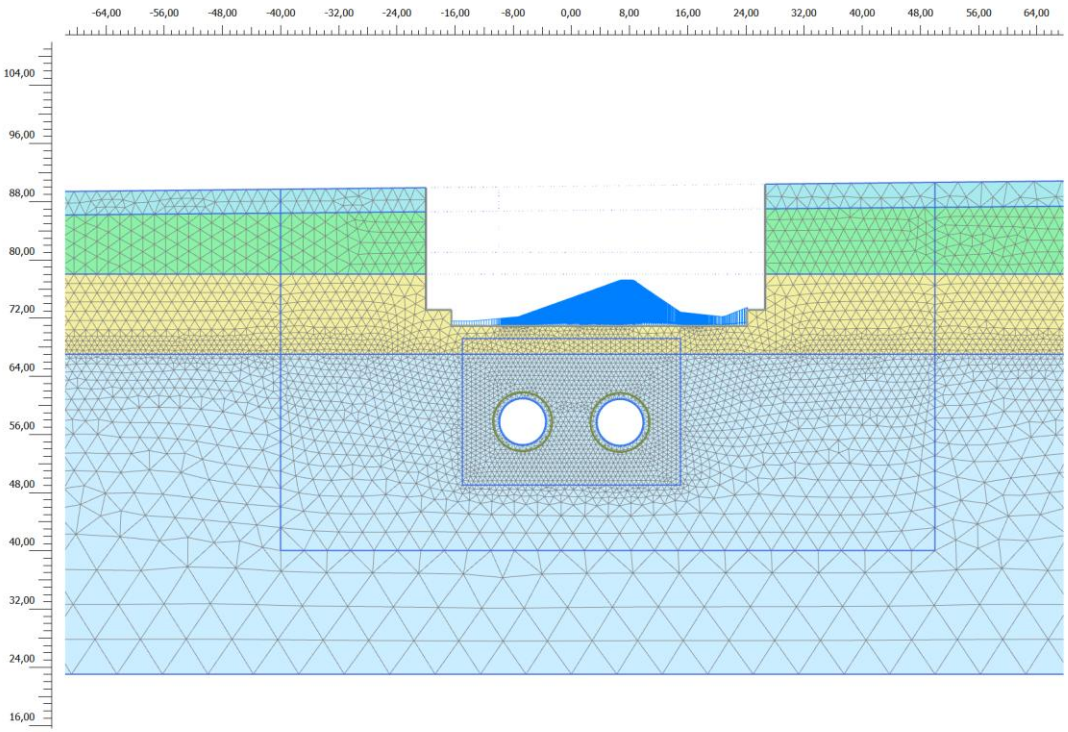
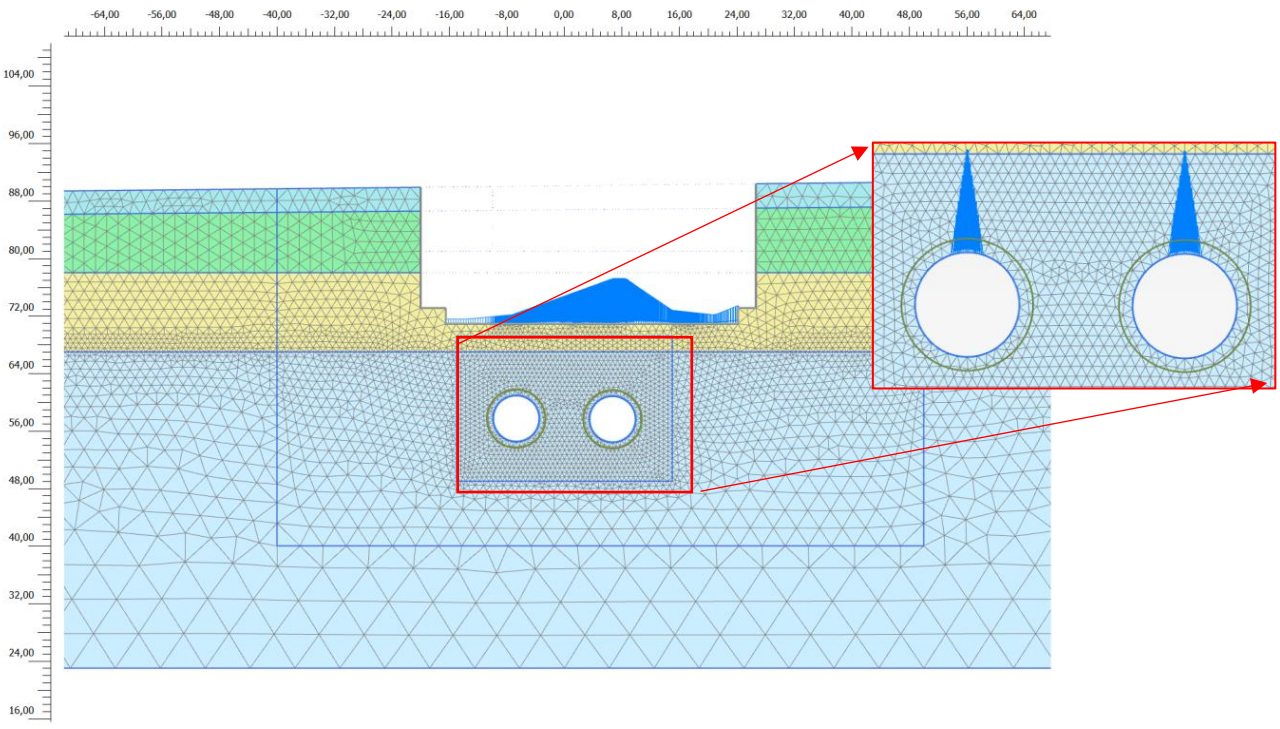
Stage 2: Apply wind building load case 14 (Load Case 6)



Stage 2: Apply wind building load case 14 +Exceptional Wedge Load (Load Case 6.1)



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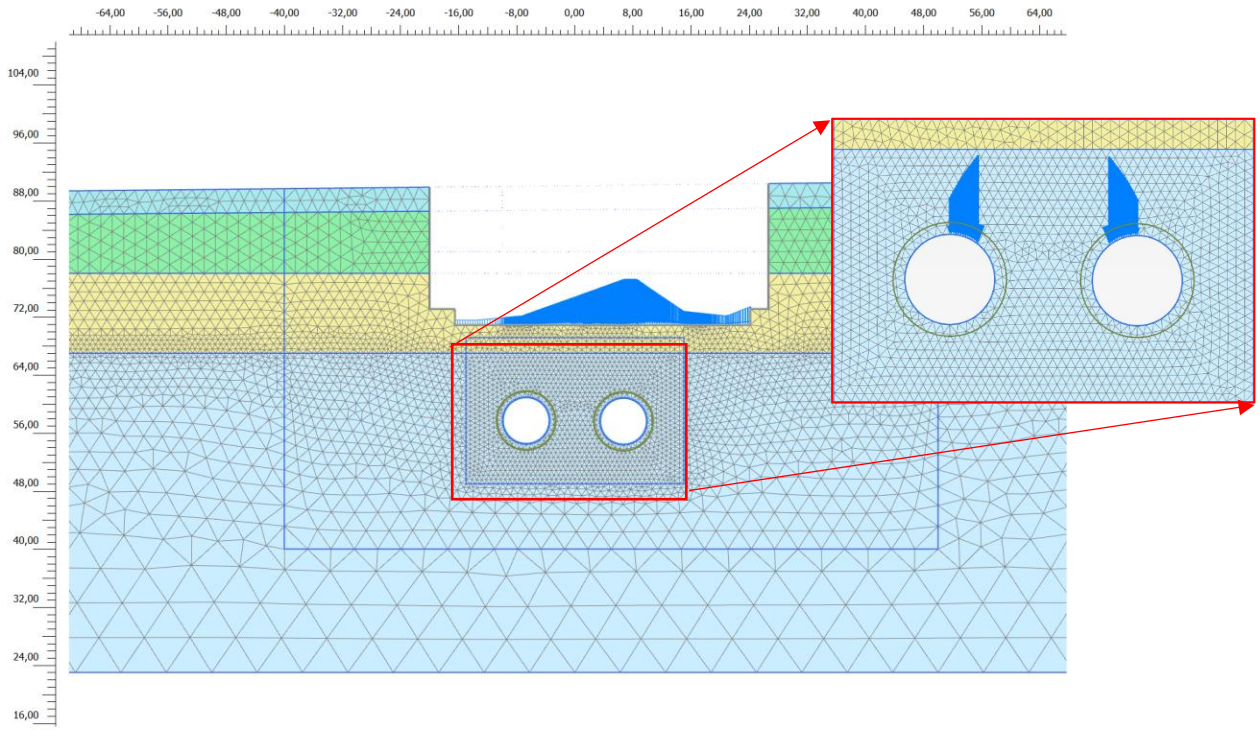
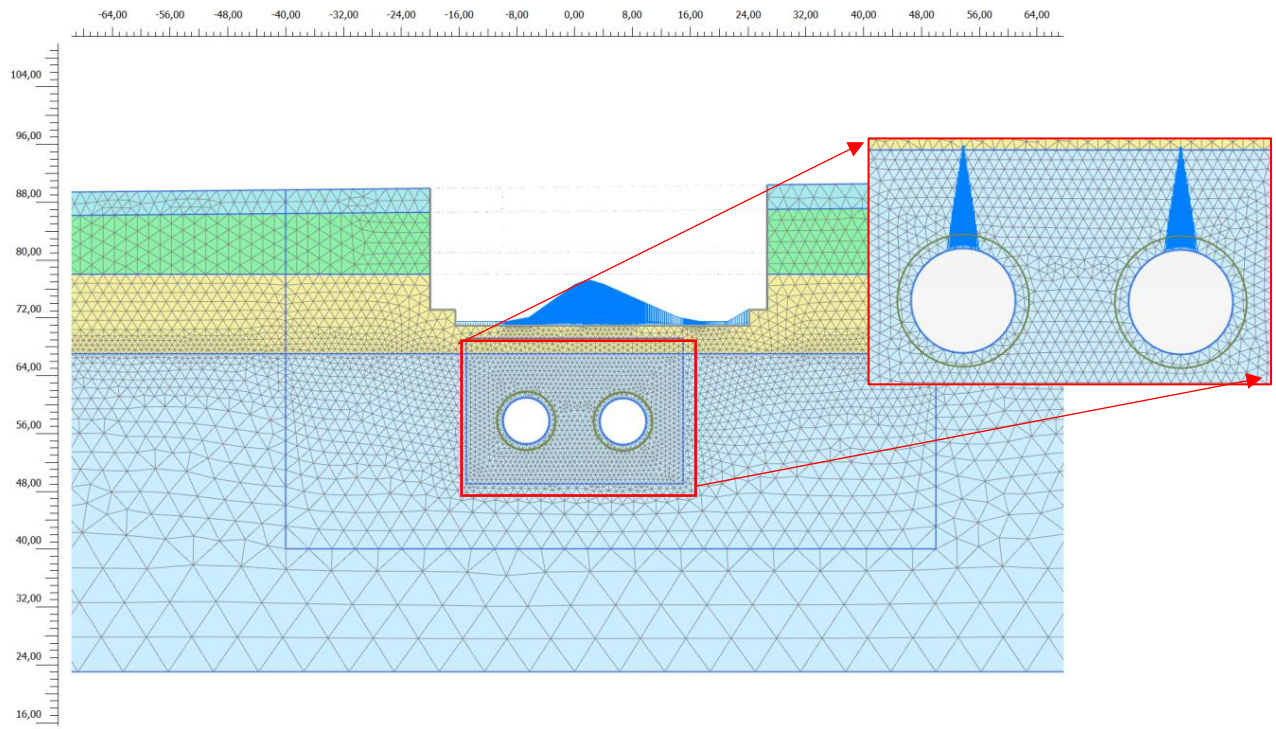
Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



Stage 2: Apply wind building load case 15 (Load Case 7)



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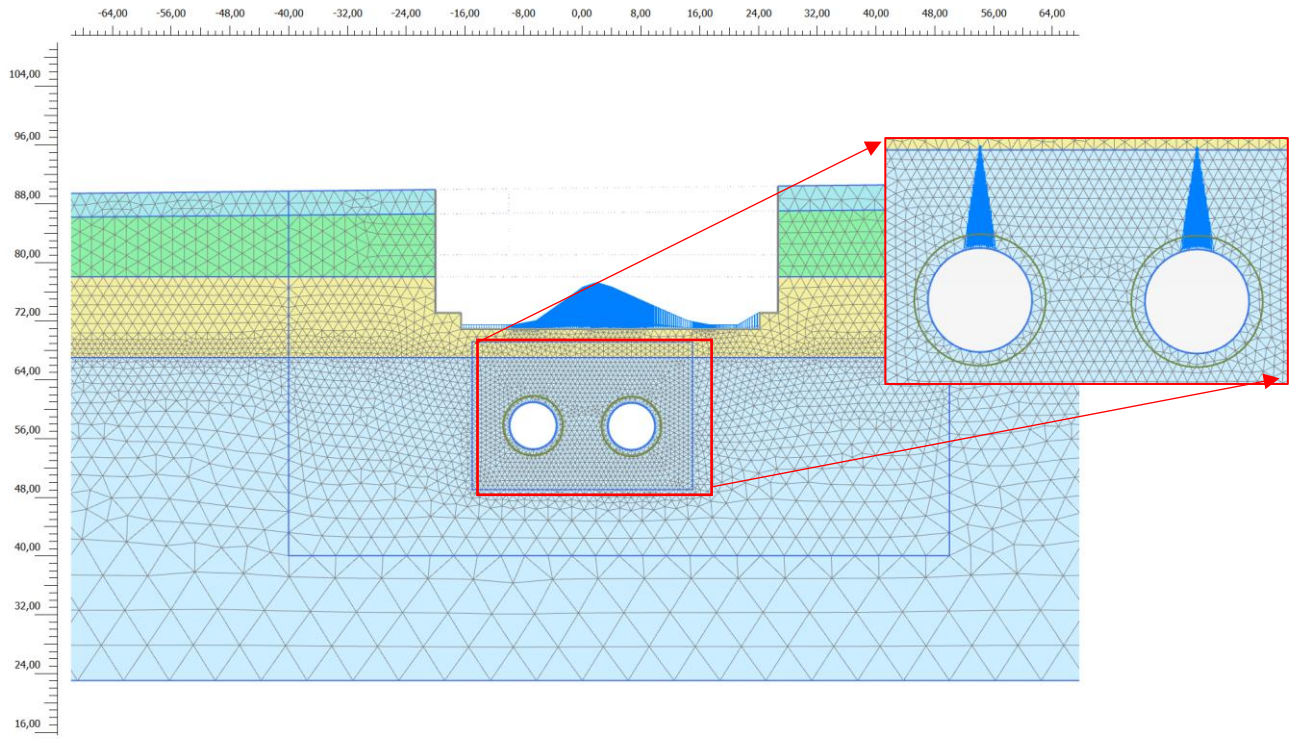
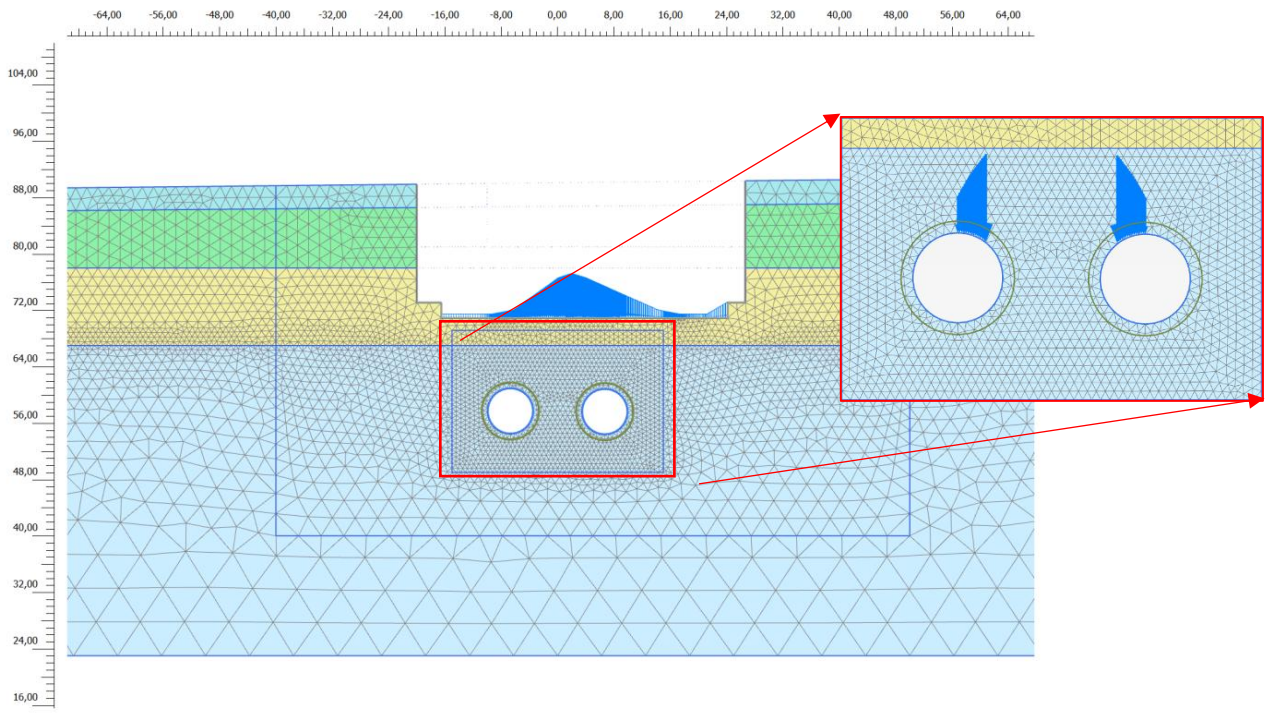
Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



Stage 2: Apply wind building load case 1 +Typical Wedge Load (Load Case 7.2)



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4 SEGMENTAL LINING STRUCTURAL ANALYSES

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4.1. INTRODUCTION

Analysis of the structural impacts of the development on the tunnel lining have been carried out in three parts:

1) Initial capacity checks at Ultimate and Serviceability Limit states have been completed using force and moment outputs extracted from the Plaxis analyses and are applied to standard force-moment interaction curves that have been generated for the segments. These checks are completed for the Case 1 (Base Case) as well as Case 2 (Sensitivity Case). The results have been presented as plots of rock mass stress along with tunnel lining axial force, bending moment and shear force. The plots are included in ANNEX 2: PLAXIS 2D OUTPUTS.
2) A more rigorous structural three-dimensional structural FE model using STRAND7 software (produced and distributed by STRAND7 Ltd, Australia) has been implemented to more accurately model the segment to segment and ring to ring joints which are important for representing structural behaviours. This model is then used to complete checks on the longitudinal joints using results from the 2D geotechnical model. Results are shown in Section 4.7 with complete checks presented in ANNEX 3: LONGITUDINAL JOINT CHECKS from 2D geotechnical FEM model.
3) The more detailed STRAND7 Model is also used to perform structural checks using loads derived from Douglas Partner's FLAC 3D results [1.]. These checks are presented in Section 4.5 and Section 4.6. Due to the complex data extraction and analysis process, this model has only been run for Case 2, being the most onerous design condition that is being considered.

4.2. INITIAL CAPACITY CHECKS (2D GEOTECHNICAL MODEL)

Ultimate Limit State and Serviceability Limit state structural checks were conducted for the segmental lining. The load combinations were defined in accordance with AS 5100.2:2017 (Clause 23.3 and Table D3). Following the ATS (Australian Tunnelling Society) Tunnel Design Guideline (Section 4.4.11), the internal forces derived from the PLAXIS 2D numerical analyses were factored as follows:

- For SLS and Accidental Load Cases: A load factor of 1.0 was applied to all load components to reflect actual service conditions.
- For ULS Cases: A global load factor of 1.5 was applied to the lining moments and axial forces, consistent with AS 5100.2 requirements for geotechnical structural actions.

It should be noted that this approach is consistent with that taken in the original Sydney Metro design. However, it should also be noted that in the case of their sensitivity checks for reduced rock parameters, load factors were reduced from 1.5 to 1.25 (Ref Appendix I1 Section 7.3 of Design Report [2.]). This reduction has not been adopted in our capacity checks.

The structural checks for the SFRC lining have been conducted in accordance with the Fib Model Code 2010 using in-house spreadsheets.

The shear verification was performed according to §7.7.3.2 of the Model Code 2010. For Steel Fiber-Reinforced Concrete (SFRC) elements with tensile-hardening behaviour, and in the absence of both longitudinal and transverse reinforcement, it is required that the resistance shear does not exceed the design shear:

$$V_{Rd} = f_{Ftud} bh = \frac{f_{R3k}/3}{\gamma_f} bh$$

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As PLAXIS 2D internal forces are provided per meter run of tunnel, these values have been converted to total design actions per segment ring (multiplied by 1.7m to consider the length of the segments).

4.2.1. RESULTS SUMMARY

Results for the two design cases are summarised below. For full details, please refer to ANNEX 2:PLAXIS 2D OUTPUTS.

Load Stage	Axial force (kN/m)		Moment (kNm/m)	
	Max	Min	Max	Min
Stage1 Existing Condition	-82.2	-140.7	0.26	-0.48
Stage 2 Demolition	-8.3	-31.9	2.6	-2.4
Stage 3 Basement Excavation	-8.2	-30.1	6.5	-5.0
Stage 4 New Building	-468.1	-2086	20.1	-19.5
Stage 5 New Building + Wind case 11	-482.4	-2193	22.3	-20.2
Stage 6 New Building + Wind case 14	-484.9	-2257	22.7	-20.3
Stage 7 New Building + Wind case 15	-484.1	-2194	22.5	-20.2

Table 4-1 Tunnel Liner Results – Case 1 (Base Case)

Load Stage	Axial force (kN/m)		Moment (kNm/m)	
	Max	Min	Max	Min
Stage1 Existing Condition	-101.1	-172.8	0.4	-4.05
Stage 2 Demolition	-8.3	-28.3	4.7	-3.4
Stage 3 Basement Excavation	-9.0	-24.7	14.5	-10.2
Stage 4 New Building	-562	-2237	30.4	-26.4
Stage 5 New Building + Wind case 11	-542.7	-2329	33.4	-27.4
Stage 6 New Building + Wind case 14	-561	-2409	34.6	-29.6
Stage 7 New Building + Wind case 15	-539	-2328	33.6	-27.3

Table 4-2 Tunnel Liner Results –Case 2 (Sensitivity Case)

Since the original design did not consider a design section at this location, a direct comparison is not possible. However, results are comparable with the nearest design section at CH13+000 [2.].

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4.2.2. ULTIMATE DESIGN CHECK (ULS)

4.2.2.1. Case 1 (Base Case)

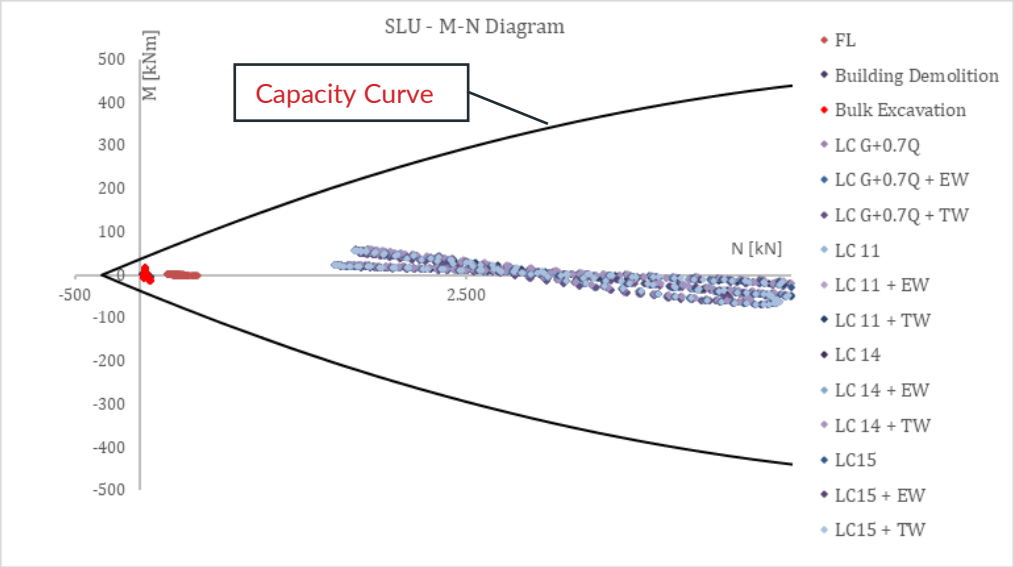

Figure 4-1 ULS axial force & moment capacity for Case 1

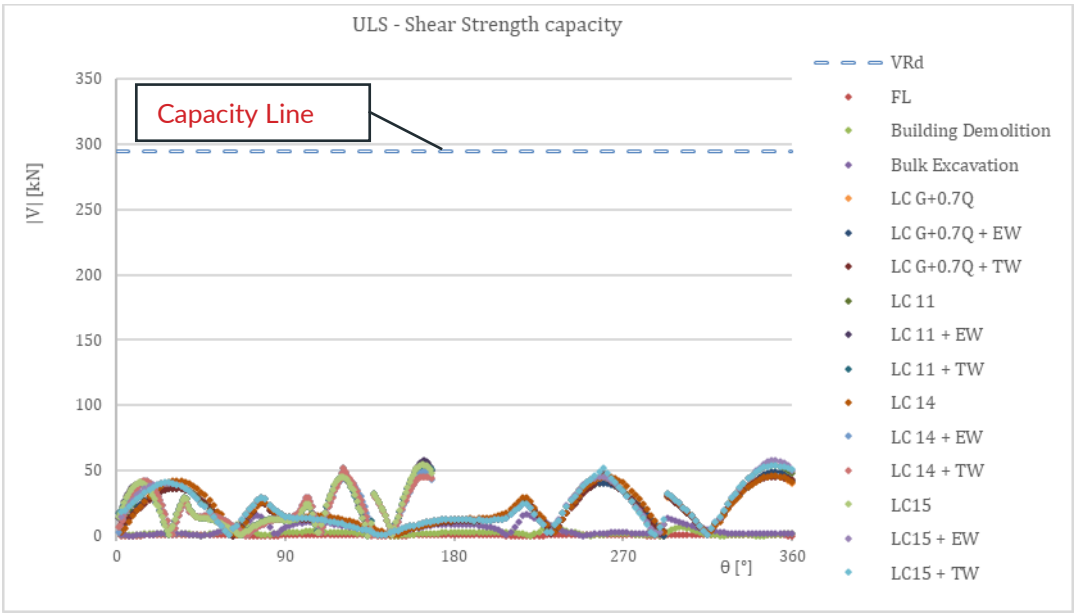

Figure 4-2 ULS shear capacity check for Case 1

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4.2.2.2. Case 2 (Sensitivity Case)

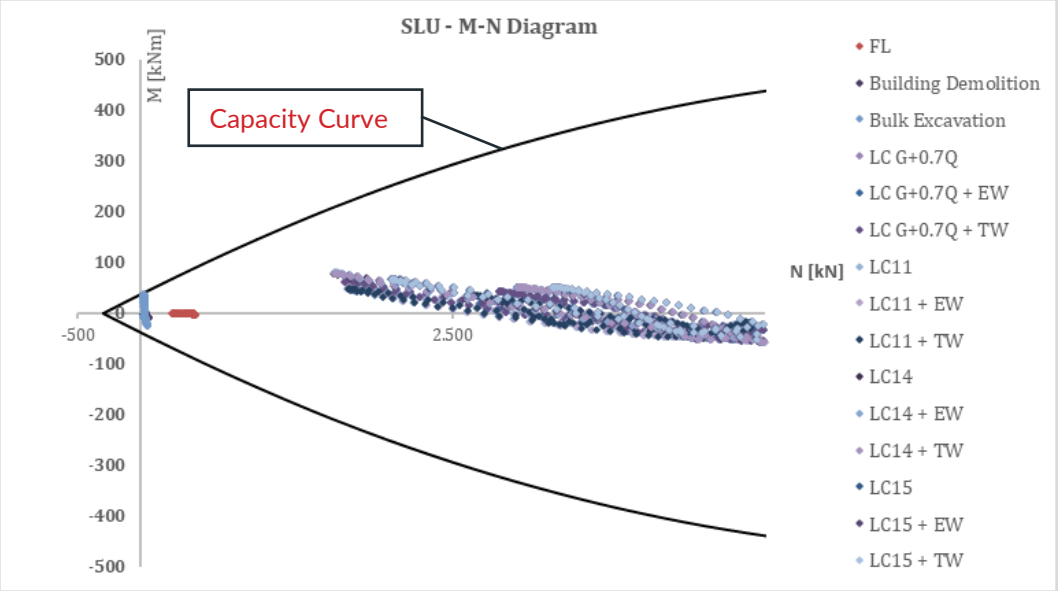

Figure 4-3 ULS axial force & moment capacity for Case 2

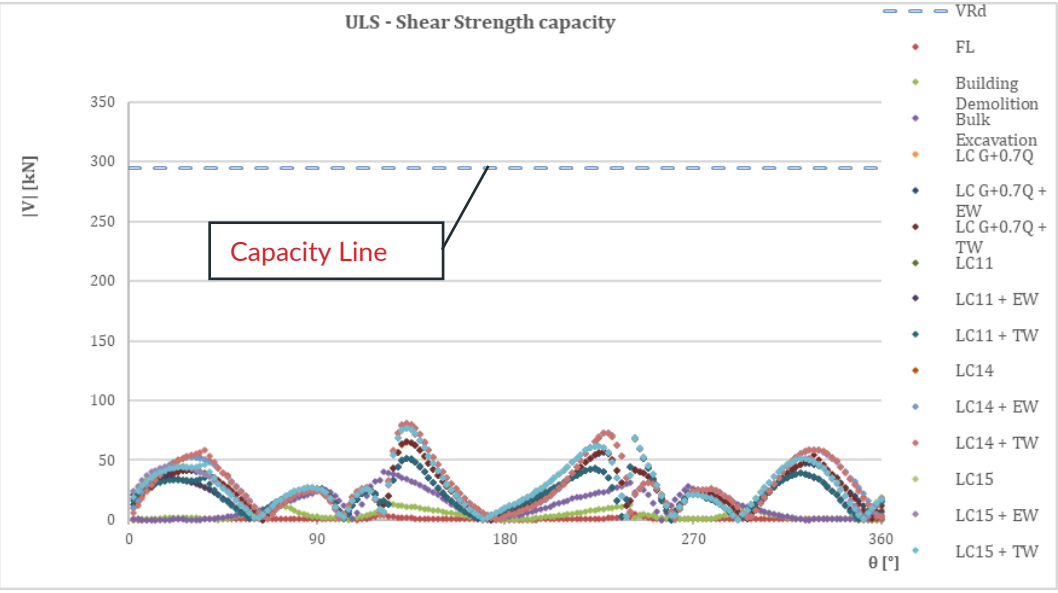

Figure 4-4 ULS shear capacity check for Case 2

4.2.3. SERVICEABILITY LIMIT STATE CHECKS (SLS)

SLS checks for SFRC segments were carried out by creating M-N interaction envelopes defining the pair of M-N actions for which each SLS verification is fulfilled (crack width of 0.15mm & stress limitation).

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4.2.3.1. Case 1 (Base Case)

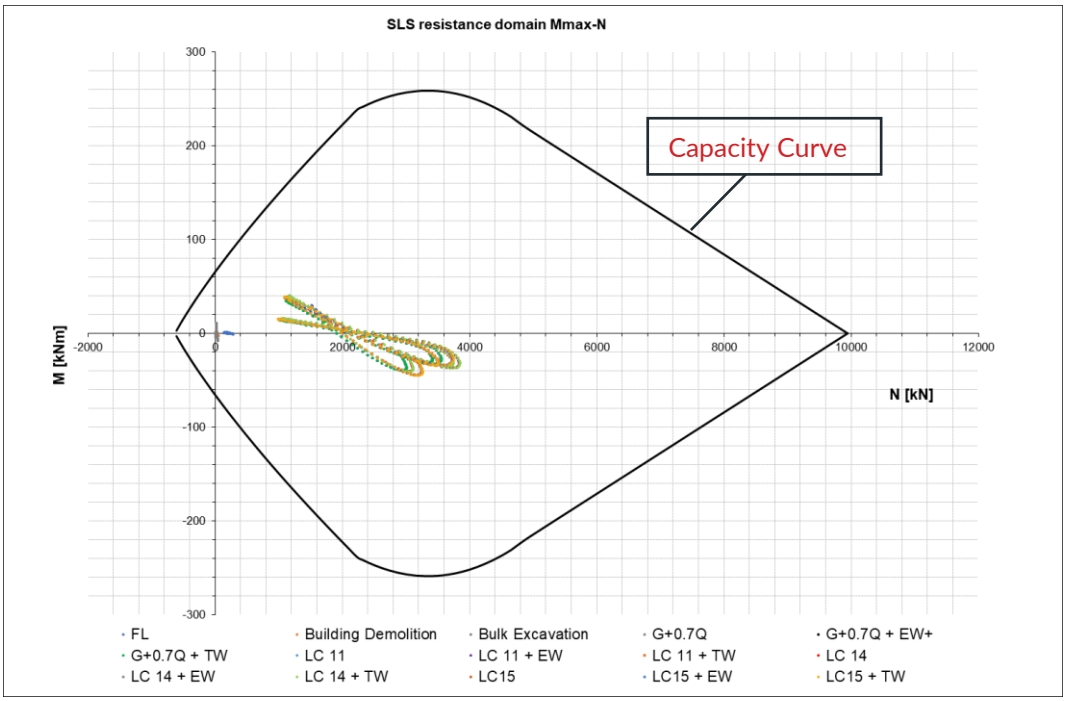

Figure 4-5 SLS check for Case 1

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4.2.3.2. Case 2 (Sensitivity Case)

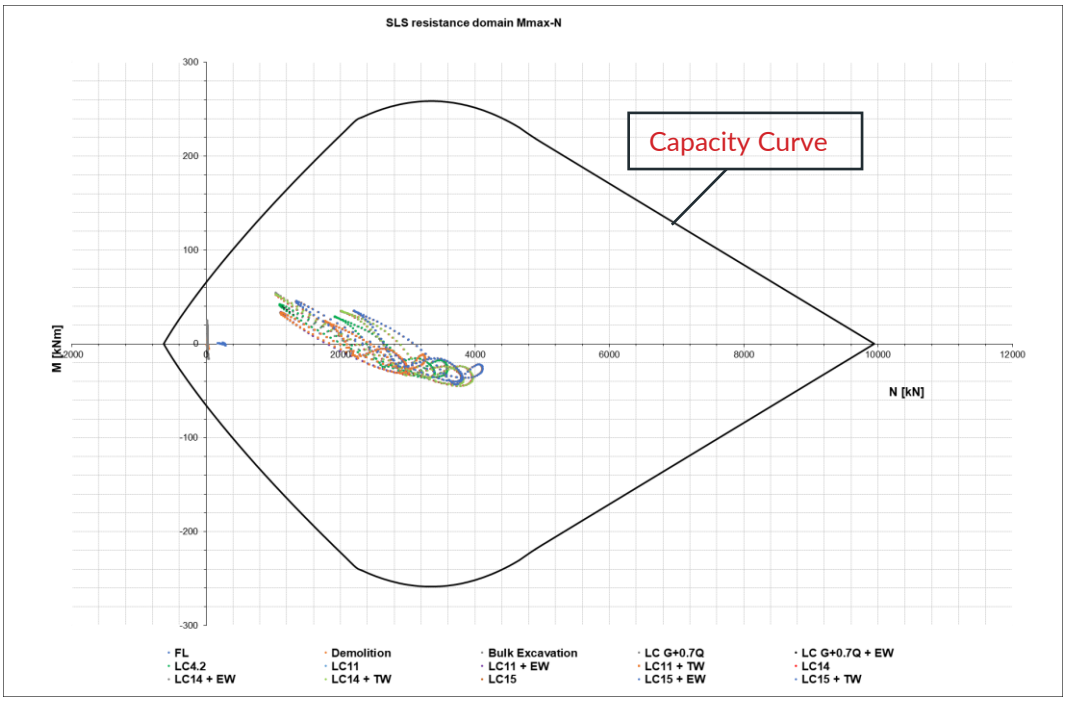

Figure 4-6 SLS check for Case 2

4.2.4. CAPACITY SUMMARY

Review of the ULS results for Case 1 and Case 2 show that in both cases, the points that fall closest to the Force - Moment capacity curve occur during the unloading phase (i.e. demolition and bulk excavation). Close inspection of Figure 4-1 ULS axial force & moment capacity for Case 1 shows that in this case, the lining capacity is approximately 70% utilised. In comparison, Figure 4-3 ULS axial force & moment capacity for Case 2 shows that in the much less likely Sensitivity Case, capacity utilisation would increase to around 95% during bulk excavation. Noting that the Plaxis 2D analysis is a simplified conservative analysis, these results compare well the more detailed ring checks that have been completed for Case 2 in Section 4.5.

It is also important to note that Case 2 (Sensitivity Case) has been checked with a standard load factor of 1.5, compared to 1.25 that was adopted in the original design.

For the corresponding SLS checks in the serviceability condition, all points are well within the capacity curves meaning that in reality, any cracking would be well within acceptable limits and most likely, completely undetectable.

All shear capacity checks at SLS and ULS are easily satisfied with worst case capacity utilisation at approximately 25% in Case 2.

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4.3. 3D STRUCTURAL MODEL DESCRIPTION

To provide a more detailed analysis of the worst case and check effects at the joints between tunnel segments, a structural model consisting of five consecutive rings (each made up of five segments) has been implemented using STRAND7. The segments are modelled with four linear "beam" type elements, having the following characteristics:

- Segment width: 1.7 m
- Segment thickness: 0.26 m
- Approximate mesh size: 0.11 m

In accordance with the information provided in the segmental lining drawings, [3.], successive rings are rolled by an angle of 60°, corresponding to the angle between two consecutive ring-to-ring dowels.

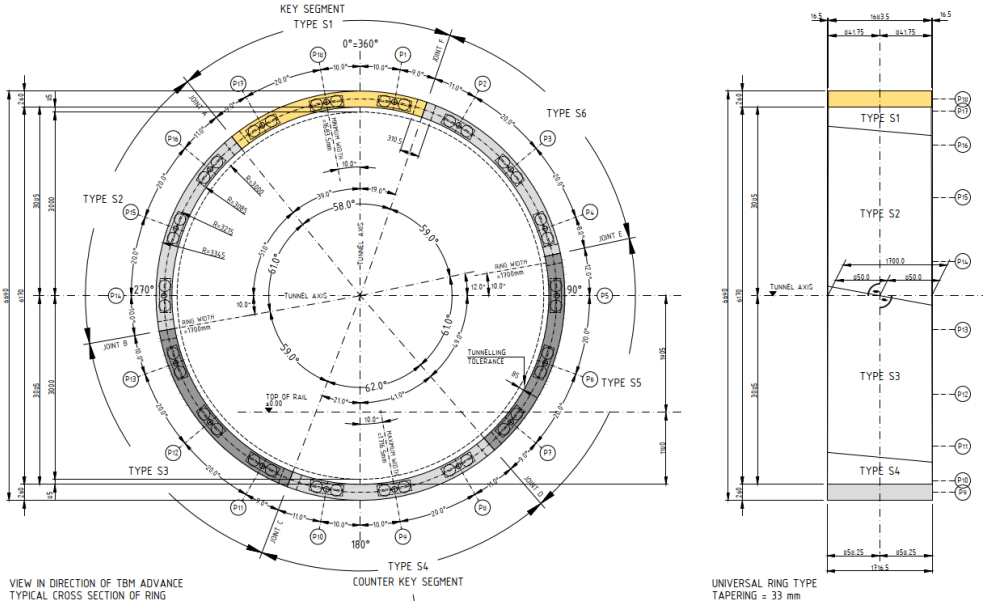

Figure 4-7 – Cross section and longitudinal view of the ring from the segmental lining drawings

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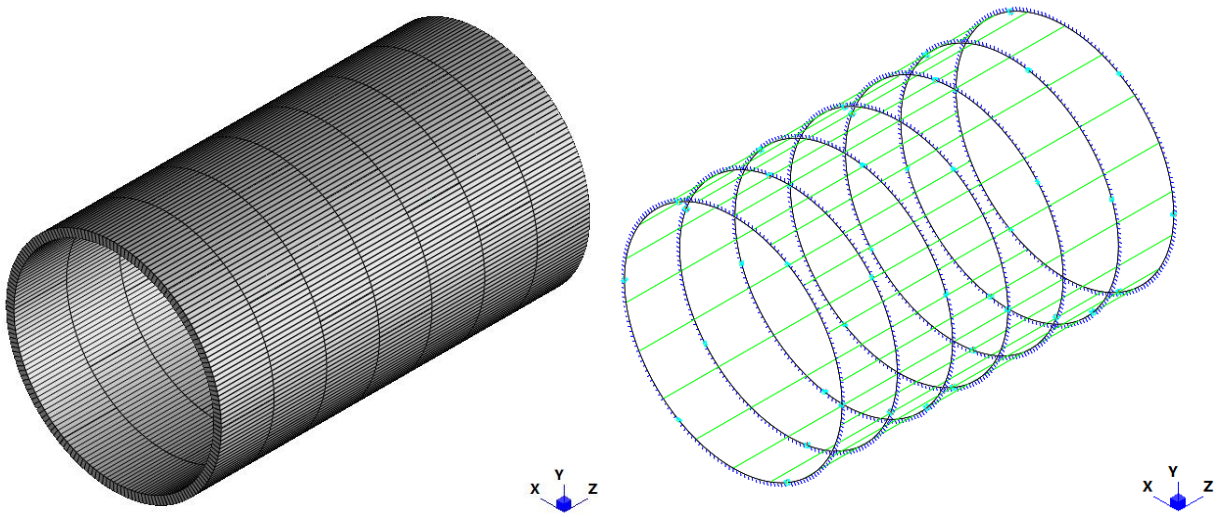

Figure 4-8 – STRAND7 model

4.3.1. LINING CHARACTERISTICS

The material behaviour of concrete C50/60 has been conservatively considered as linear elastic for both ULS and SLS conditions. The following figure shows the material properties defined in the FE structural model.

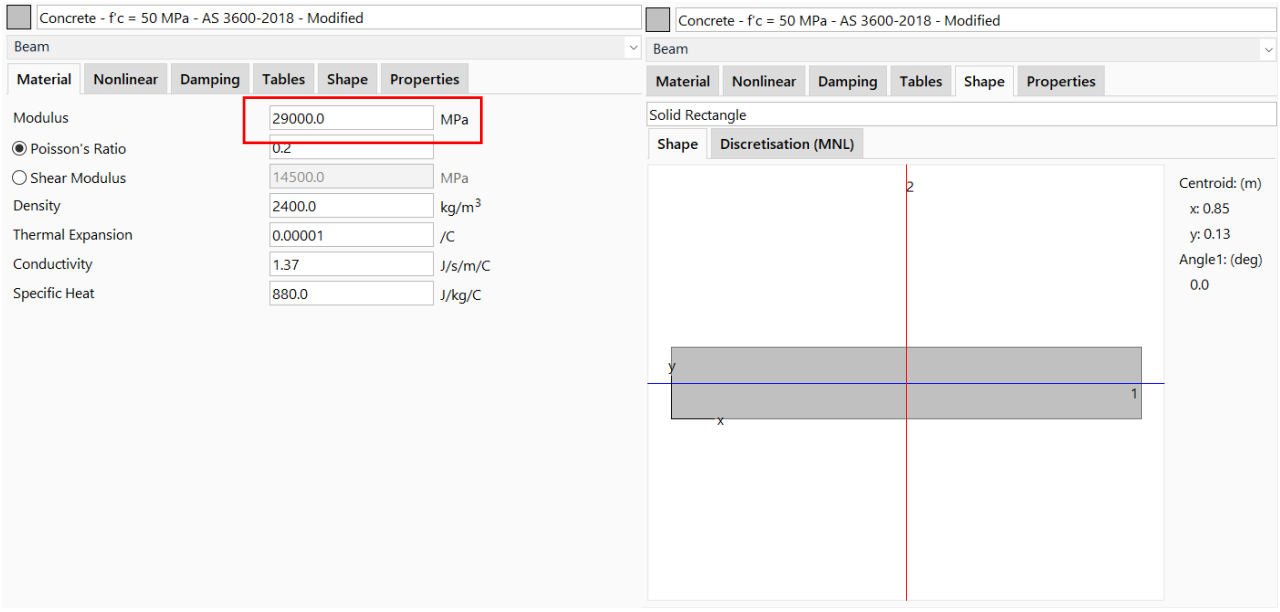

Figure 4-9 - Material properties adopted for the segmental lining.

A 20% reduction in the instantaneous stiffness of the concrete has been considered to account for creep.

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4.3.2. LONGITUDINAL JOINT

Attention is given to the modelling of the contact area between segments. Contact dimensions are 148 mm x 1596 mm, as shown in the following figure.

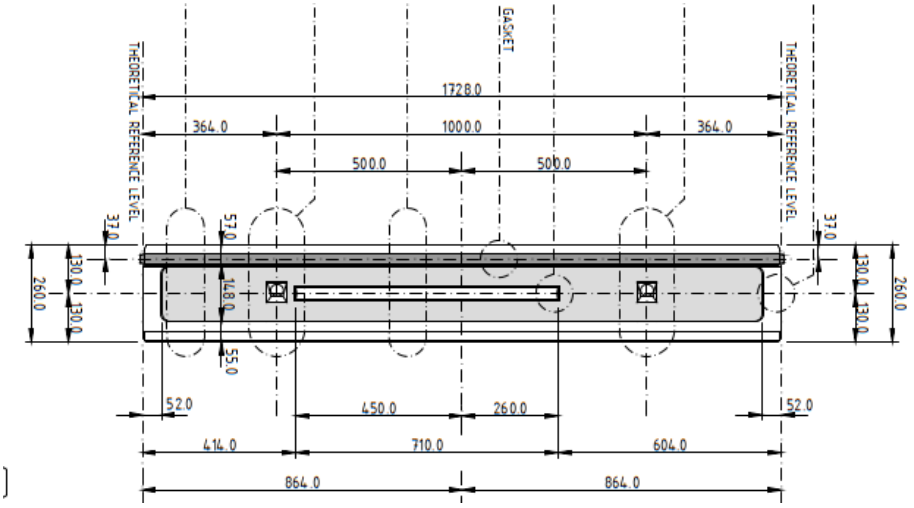

Figure 4-10 - Geometry of the longitudinal joints.

The axis of the contact surface has an eccentricity with respect to the mean radius of the ring equal to 1.5mm towards the inside of the ring. The surface of the longitudinal joints is modelled using compression only point contact elements. The compressive behaviour of contact elements is considered as linear elastic.

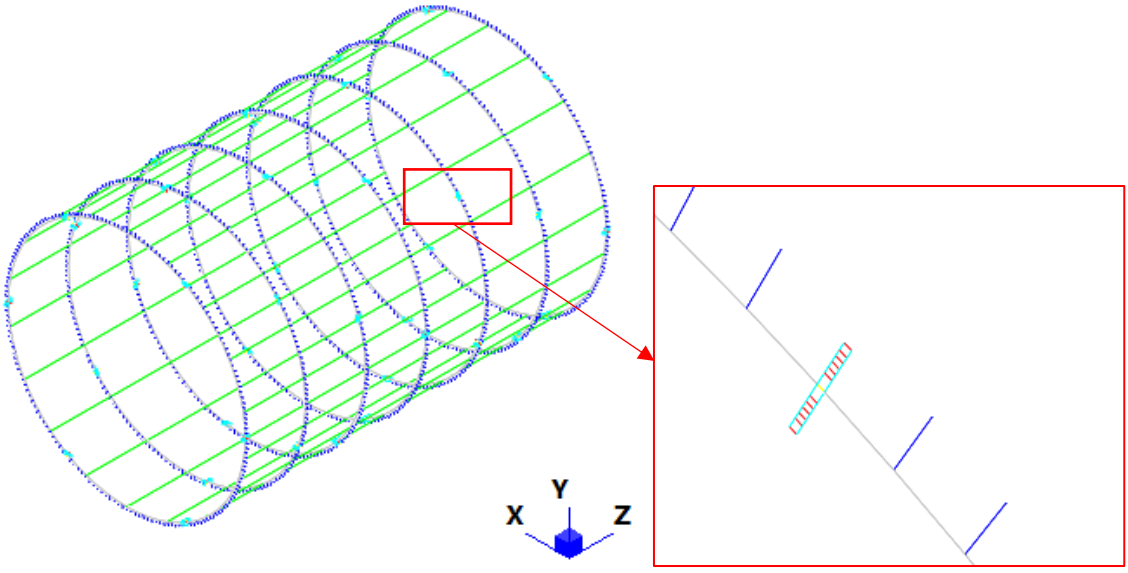

Figure 4-11 - Longitudinal joints in the STRAND7 FE model

As shown in the previous figure, each contact element (red) is connected to the ring element plate (grey) using a series of rigid links (cyan).

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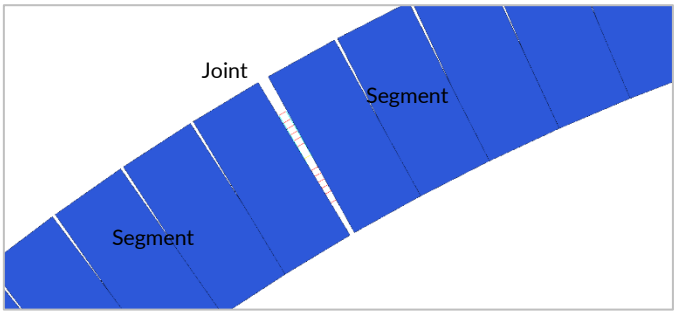

Figure 4-12 - Solid view of longitudinal joints

4.3.3. STIFFNESS OF JOINT CONTACT ELEMENTS REFERRED TO CONCRETE C50/60

To estimate the stiffness for each contact element in joints referred to concrete C50/60, the following has been considered:

- Contact Area: A = (1500-52-52) x (260-55-57) = 236208 mm^2
- Secant modulus of concrete (B65): E_{cm} = 29000 MPa
- Number of elements modelled in FEM: n° = 11
- Reference length: L = 260 mm

The total Stiffness in joint is calculated below:

$$k_{joint} = \frac{E_{cm}\, A}{L} = \frac{29000 \cdot 236208}{260} = 26891372\ kN/m$$

The specific stiffness of each contact element referred to concrete C50/60, is calculated below:

$$k_{FEM\ contact\ element} = \frac{\boldsymbol{k}_{joint}}{n_{long}.n_{transv}} = \frac{26891372}{11\,.\,1} = 2444670\ kN/m$$

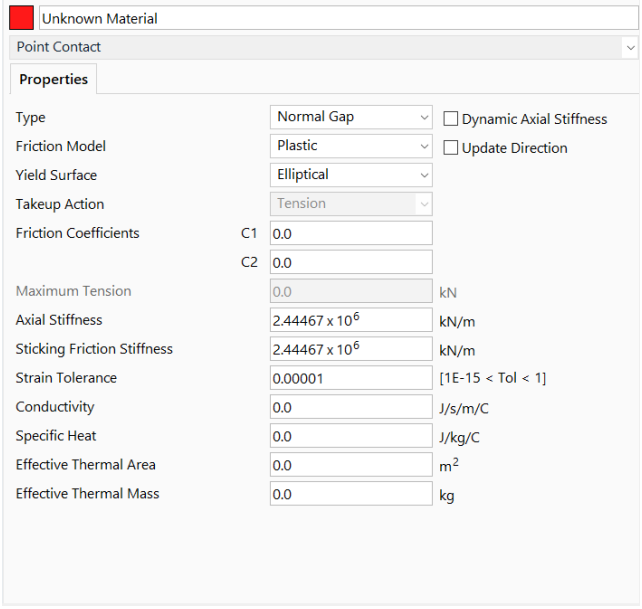

Figure 4-13 – Joint properties

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This detailed modelling strategy has been described in more detail by Menozzi A., Tiberi B., Maturi D. & Comini R. 2024[10.].

4.3.4. CIRCUMFERENTIAL JOINTS

The position of dowels has been reproduced in the FE Model using *connection* elements (green colour).

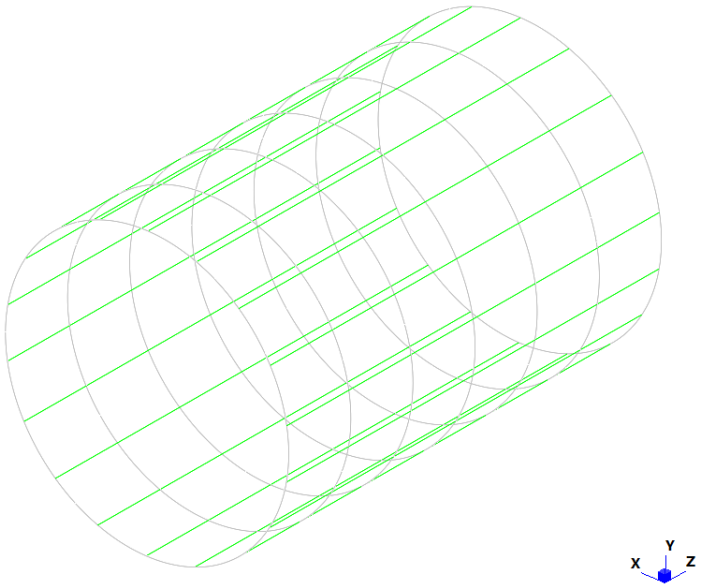
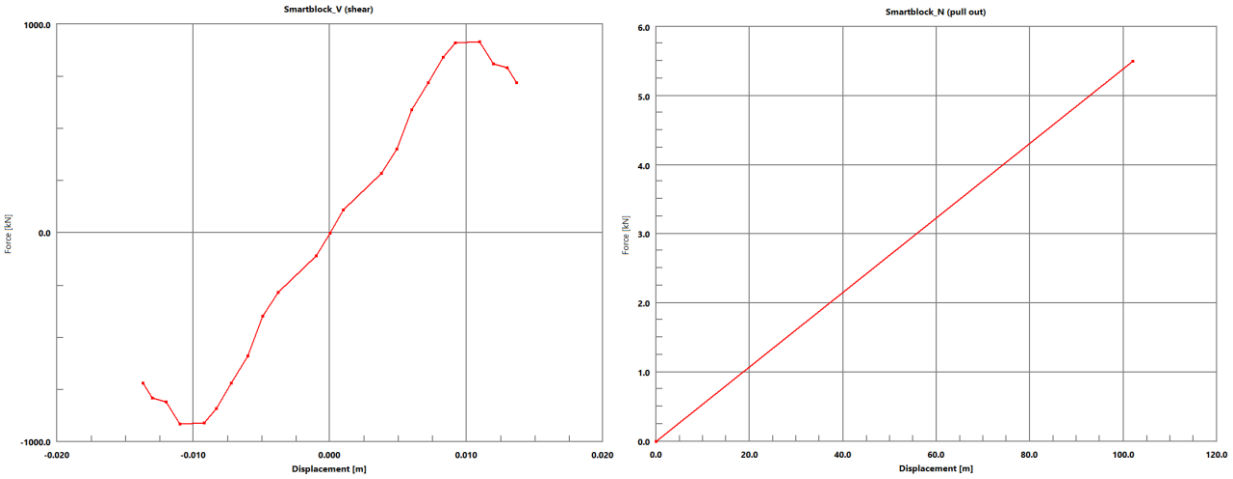


Figure 4-14 - Connector elements implemented in the FEM model.

The dowels have been modelled using the non-linear shear force-displacement and pull-out force-displacement characteristics of the products used, as presented in the segmental lining report [2.].



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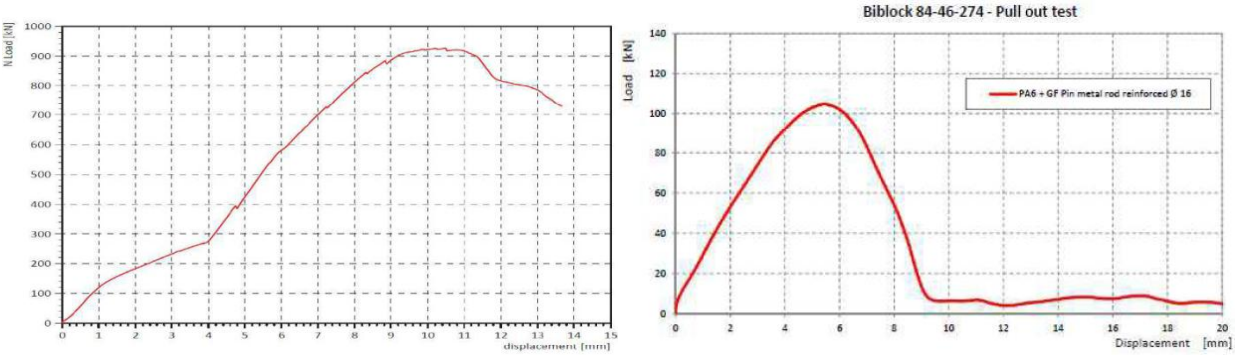

Figure 4-15 - Shear and pull-out force-displacements

4.4. FLAC3D DATA EXTRACTION (CASE 2 - SENSITIVITY CASE)

4.4.1. EXTRACTION PROCESS

The results from the FLAC3D model developed by Douglas and Partners [1.] have been applied to the 3D structural model, enabling a more detailed analysis to be completed, properly accounting for the segmental lining joints and geometry. The most critical extent of tunnel is assessed in the structural model over a length of approximately 12 meters. The critical cases of unloading (building demolition and basement excavation) and loading (complete building construction) have been considered, equivalent to the considerations made in the 2D geotechnical analysis.

The normal and shear stresses for the two critical cases of unloading and “load case 14” (building loading) were extrapolated from the FLAC3D model. These values were then elaborated using an in-house tool which averages stresses over a length of 1.7m (ring length).

Note that due to the complex data extraction and analysis process, this model has only been run for the Case 2 (Sensitivity Case), being the most onerous design condition that is being considered.

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Figure 4-16 – Normal stresses

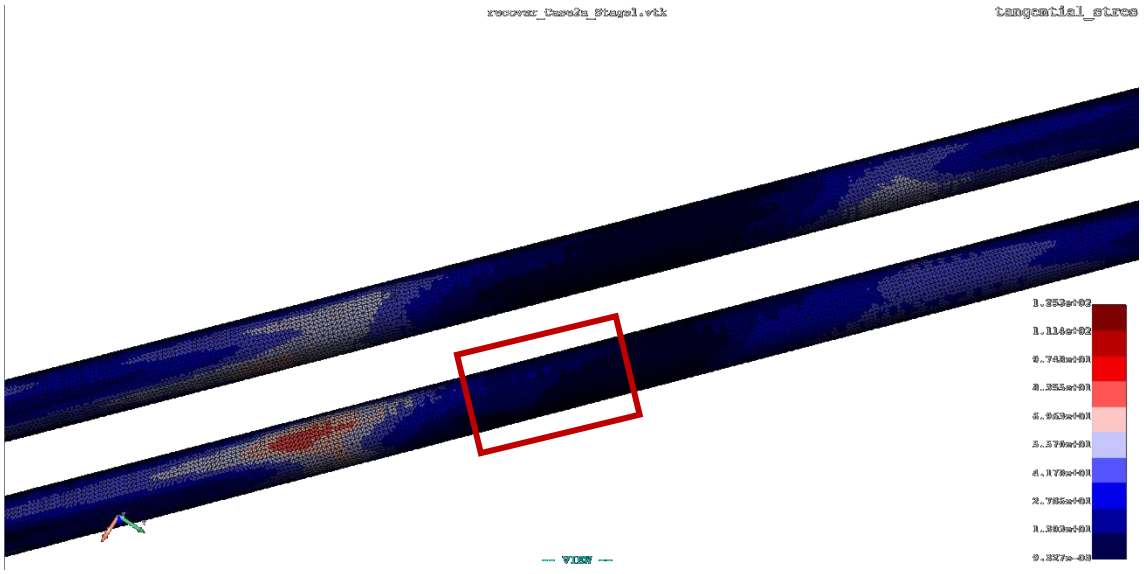

Figure 4-17 - Tangential stresses

The area indicated in the two figures above is zoomed in Figure 4-18.

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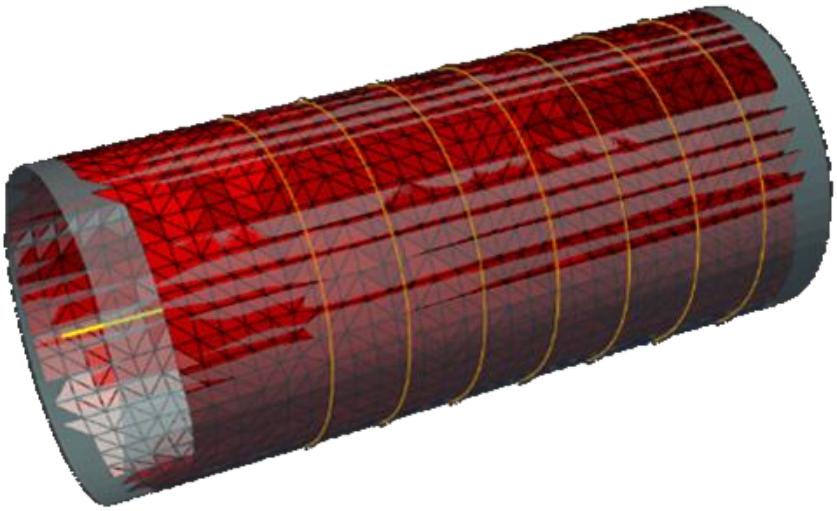

Figure 4-18 – Strand7 beam elements (yellow lines) superimposed on the Flac3D plate elements: the in-house tool yields an averaged loading on the beam elements

Subsequently, the averaged forces per segment length were imported into STRAND7.

4.4.2. CASE 2 – INPUT DATA - UNLOADING

The results from FLAC3D for the unloading case are illustrated in the figures below.

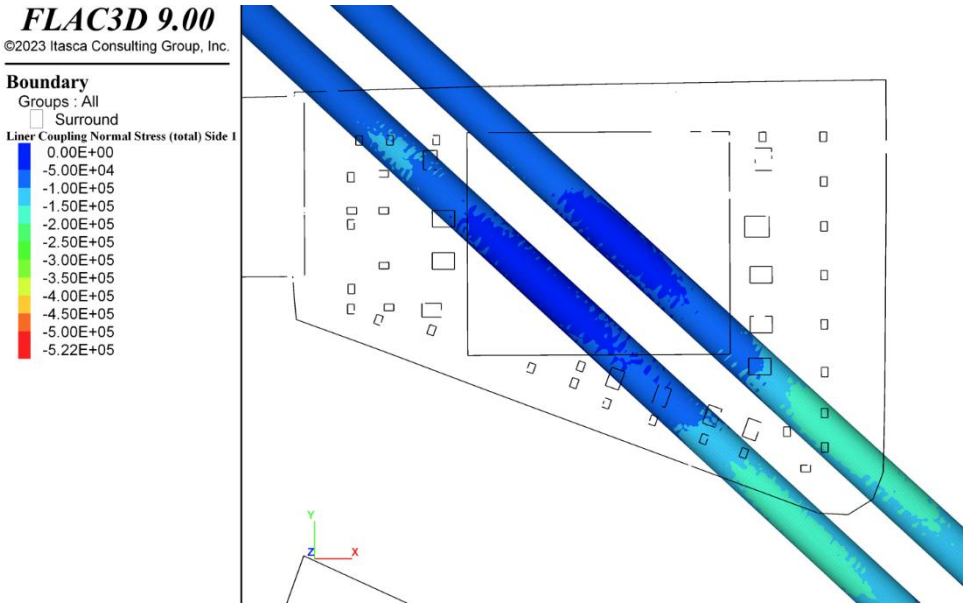

Figure 4-19 - Normal stress [MPa] - Case 2 Load Case 14

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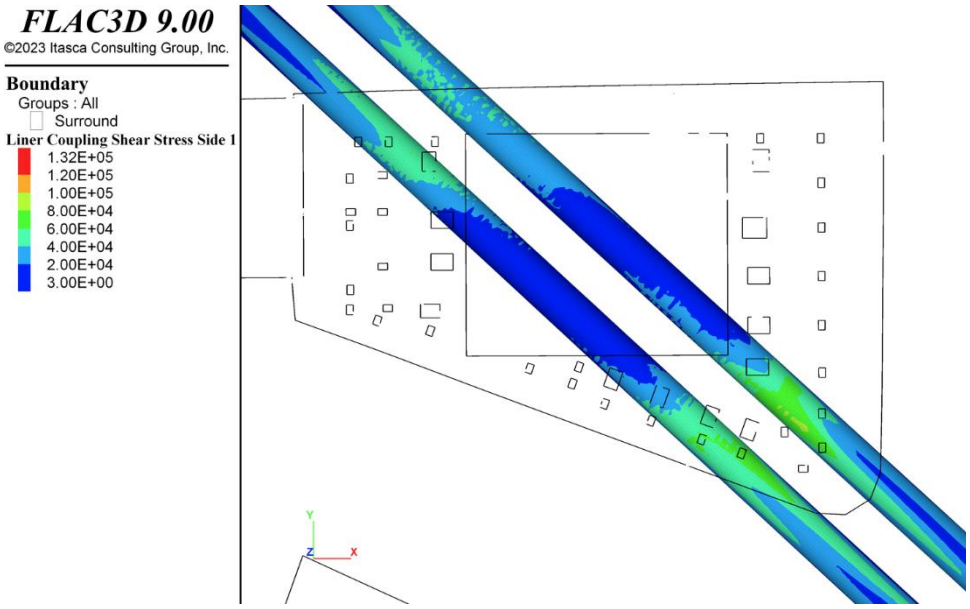

Figure 4-20 - Shear stress [MPa] - Case 2 Load Case 14

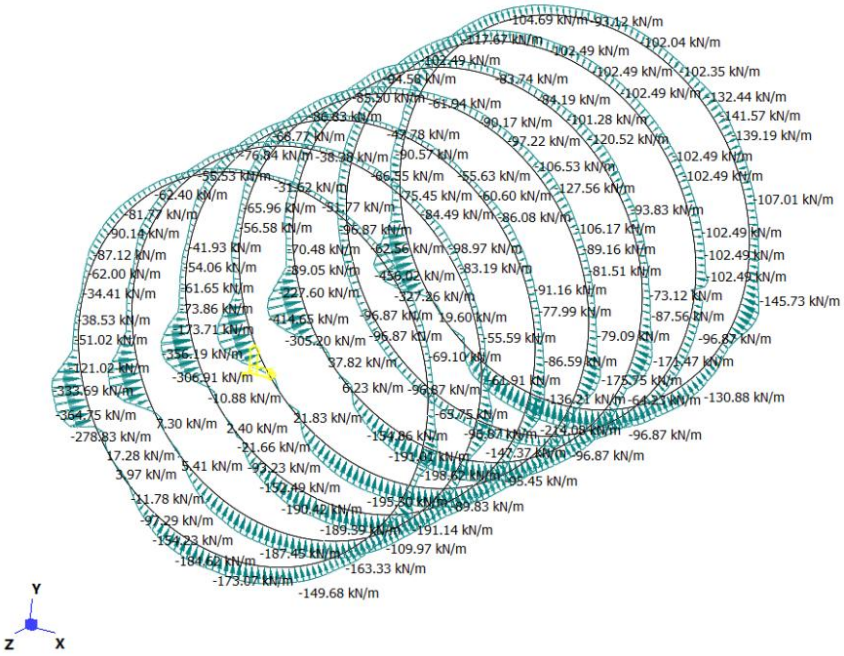

Figure 4-21 - Normal stress imported to Strand7

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4.4.3. CASE 2 – INPUT DATA LOADING STAGE (LOAD CASE 14)

The output data from FLAC3D for the loading stage are shown below in Figure 4-22 and Figure 4-23:

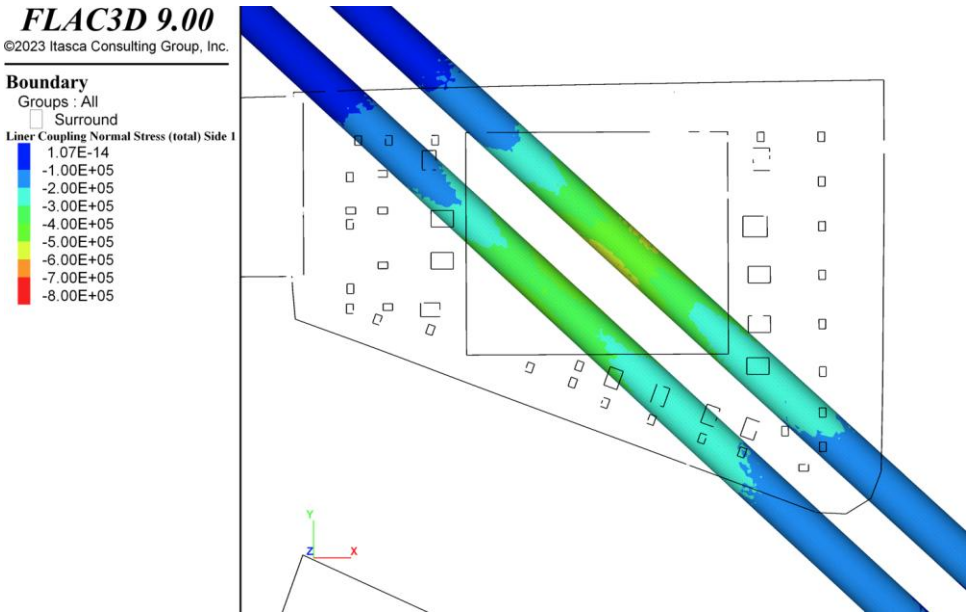

Figure 4-22 - Normal stress [MPa] - Case 2 Load Case 14

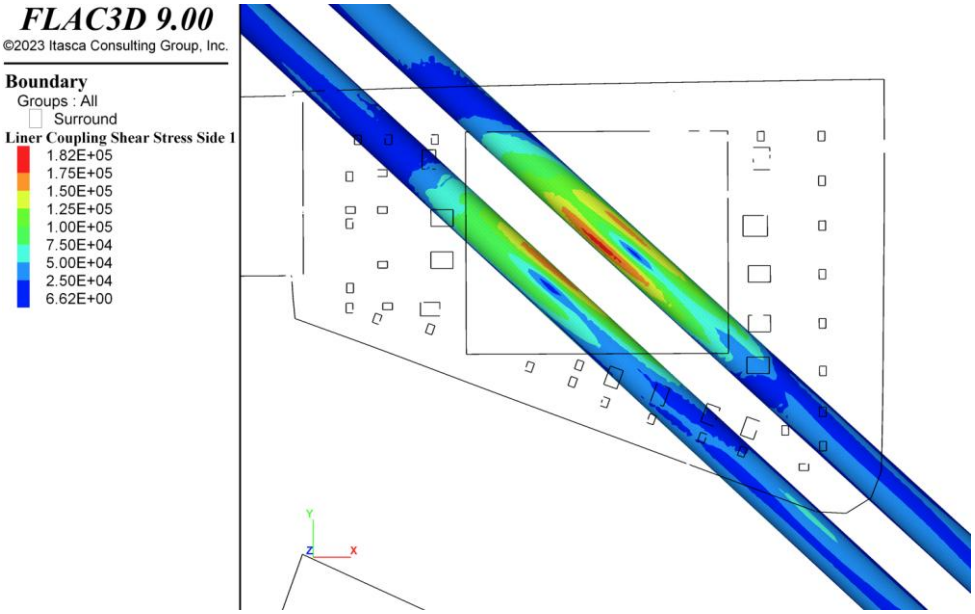

Figure 4-23 - Shear stress [MPa] - Case 2 Load Case 14

The modelling was performed following the characteristics defined in the §4.4 with results shown below in the following sections.

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4.5. UNLOADING STAGE BENDING & SHEAR CHECKS

4.5.1. UNLOADING STAGE RESULTS (CASE 2 SENSITIVITY CASE)

Results for the maximum unloading condition (basement formation level) are shown below in Figure 4-24 and Figure 4-25. These results show that in comparison with the simplified, 2D analysis included in Table 4-2 Tunnel Liner Results –Case 2 (Sensitivity Case) [Stage 3 Basement Excavation], significantly higher beneficial axial loads are retained in the lining during the unloading phases. Segment bending moments are slightly increased compared to the 2D analysis.

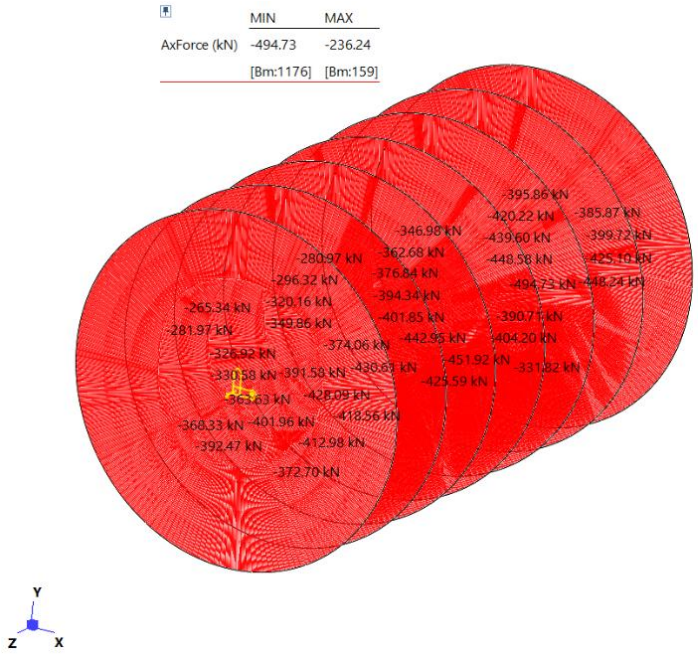

Figure 4-24 - SLS - Axial Force (Unloading stage)

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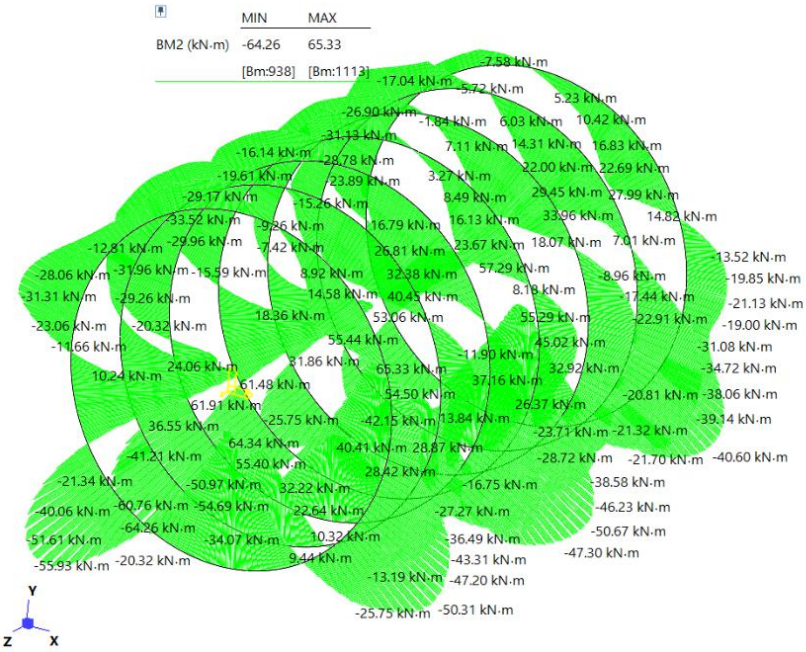

Figure 4-25 - SLS - Bending moment (Unloading stage)

4.5.2. ULTIMATE DESIGN CHECK (ULS)

A load factor of 1.5 has been applied at the ULS with results presented below. Although the analysis shows increased bending moments compared to the Plaxis 2D analysis, the accompanying increase in beneficial axial loads shows that all results still remain within the capacity curve, albeit with similarly high utilisation of capacity.

Although the shear checks show a few points with higher loads than in the 2D analysis, all points remain well within capacity with maximum utilisation around 85%.

As for the 2D analyses, it is also important to note that unlike the original Sydney Metro Design, Case 2 (Sensitivity Case) has been checked with a standard load factor of 1.5, compared to 1.25 that was adopted in the original design.

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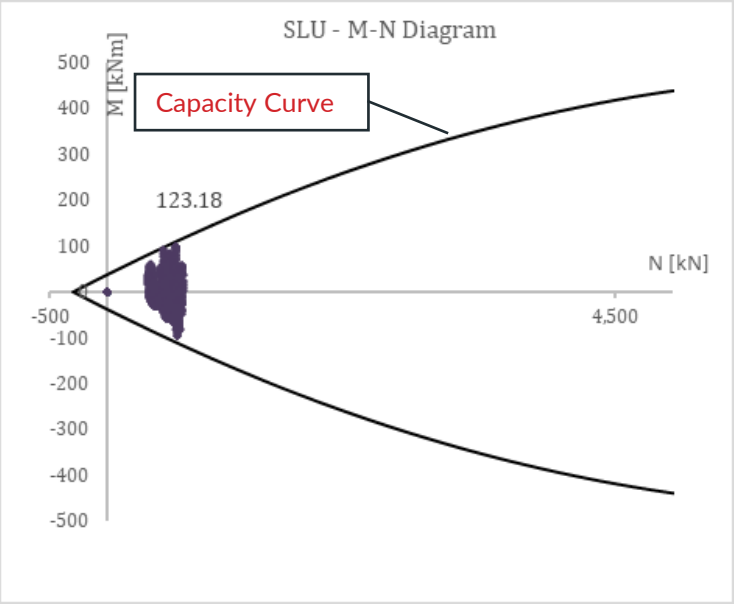

Figure 4-26 ULS axial force & moment capacity for Case 2

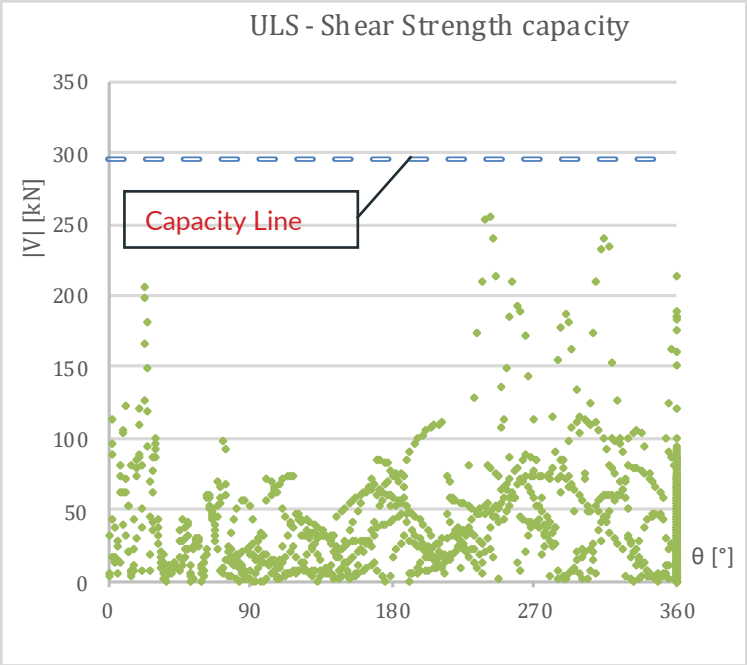

Figure 4-27 ULS shear capacity check for Case 2

4.5.3. SERVICEABILITY LIMIT STATE CHECKS (SLS)

SLS checks for SFRC segments were carried out using M-N interaction envelopes for a crack width limitation of 0.15mm (being the same criteria applied in the original design[2.]). All points remain well withing acceptable limits.

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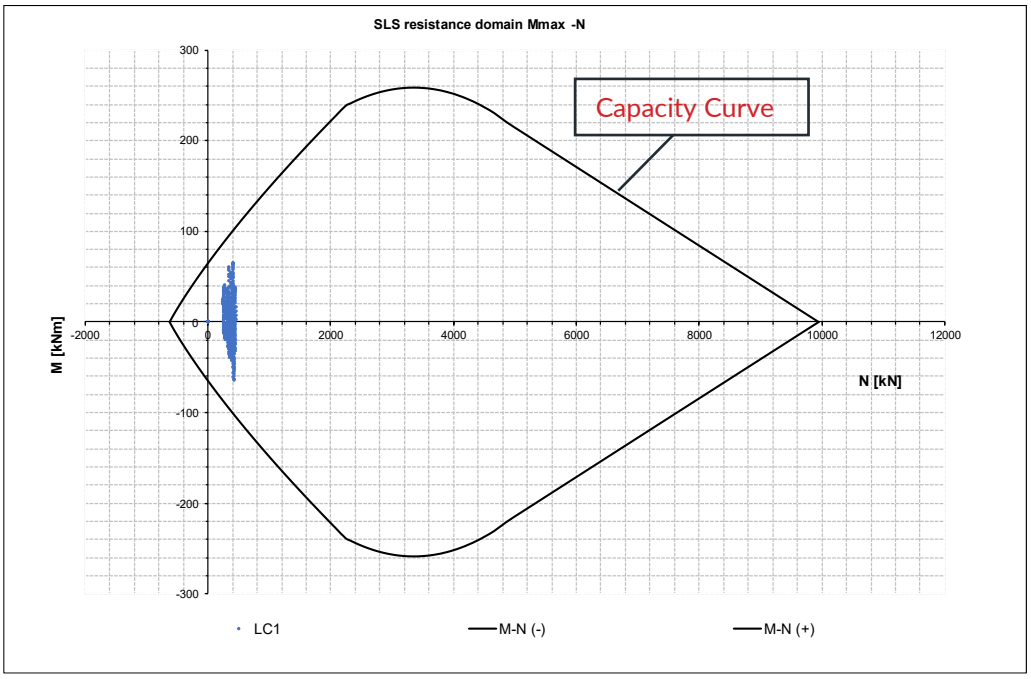

Figure 4-28 SLS check for Case 2

4.6. LOADING STAGE (LOAD CASE 14) BENDING & SHEAR CHECKS

4.6.1. LOADING STAGE RESULTS (CASE 2 SENSITIVITY CASE)

The same approach as in section 4.5 is adopted for the loading case structural checks. Results for the maximum loading condition are shown below in Figure 4-29 and Figure 4-30. These results show that in comparison with the simplified, 2D analysis included in Table 4-2 Tunnel Liner Results –Case 2 (Sensitivity Case) [Stage 6 New Building + Wind Case 14], slightly higher beneficial axial loads occur in the lining with bending moments also higher than shown in the simplified 2D analysis.

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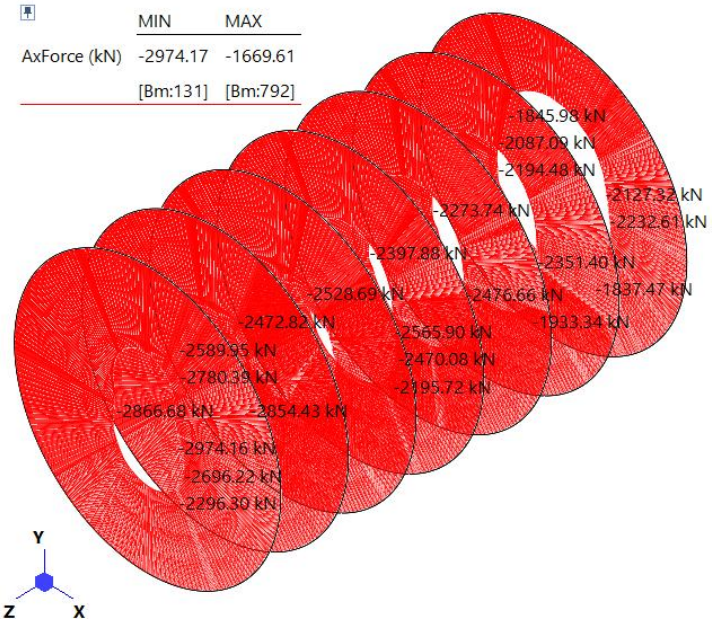

Figure 4-29 - SLS - Axial Force (Loading stage)

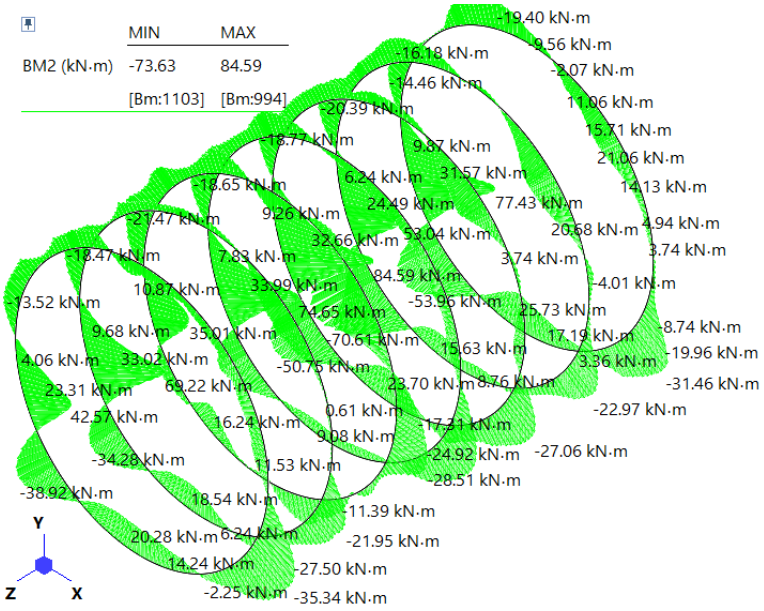

Figure 4-30 - SLS - Bending moment (Loading stage)

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4.6.2. ULTIMATE DESIGN CHECK (ULS)

The ULS structural checks for the case loading condition are presented below. Although the analysis shows increased bending moments compared to the Plaxis 2D analysis, all results remain well within the capacity curve with significant reserve capacity.

Similar to the unloading condition, shear checks are generally higher than in the 2D analysis but all points remain well within capacity with maximum utilisation around 70%.

Again, these results have been checked with a standard load factor of 1.5, compared to 1.25 that was adopted in the original Sydney Metro design.

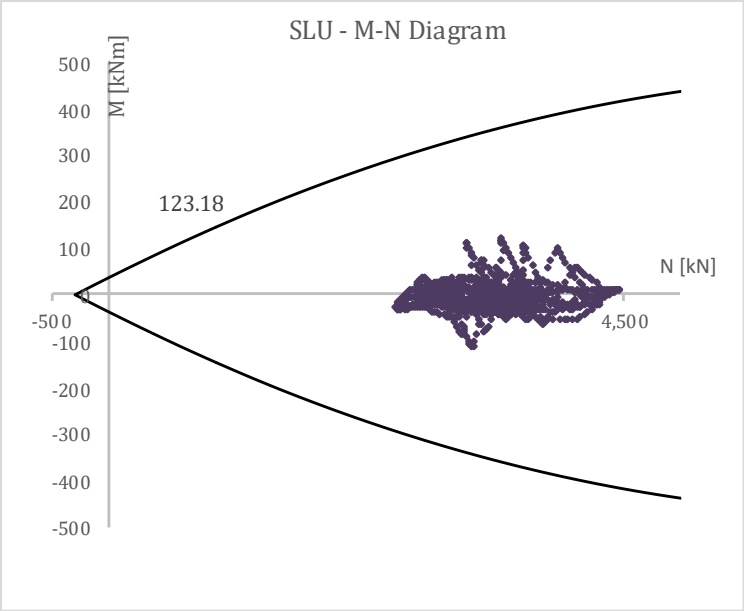

Figure 4-31 ULS axial force & moment capacity for Case 2

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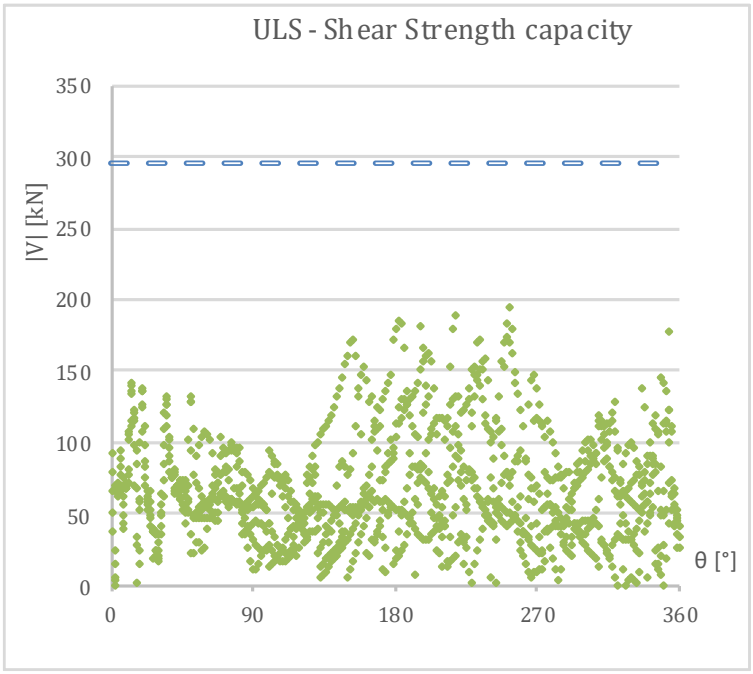

Figure 4-32 ULS shear capacity check for Case 2

4.6.3. SERVICEABILITY LIMIT STATE CHECKS (SLS)

As with the unloading condition, SLS checks for SFRC segments have been carried out using M-N interaction envelopes for a crack width limitation of 0.15mm, as adopted in the original design [2.]). Compared to the unloading condition, it can be seen that the increased axial loads move all points further away from the capacity curve, meaning that as the building loads are applied, any cracks would diminish and most likely would be completely indetectable in an SFRC lining.

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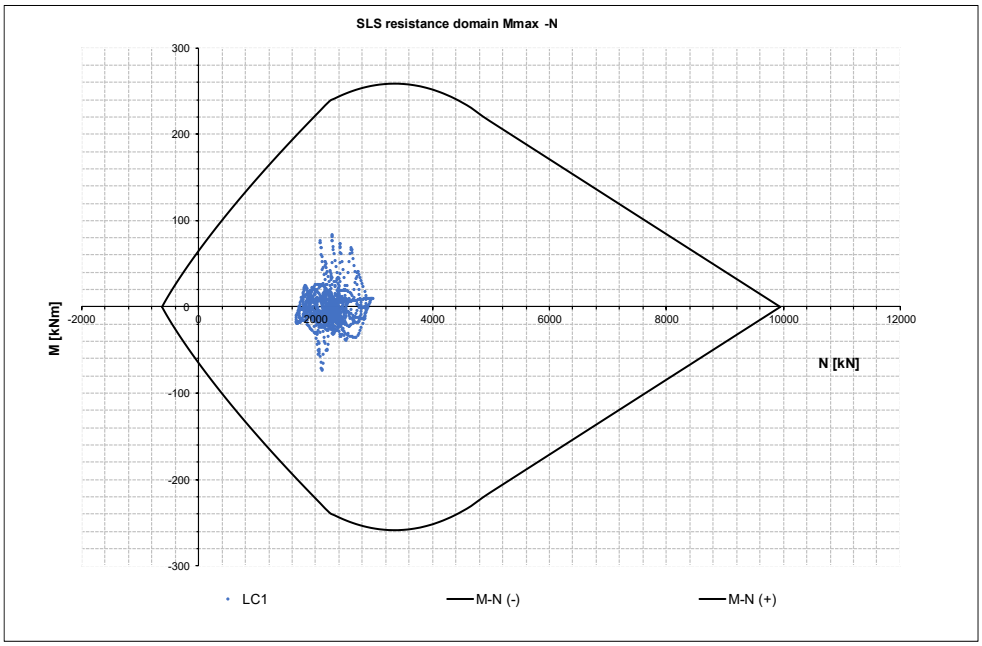

Figure 4-33 SLS check for Case 2

4.7. LONGITUDINAL JOINT CHECKS (2D GEOTECHNICAL MODEL)

Since the design cross-section in the 2D geotechnical analysis covers the area of peak loads and considering that the lining in the geotechnical model is modelled as a continuous element with an equivalent stiffness to take account of the presence of the longitudinal joints, unrealistically high load eccentricities are obtained at the joints. Conversely, the 3D structural model enables a much more accurate representation of the distribution of bending stresses at the longitudinal (segment to segment) and circumferential (ring to ring) joint.

Therefore, to provide a comprehensive check of stresses associated with segment joints, the 3D structural model has been loaded with normal and tangential stresses at the soil-lining interface for the design conditions assessed in the 2D geotechnical model. By doing so, more exhaustive checks have been possible than could have been achieved with the more limited results from the FLAC3D analysis.

The structural model allows us to appreciate the interaction between the rings and the segments due to the presence of the circumferential and longitudinal joints. Detailed results are presented in ANNEX 3: LONGITUDINAL JOINT CHECKS and are summarised below. For each joint, two separate checks are performed:

- a **compression check at ULS**, the maximum compressive force in the longitudinal joint shall be determined in accordance with EN1992-1-1.
- a **radial bursting check at ULS and SLS,** the tensile stress is calculated according to Leonhardt's formulation and compared to the tensile capacity of the segmental lining.

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4.7.1. CASE 1 (BASE CASE)

Loads at the critical design cases have been applied to the structural FE model using the normal and shear stresses acting from the geotechnical PLAXIS 2D analyses. Loads shown below are for the excavation phase; a similar approach is applied for the loading phases.

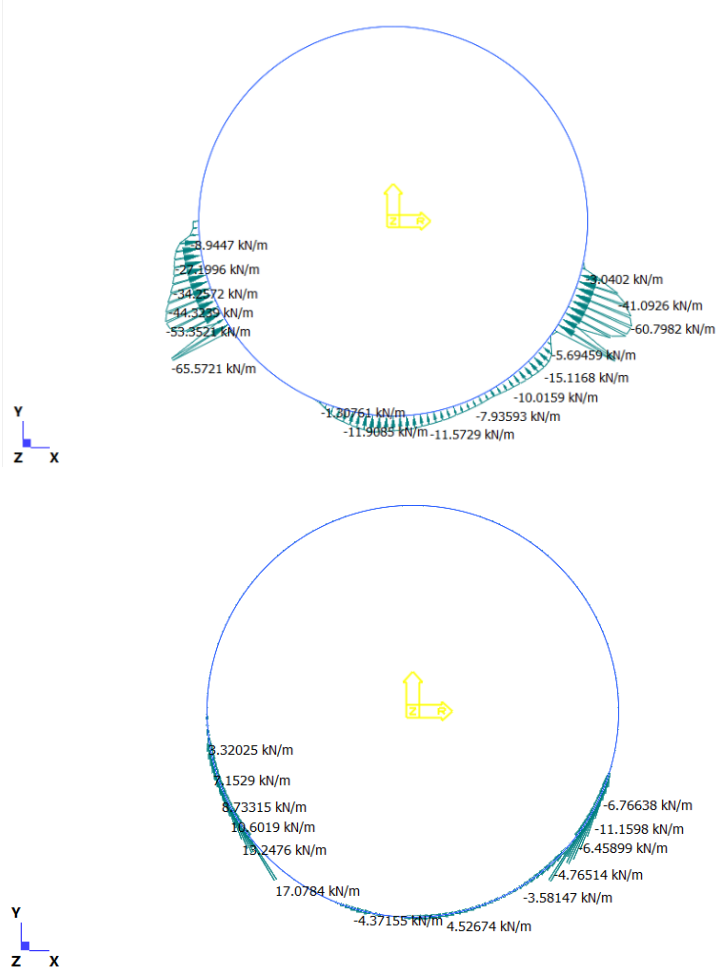

Figure 4-34 - Normal and tangential stresses applied to the structural (STRAND7) model

Since the force system is at a state of equilibrium in the geotechnical model, transferring the same forces in the structural model allows to consider spring supports around the ring with a negligible radial and tangential stiffness of 1kN/m.

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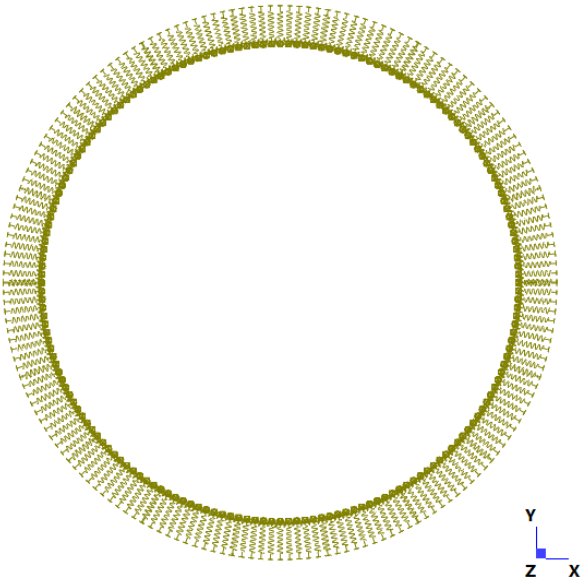

Figure 4-35 – Radial and tangential spring stiffness (1kN/m)

This load application procedure shows a perfect match between the results of the two software programs.

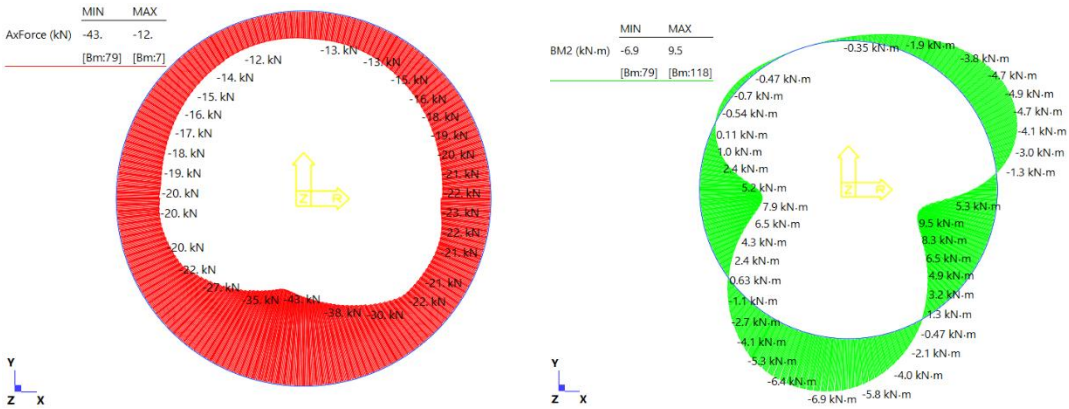

Figure 4-36 – Axial force [kN] and bending moment [kNm]- STRAND7 model

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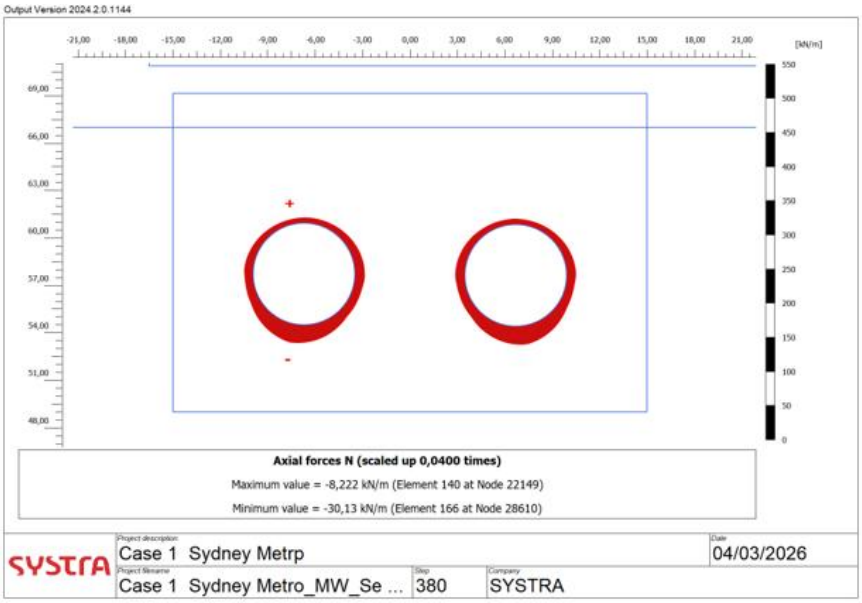

Figure 4-37 - Axial force [kN/m] - PLAXIS model

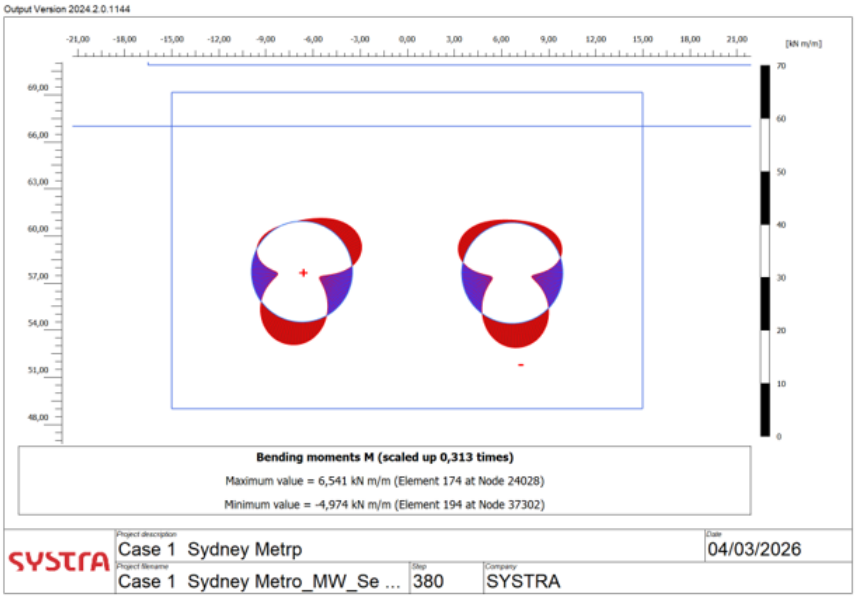

Figure 4-38 – Bending moment [kNm/m] - PLAXIS model

All the rings are loaded with lining normal and shear stresses from the PLAXIS 2D model. These pressures are expressed per linear meter in the geotechnical model, so they must be multiplied by the actual length of the segments (1.70 m) and applied to the structural model.

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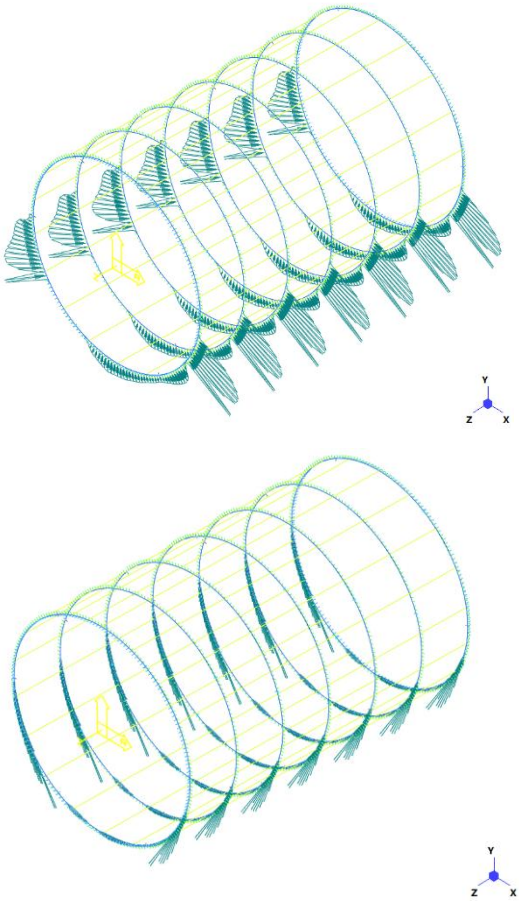

Figure 4-39 - Applying pressures to the STRAND7 model

As shown in Table 4-3 below all bearing and bursting checks for Case 1 are satisfied.

Load Stage	Bearing Check (ULS)		Bursting Check (ULS)		Bursting Check (SLS)	
	Stress (MPa)	Utilisation	Stress (MPa)	Utilisation	Stress (MPa)	Utilisation
Stage1 Excavation Phase	52.7	53%	0.2	7%	0.2	3%
Stage 2 Loading Stage G+0.7Q+TW	28.2	67%	2.9	87%	2.2	43%
Stage 3 Loading Stage G+0.7Q+TW + Wind Case 15	30.2	72%	3.1	93%	2.3	46%

Table 4-3 Joint Bearing and Bursting Checks– Case 1 (Base Case)

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4.7.2. CASE 2 (SENSITIVITY CASE)

The same approach as for Case 1 has been adopted. The loads for the unloading case is illustrated in the following figures.

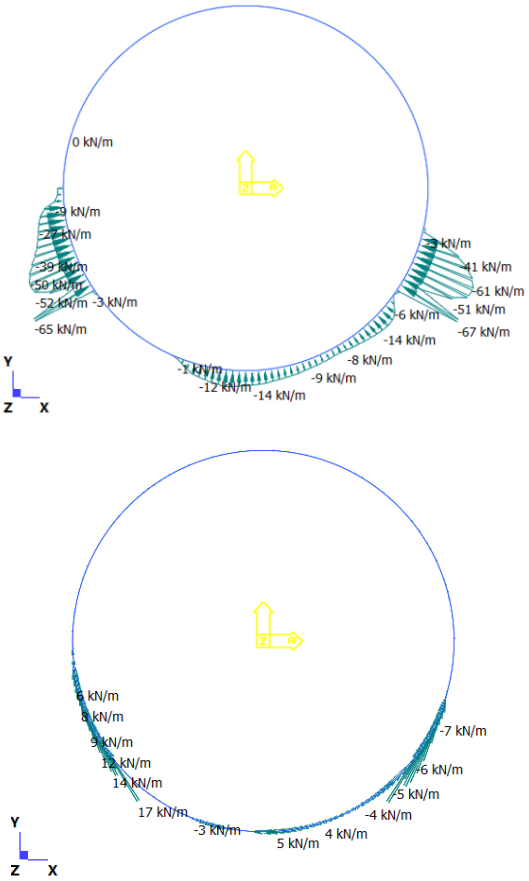

Figure 4-40 - Normal and tangential pressure applied to the model (STRAND7 2D analysis)

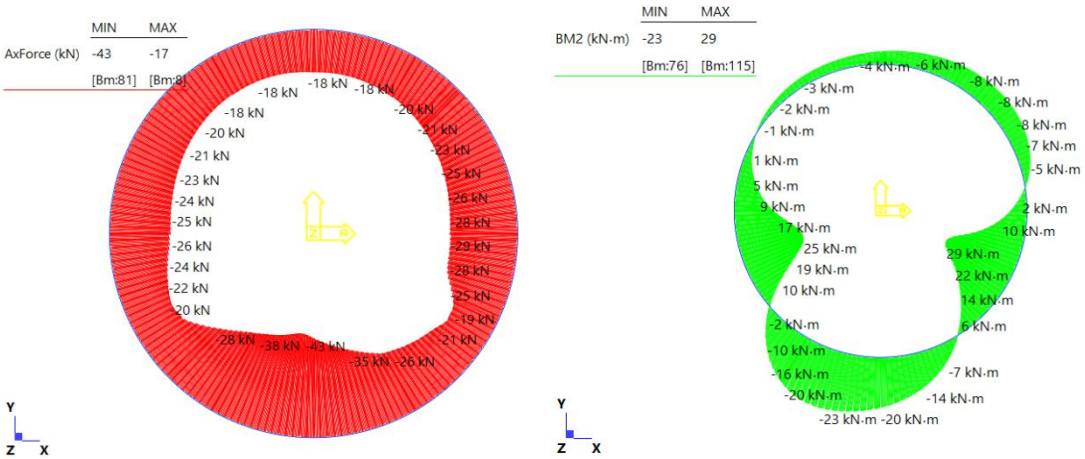

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Figure 4-41 – Axial force and bending moment - STRAND7 model

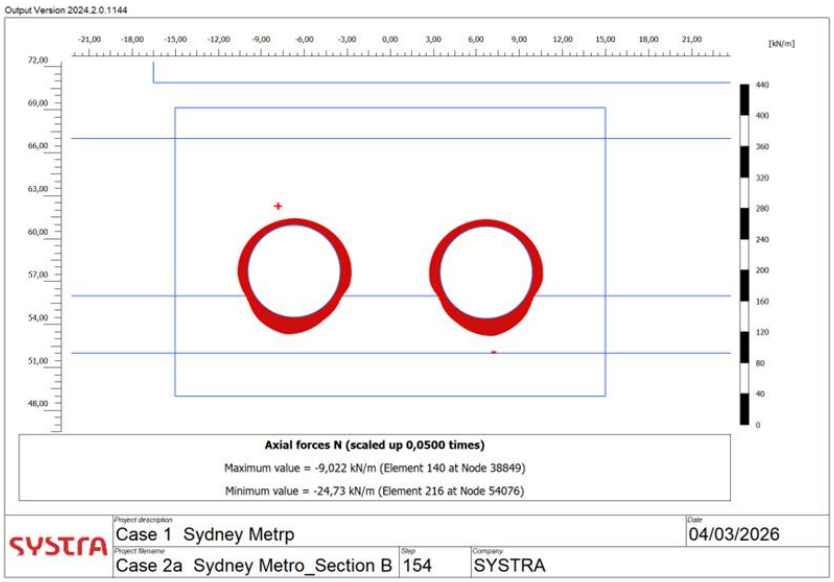

Figure 4-42 - Axial force [kN/m] - PLAXIS model

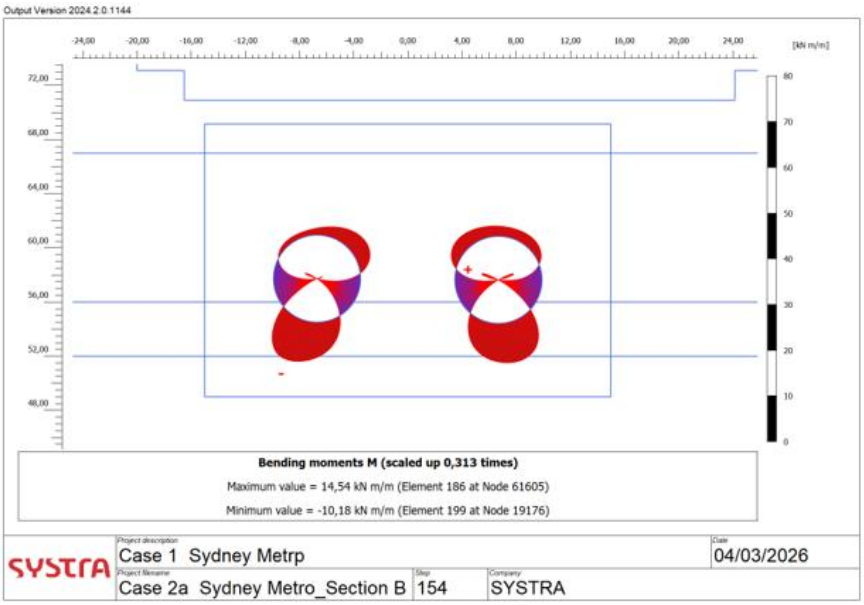

Figure 4-43 – Bending moment [kNm/m] - PLAXIS model

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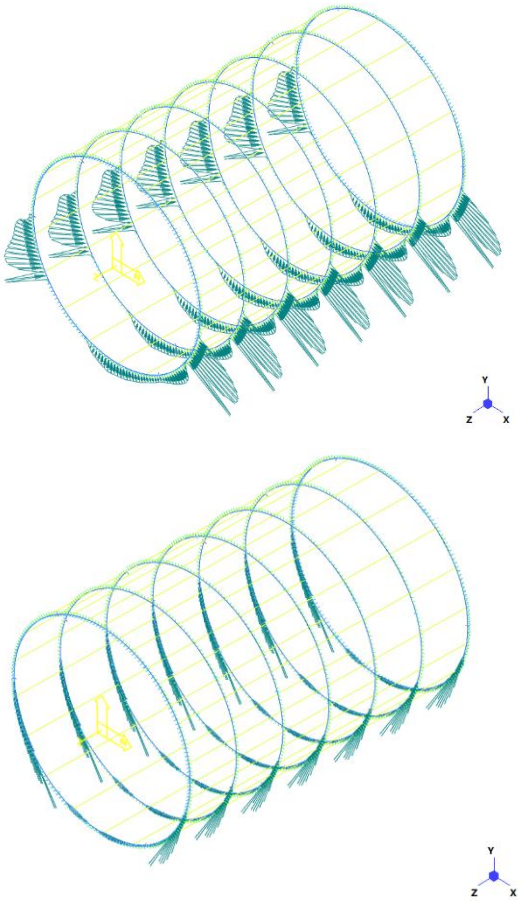

Figure 4-44 - Applying pressures to the STRAND7 model

As shown in Table 4-4, below all bearing and bursting checks for Case 2 are satisfied.

Load Stage	Bearing Check (ULS)		Bursting Check (ULS)		Bursting Check (SLS)	
	Stress (MPa)	Utilisation	Stress (MPa)	Utilisation	Stress (MPa)	Utilisation
Stage1 Excavation Phase	3.8	4%	0.2	7%	0.2	3%
Stage 2 Loading Stage G+0.7Q+TW	26.4	66%	2.7	96%	2.0	40%
Stage 3 Loading Stage G+0.7Q+TW + Wind Case 15	33.9	84%	2.7	96%*	2.6	52%

* Verified by non-linear analysis according to SFRC design fib Model Code 2010

Table 4-4 Joint Bearing and Bursting Checks– Case 2 (Sensitivity Case)

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4.7.3. GASKET CHECK

A representative calculation for the gasket is shown below considering a radial joint rotation of Ψ = 0.156deg, obtained in previous calculations.

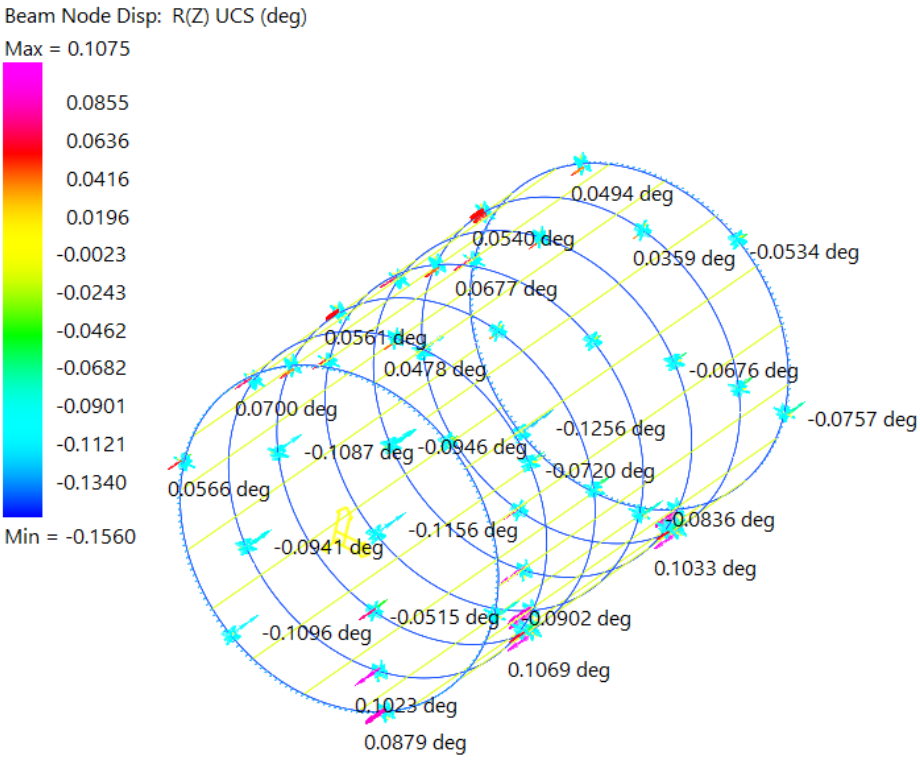

Figure 4-45 -Radial joint rotation – Case 2 a Excavation phase

According to BTS Specification Section 204.4, the following tolerances have been considered:

- Groove depth tolerance equal to 0.25mm
- Gasket position tolerance equal to 1.5mm

Gap including tolerances is calculated as (168mm + 1.5mm) x tan (0.156°) + 2 x 0.25mm = 0.96mm.

This result demonstrates that the gasket can withstand all conditions of groundwater level, as the maximum gap limit is never reached. The maximum gap that can be sustained by the gasket for 10 bar is 6.00mm as shown in the figure below. This limitation is reported in [2.].

0.96mm < 6.0 mm∴ VERIFIED.

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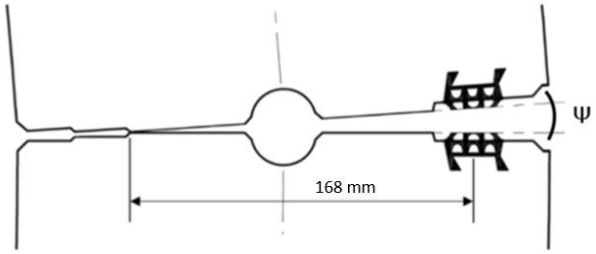

Figure 4-46 - Gasket gap due to radial joint rotation

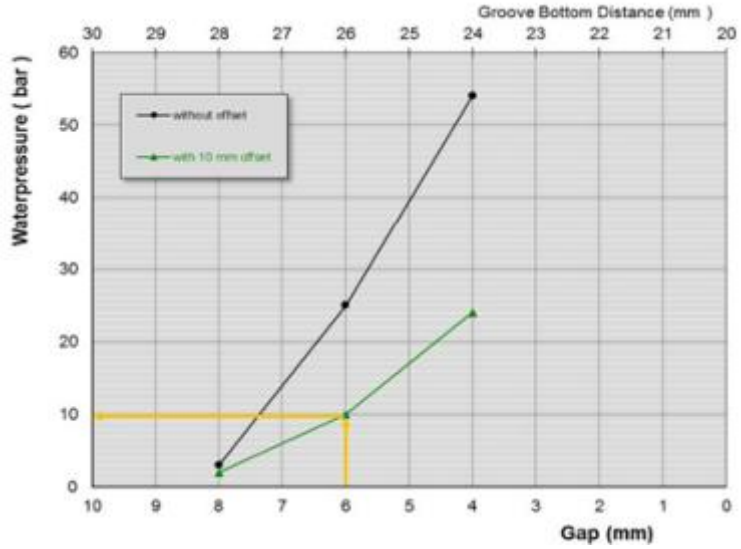

Figure 4-47 - Gasket tightness diagram

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5 LINING MOVEMENTS ASSESSMENT

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5.1. MOVEMENT CRITERIA

Section 5.1.2 of Sydney Metro Underground Corridor Protection Technical Guidelines [11.] requires that:

> *"For tunnels that are supported by a precast concrete segmental lining, the allowable total movement in any direction is 10 mm and differential movement in any plane is 10 mm or 1:2000 whichever is less. The main purpose of these limits is to ensure that the watertightness of the lining through joints is not compromised as consequence of gasket decompression and/or damage".*
>
> *"For the running rails, the allowable total movement in any direction is 8 mm and differential movement in any plane is 8 mm or 1:2500, whichever is less."*

5.2. MOVEMENT ASSESSMENT

Tunnel lining movements have been calculated in Douglas Partners FLAC3D analysis [1.] and are reproduced in the tables below.

Stage	Load Case	Maximum Total Rock Mass Displacement Around Tunnel (mm)	Maximum Total Tunnel Liner Displacement (mm)
1	**No Load**	3.6	3.5
2	**G+0.7Q**	7.2	7.0
	11	7.2	7.0
	14	7.3	7.1
	15	6.5	6.3

Table 5-1 Case 1 Serviceability Displacement Results for RT01 Tunnel

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Stage	Load Case	Maximum Total Rock Mass Displacement Around Tunnel (mm)	Maximum Total Tunnel Liner Displacement (mm)
1	No Load-	6.3	6.3
2	G+0.7Q	11.0	10.8
	11	11.1	10.9
	14	11.3	11.0
	15	10.0	9.8

Table 5-2 Case 2 Sensitivity Displacement Results for RT01 Tunnel

Douglas Partners also report that:

Case 1 (Base Case):

- *The maximum displacement in the tunnel floor during Stage 2 is predicted to be 4 mm (downward).*
- *For Load Case 14, a maximum angular distortion of 0.3mm/m and 0.2mm/m is estimated in the tunnel crown and tunnel floor, respectively.*

Case 2 (Sensitivity Case):

- *The sensitivity analyses predict liner displacements of up to 11mm, at the end of Stage 2.*
- *A maximum angular distortion in the order of 0.42mm/m was calculated in the RT01 tunnel. For Load Case 14, a maximum angular distortion of 0.3mm/m and 0.2 mm/m is estimated in the tunnel crown and tunnel floor, respectively.*

In addition to these results, differential movements between adjacent rings have been extracted from the 3D structural model for Case 2. These results reflect the non-linear behaviour of the dowels which cannot be derived for the monolithic structure that is adopted in the FLAC3D model .

Figure 5-1 below shows crown displacements relative to a point on the invert with a maximum predicted differential movement of 3.8mm for Case 2 (Sensitivity Case).

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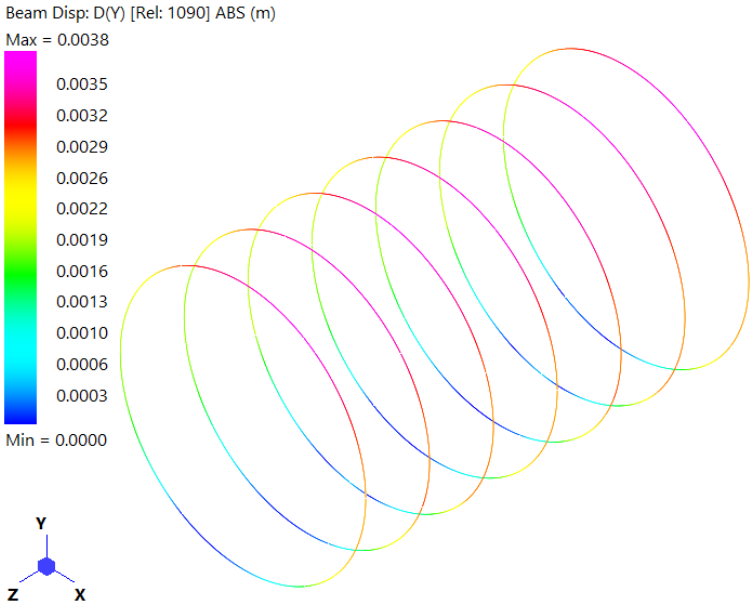

Figure 5-1 - Displacement between the invert and the crown - Load Case 14 (Case 2a)

For Case 1 (Base Case), at 7.1mm maximum, all lining movements are well within the Sydney Metro criteria of 10mm maximum or 1:2000 (0.5mm/m).

For Case 2 (Sensitivity Case) although the maximum movement of 11.0mm is marginally above the permitted movement of 10mm, all angular distortions remain within the 0.5mm/m criteria.

To more specifically consider the invert on which the rail track form is founded, Figure 5-2 shows the relative displacement between consecutive rings for Case 2. This figure shows that at the invert there is minimal differential movement of less than 0.3mm between rings or a slope of 1:5667 (0.3mm / 1700mm), well within the acceptance criteria of 1:2500. In reality, given the resilience that is inherent in the track form, it unlikely that these movements would ever fully translate to the rail head.

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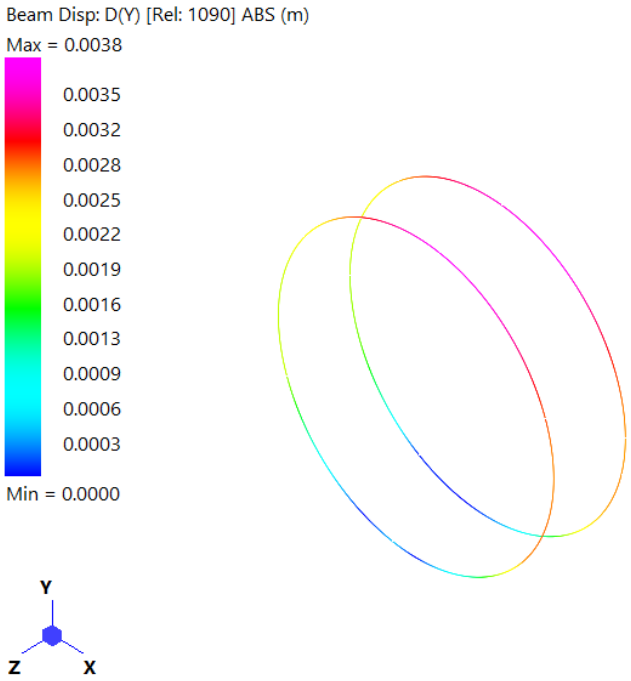

Figure 5-2 - Displacement between adjacent rings - Load Case 14 (Case 2a)

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6 SUMMARY & CONCLUSION

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The analyses performed as part of this Engineering Impact Assessment show that the structural integrity and operational continuity of the underlying Sydney Metro assets (RT01 and RT02) will be maintained throughout all stages of construction and long-term building occupancy of the proposed 52-storey development with 6 level basement at 601 Pacific Highway. The checks have covered all typical criteria including bending, bearing and bursting checks at Ultimate and Serviceability Limit State. In addition, joint rotation checks show that gasket compression should easily be retained within acceptable limits, meaning that the risk of tunnel leakage is minimal.

The more detailed structural checks conducted for the unlikely worst case scenario (Case 2) using the 3D STRAND7 model that more accurately reflect the small articulations that occur at the segment joints re-affirms that under all foreseeable conditions, the SFRC segmental lining has the capacity to withstand the changes in load condition arising from the proposed development.

In considering these conclusions, it is worth noting that all checks (Case and Case 2) have been completed using less favourable ground parameters than were adopted in the original Sydney Metro design. In addition, for the most critical Sensitivity Case, a more onerous load factor of 1.5 has been adopted, compared with 1.25 that was adopted in the original design. The checks that have been undertaken herein are therefore more onerous than were considered in the original design

Numerical analyses performed by Douglas Partners in their FLAC3D indicate that under the most realistic serviceability conditions (Case 1), the maximum predicted vertical displacement of the tunnel lining is 7.1 mm, well within the 10mm limit established by the *Sydney Metro Underground Corridor Protection Technical Guidelines [11.]*.

Further checks on movements at the invert show that the impact on the track structure (and therefore rail operations) is even less significant with predicted movements expected to be less than 50% of allowable limits.

Although the Case 2 Sensitivity Analysis does yield a maximum displacement of 11 mm, this result is associated with an unlikely combination of lower-bound rock mass stiffness. Given that Case 2 represents an unlikely worst case scenario and all structural checks have already been shown to be acceptable, we do not believe that this marginal exceedance of deflection criteria should present any significant concern, especially as track related criteria remain well within acceptable limits.

In the most likely Case 1 scenario, all movement and structural criteria have been shown to be comfortably satisfied.

Given these results, to more conclusively establish the likelihood Case 2 conditions could arise, it is recommended that further geotechnical investigations be conducted to better evaluate the actual rock mass parameters. Emphasis should be placed on a more detailed characterisation of the Fractured Sandstone (Unit E) to allow a subsequent refinement of the numerical model.

In conclusion, the proposed development is considered geotechnically and structurally viable, posing no significant risk to the Sydney Metro infrastructure. To ensure the safety of the assets, an Instrumentation and Monitoring Plan (IMP) must be established prior to demolition to validate these analytical predictions against real-time data and to manage construction activities within agreed safety trigger levels.

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ANNEX 1: COMPARATIVE ANALYSIS OF GROUNDWATER SCENARIOS

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A comprehensive sensitivity analysis has been performed to evaluate the structural response and integrity of the Sydney Metro tunnels under varying groundwater levels. This analysis integrates three credible groundwater scenarios—FGW1 (29m), FGW2 (16m), and FGW3 (0m), as stated in Chapter 3.3. This analysis was conducted using the Case 1 (Best Estimate) geotechnical model.

The following table summarises the maximum predicted displacements and governing structural actions (N_k, M_k, Q_k and e) across the three different groundwater levels: FGW1 (29m), FGW2 (16m), and FGW3 (0m).

Table 6-1 Summary of Governing Structural Actions and ULS Verification for Segmental Lining

Groundwater Scenarios		N_k (kN/m)	M_k (kNm/m)	Q_k (kN/m)	e (mm)	Load Cases
FGW1 Highest GW = 29 m	N_{max}	3332.3	-4.0	4.0	-1.2	Load Case 14 TW
	N_{min}	-7.4	16.8	3.6	9.8	Load Case 14
	M_{max}	3095.8	21.2	0.5	6.9	Load Case 11
	M_{min}	3099.0	-21.3	0.5	-6.9	Load Case 11 EW
	V_{max}	265.6	5.3	21.1	4.9	Bulk Excavation
	e_{max}	479.9	8.6	0.9	17.9	LC1 = Final Lining
FGW2 Typical GW = 16m	N_{max}	2931.4	-5.9	5.9	-2.0	Load Case 14 TW
	N_{min}	-9.2	19.2	4.4	14.7	Load Case 14
	M_{max}	1.4	20.1	0.6	15.6	Load Case 14
	M_{min}	0.1	-23.4	0.5	-8.7	Load Case 14
	V_{max}	265.6	0.9	19.3	1.3	Excavation
	e_{max}	74.0	2.7	0.8	36.1	Final Lining
FGW3 Lowest GW = 0m	N_{max}	2268.9	8.6	8.6	3.8	Load Case 14 TW
	N_{min}	-16.8	8.9	1.4	14.0	Load Case 14
	M_{max}	7.3	22.9	0.9	33.4	Load Case 14
	M_{min}	-1.6	-21.9	1.1	-10.1	Load Case 14
	V_{max}	320.6	-20.3	20.3	-16.8	LC4.1 = G+0.7Q
	e_{max}	93.6	0.3	0.0	2.7	Final Lining

The structural checks for the tunnel lining at the Ultimate Limit State (ULS) is presented below for the three groundwater scenarios—FGW1 (29m), FGW2 (16m), and FGW3 (0m).

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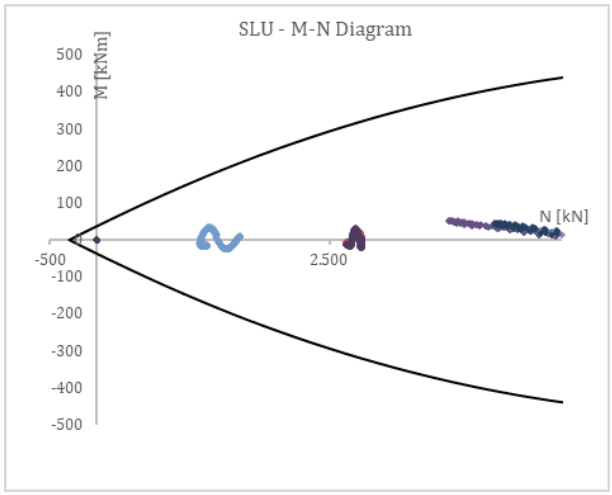

Figure 6-1 ULS axial force & moment capacity for Case 1 – FGW1

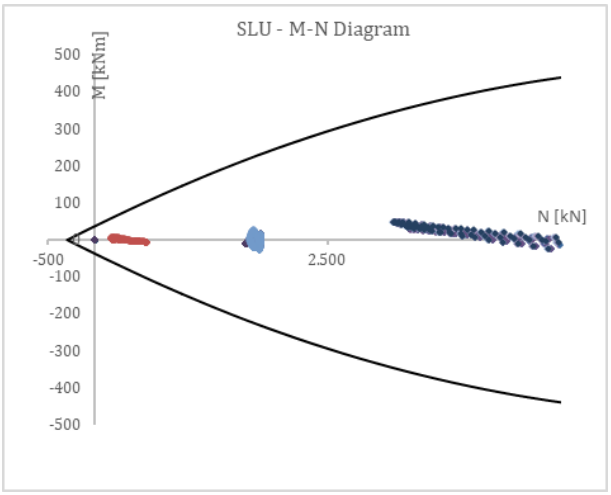

Figure 6-2 ULS axial force & moment capacity for Case 1 – FGW2

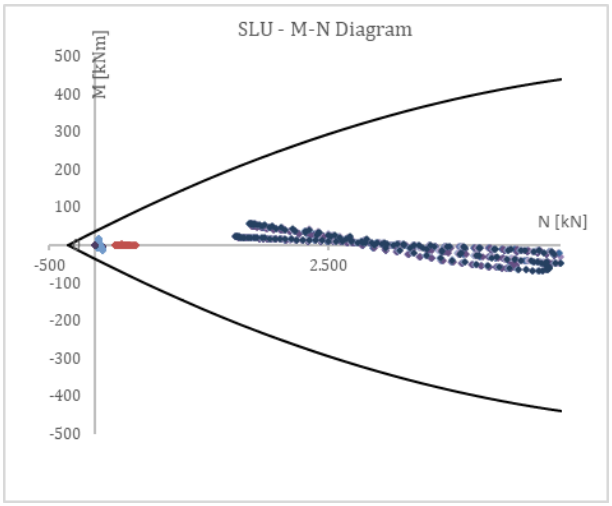

Figure 6-3 ULS axial force & moment capacity for Case 1 – FGW3

The analysis confirms that both displacement and structural requirements are satisfied across all three groundwater scenarios. However, the most critical condition occurs at the lowest water level (FGW3), as the lack of hydrostatic confinement results in lower axial forces, which increases eccentricity and structural demand on the tunnel lining.

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ANNEX 2: PLAXIS 2D OUTPUTS

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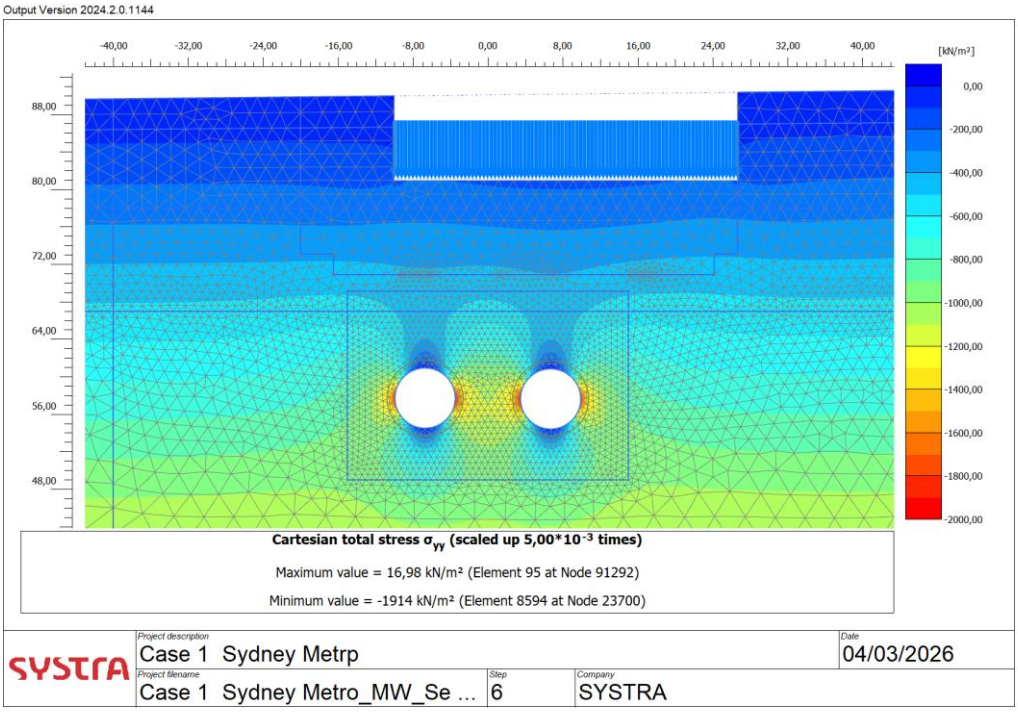
CASE 1 RESULTS (BASE CASE)

TOTAL VERTICAL STRESS

Total vertical stress - Stage 0: Metro tunnel lining installation (Load Case 1)



Total vertical stress - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)

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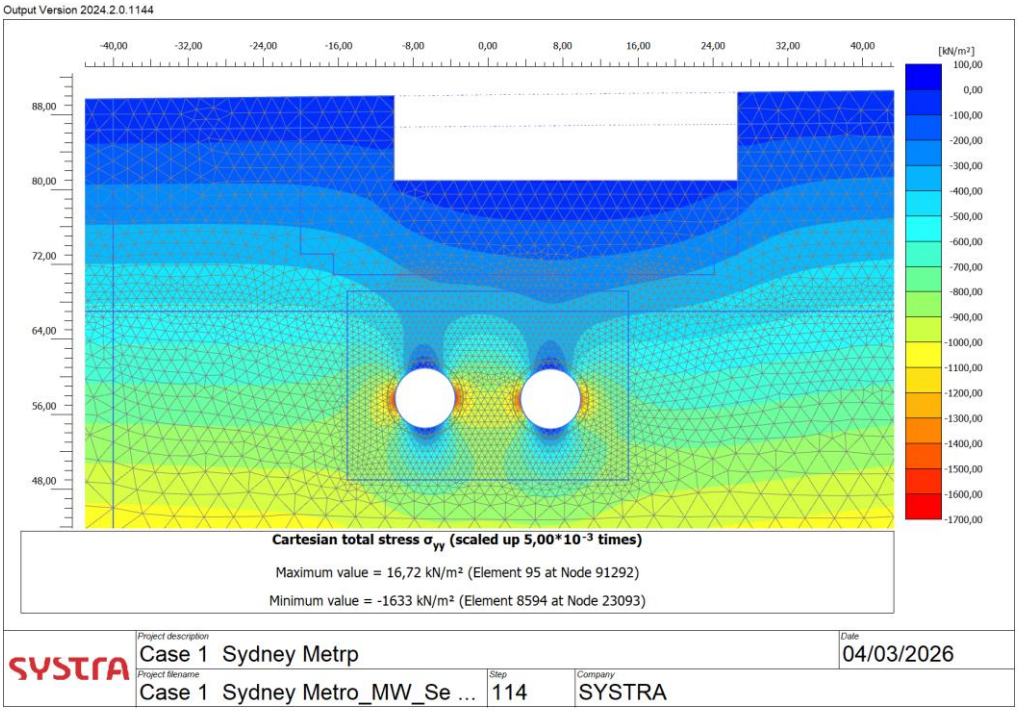
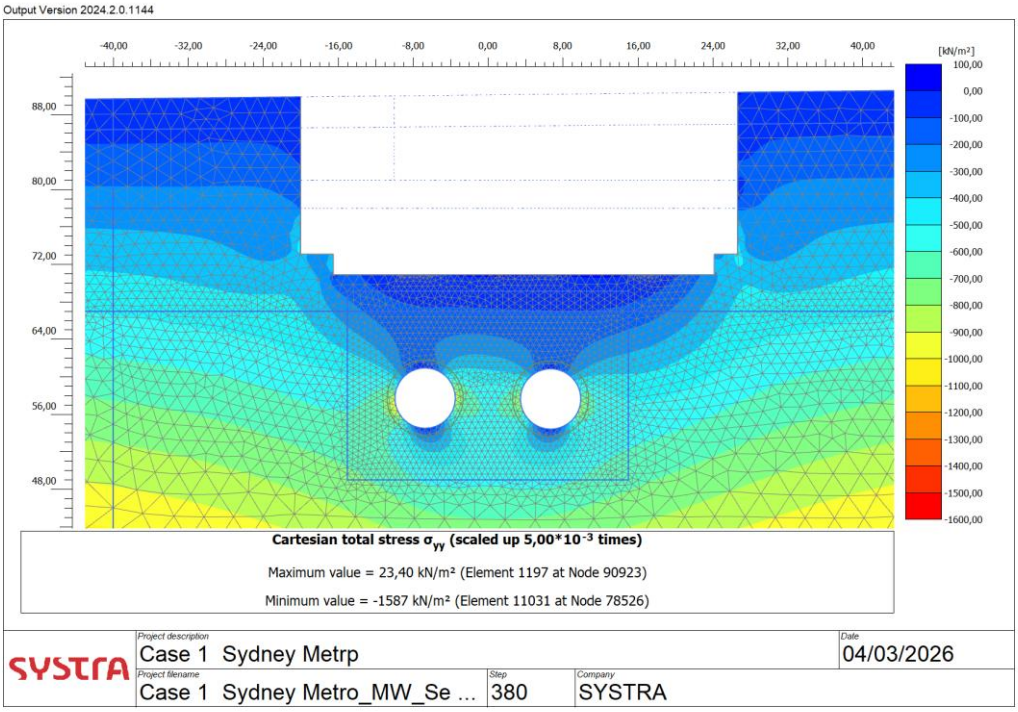


Total vertical stress - Stage 1: Excavate proposed basement (Load Case 3)



Total vertical stress - Stage 2: Apply new G+0.7Q building load (Load Case 4)

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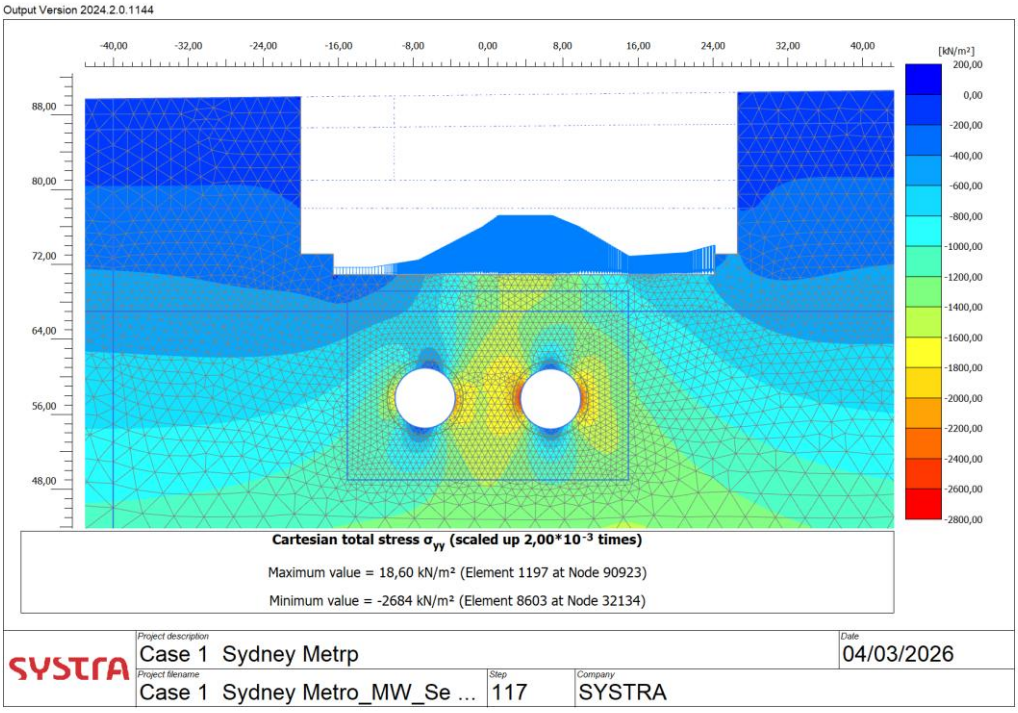
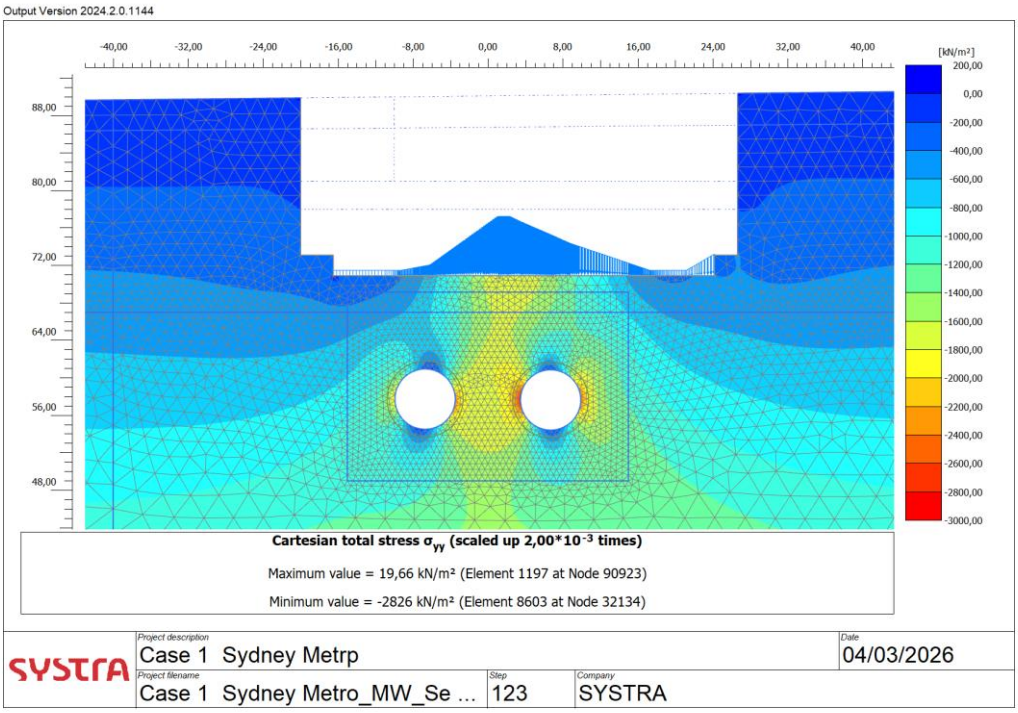


Total vertical stress - Stage 2: Apply wind building load case 11 (Load Case 5)



Total vertical stress - Stage 2: Apply wind building load case 14 (Load Case 6)

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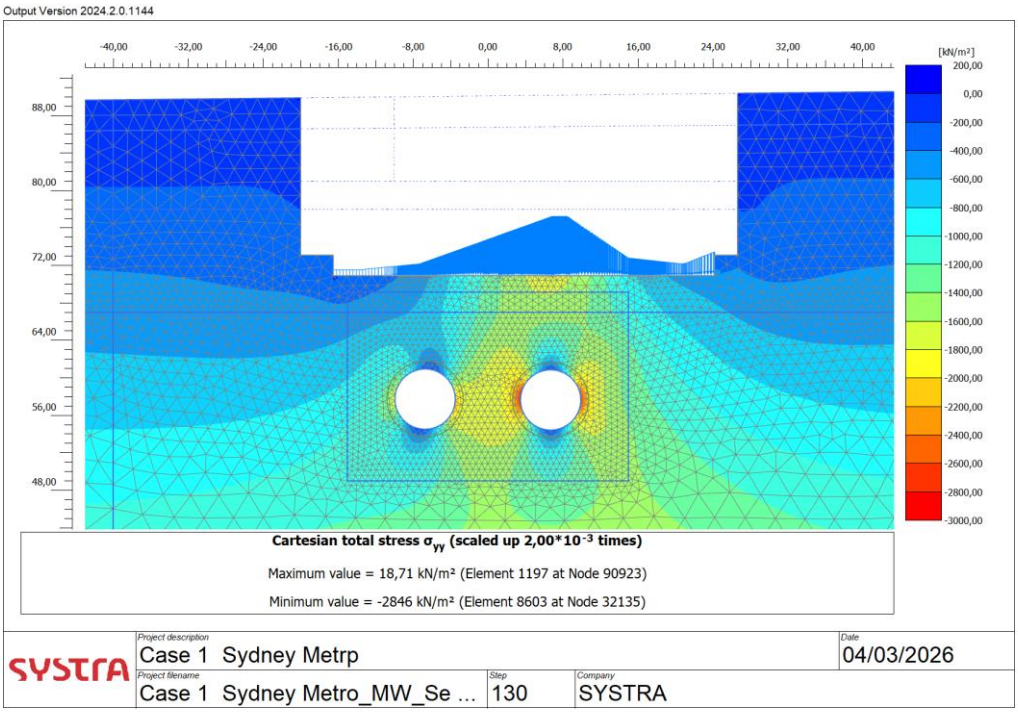
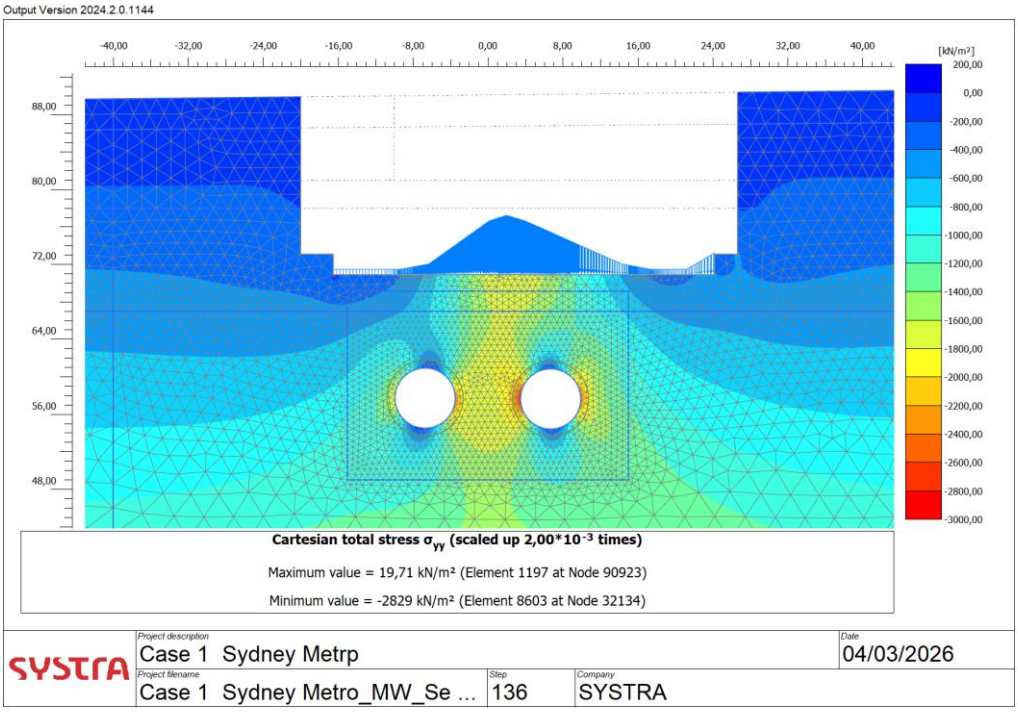


Total vertical stress - Stage 2: Apply wind building load case 15 (Load Case 7)



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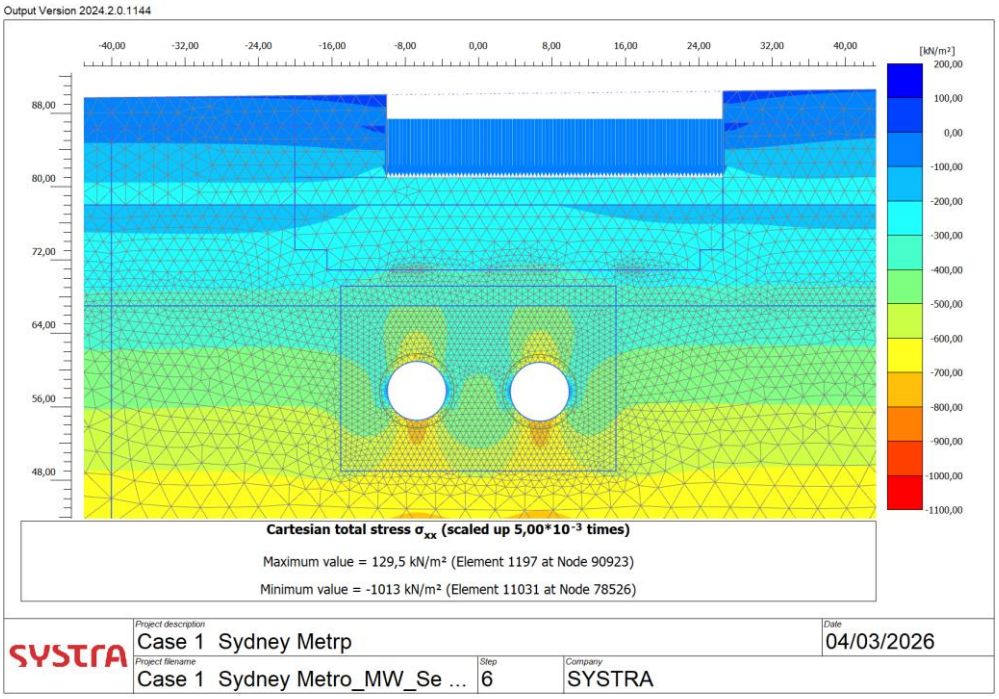
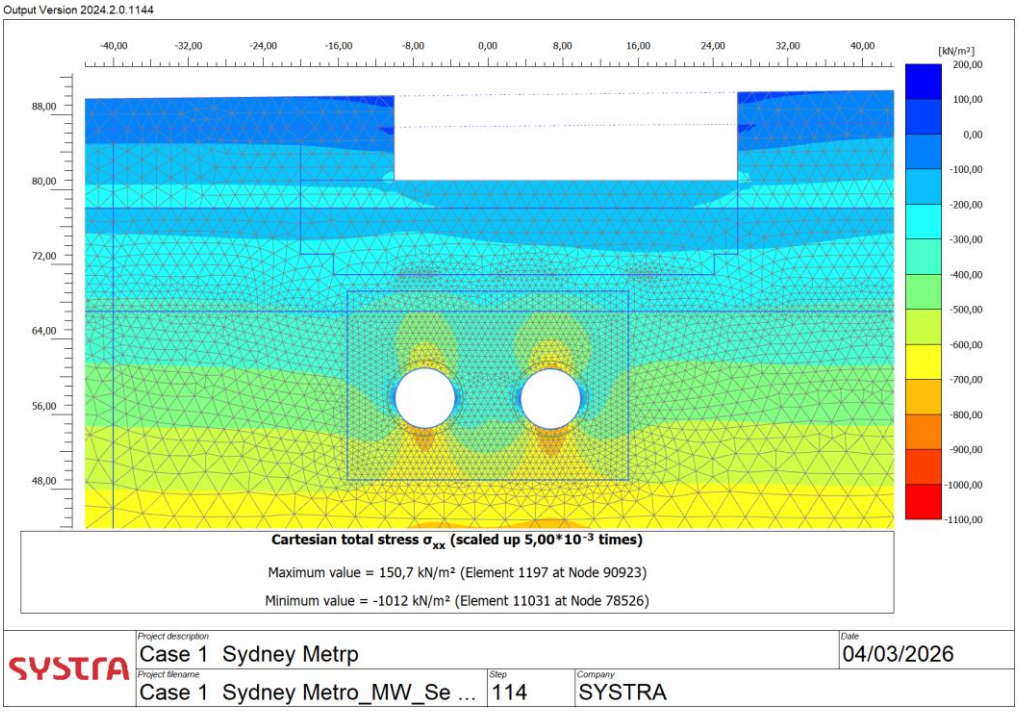
TOTAL HORIZONTAL STRESS

Total horizontal stress - Stage 0: Metro tunnels lining installation (Load Case 1)



Total horizontal stress - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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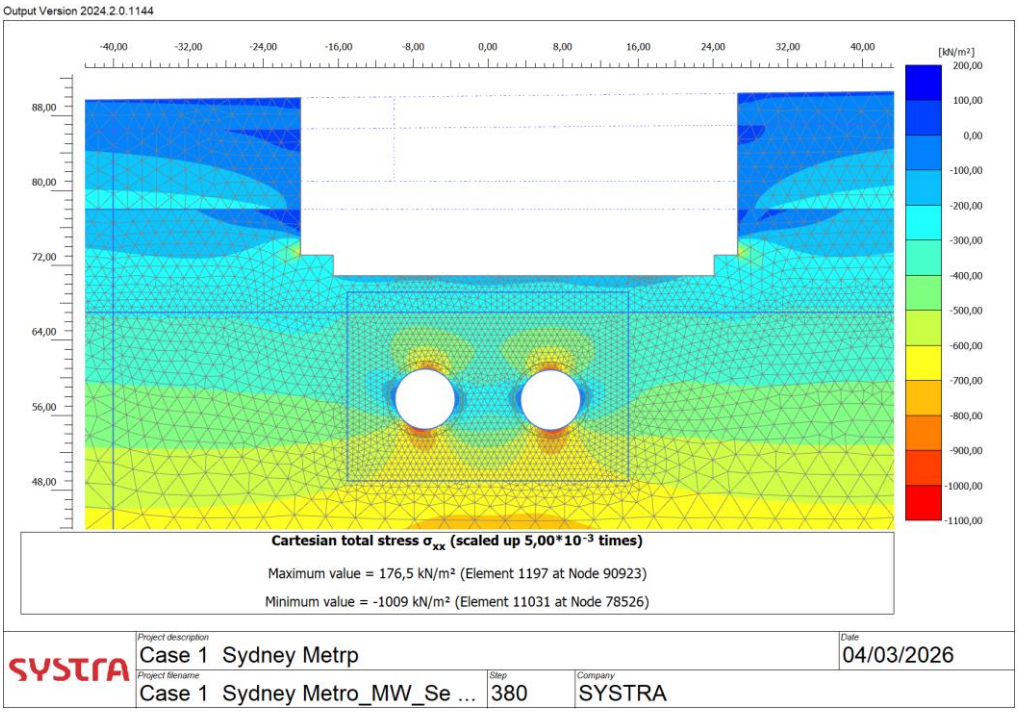
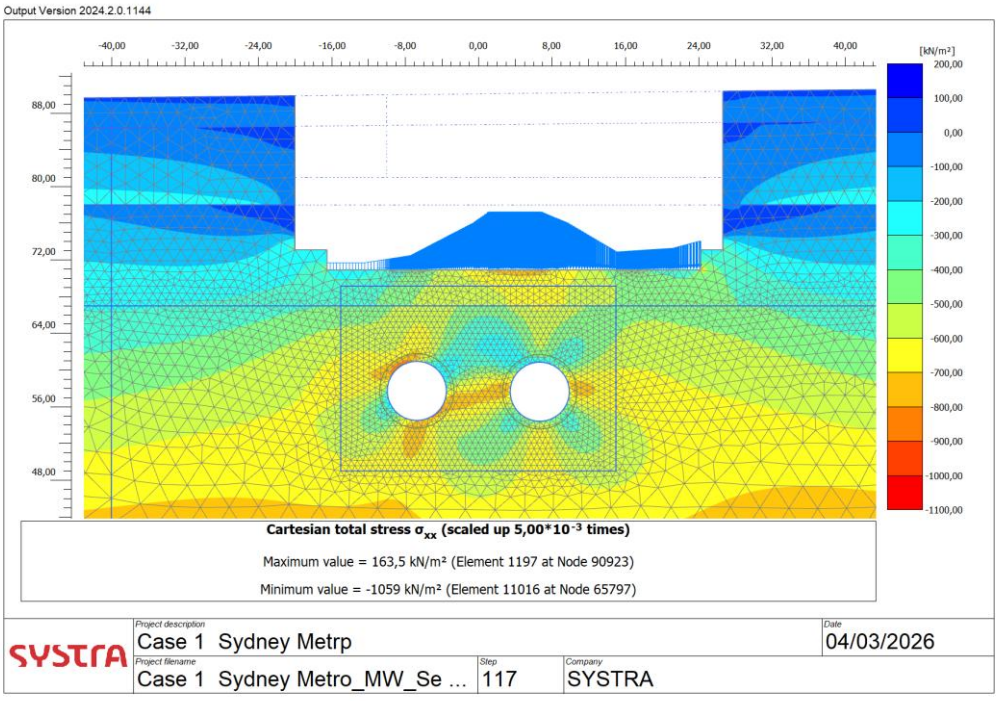
Total horizontal stress - Stage 1: Excavate proposed basement (Load Case 3)



Total horizontal stress - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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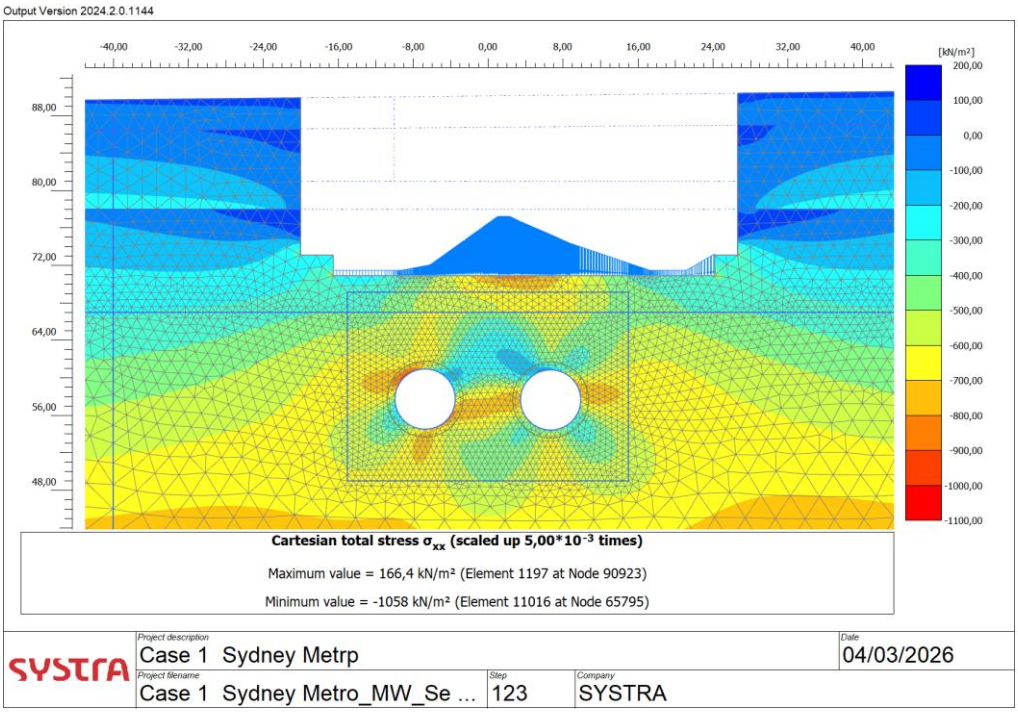
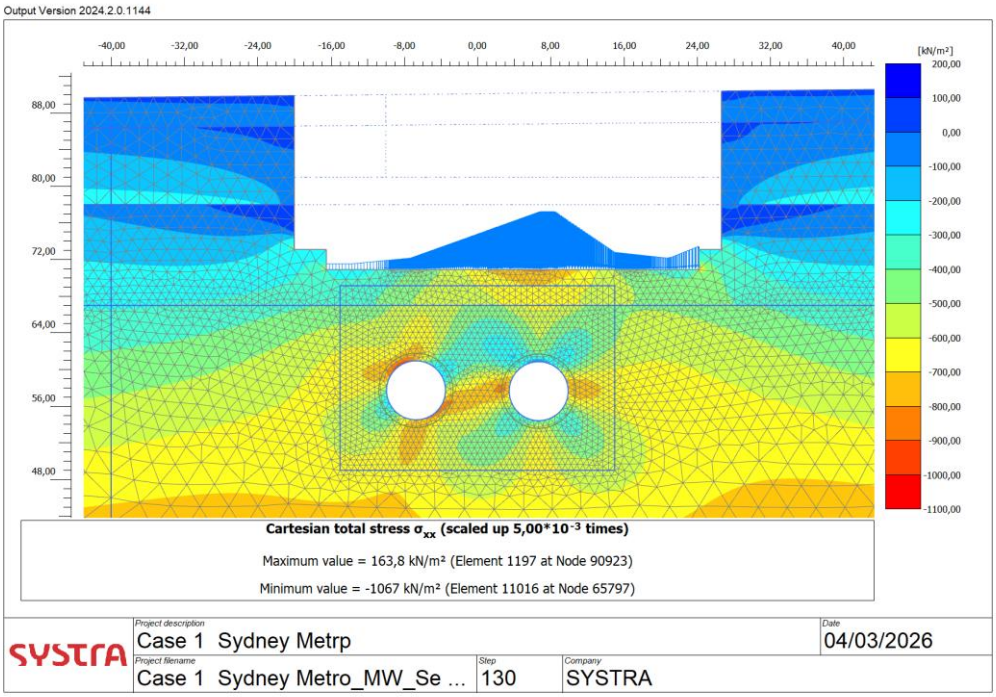
Total horizontal stress - Stage 2: Apply wind building load case 11 (Load Case 5)



Total horizontal stress - Stage 2: Apply wind building load case 14 (Load Case 6)



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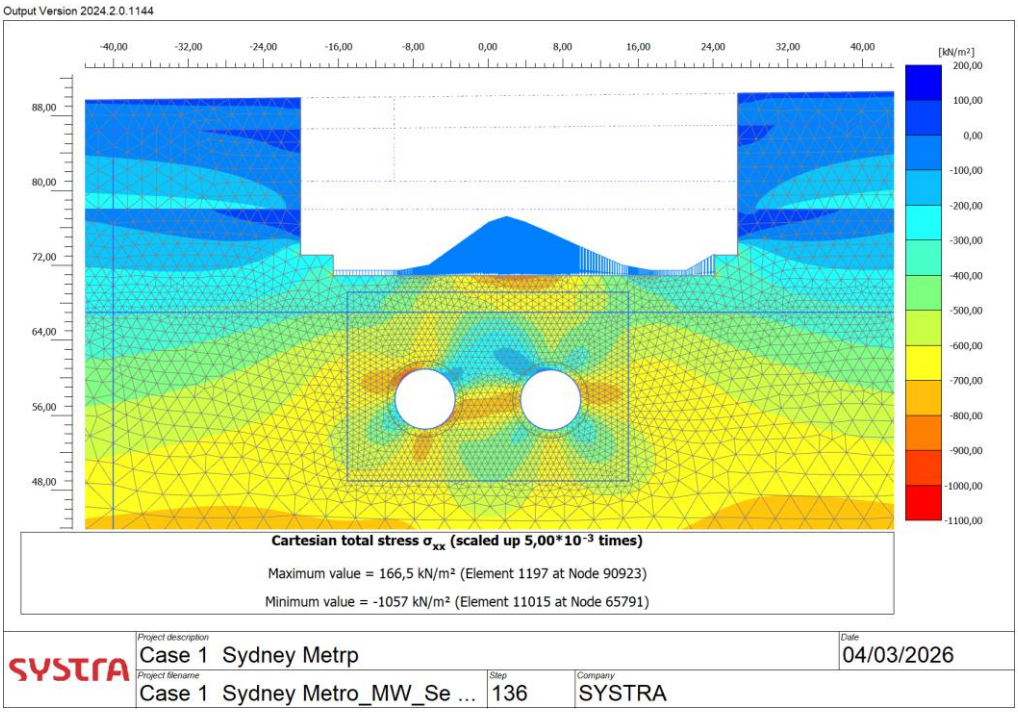
Total horizontal stress - Stage 2: Apply wind building load case 15 (Load Case 7)



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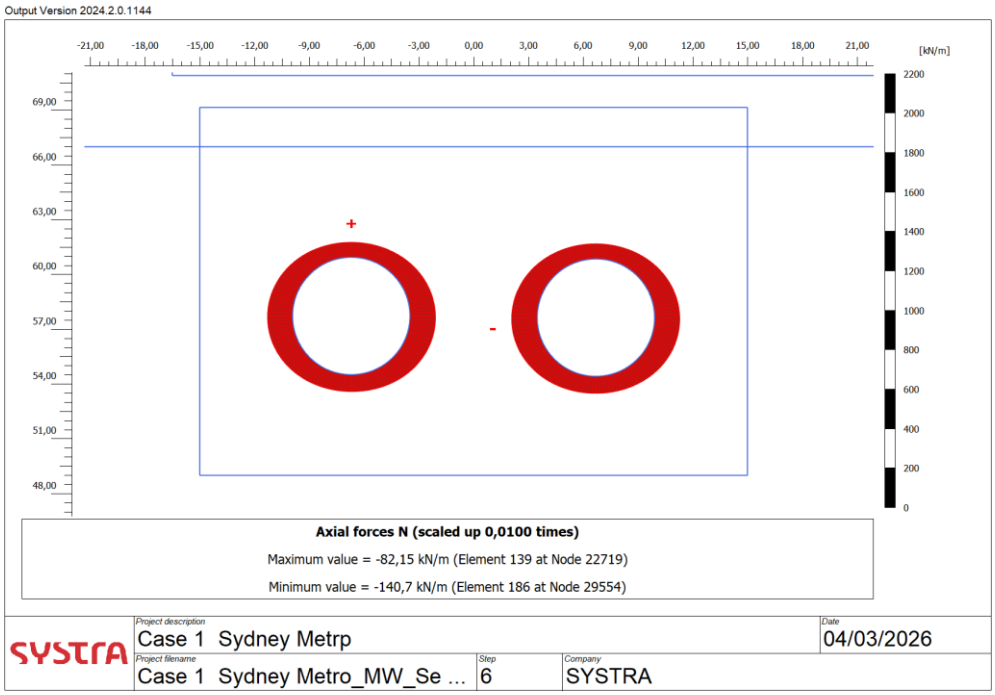
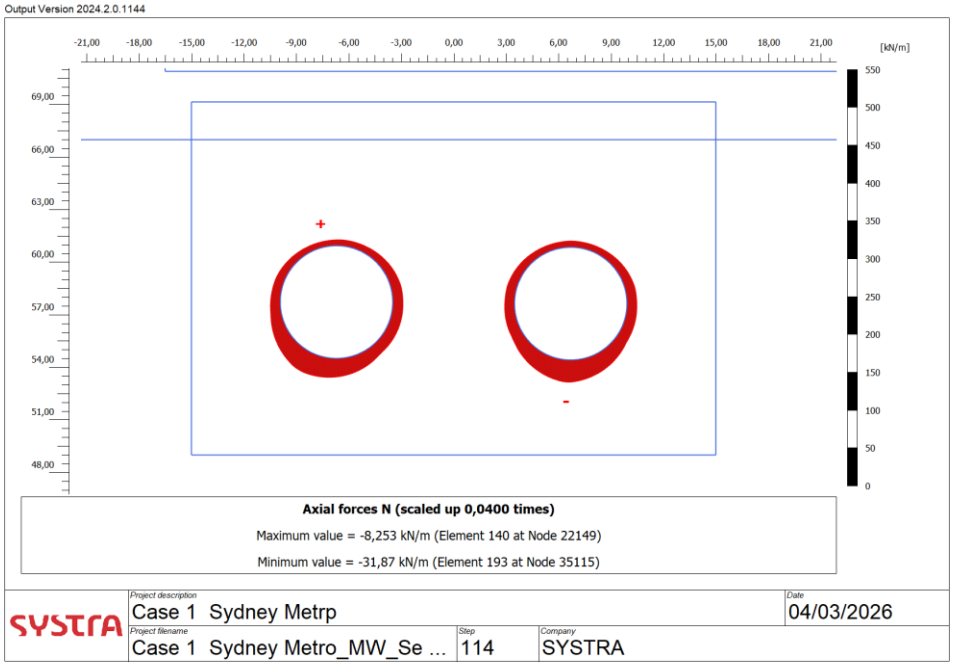
CHARACTERISTIC AXIAL FORCES ON THE LINER

Characteristic Axial Force N (kN/m) - Stage 0: Metro tunnels lining installation (Load Case 1)



Characteristic Axial Force N (kN/m) - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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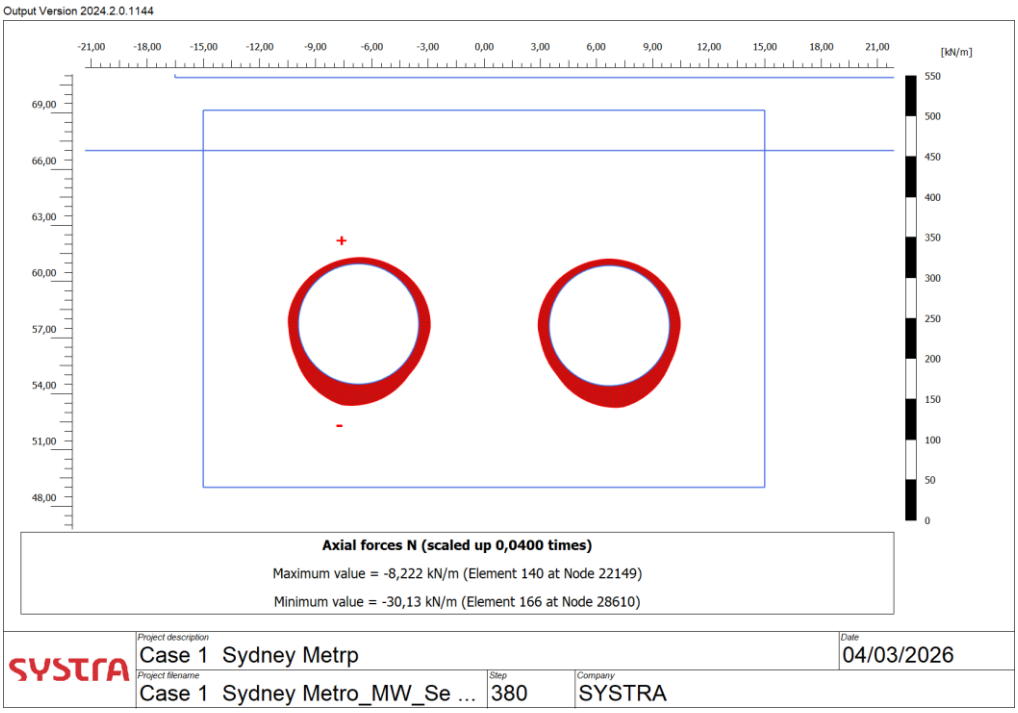
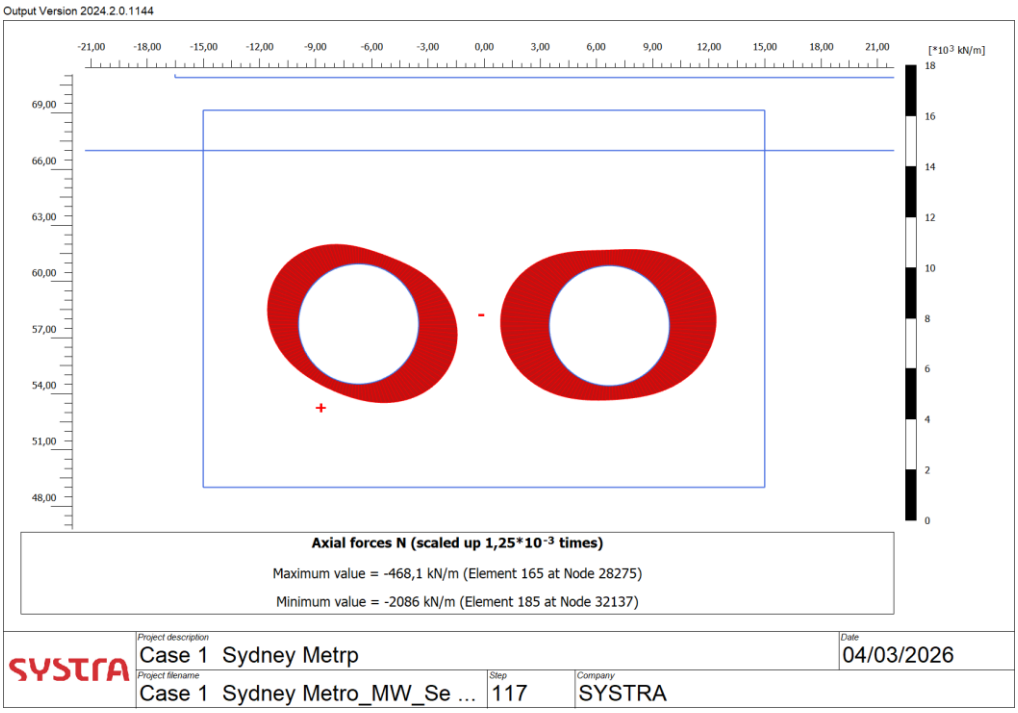
Characteristic Axial Force N (kN/m) - Stage 1: Excavate proposed basement (Load Case 3)



Characteristic Axial Force N (kN/m) - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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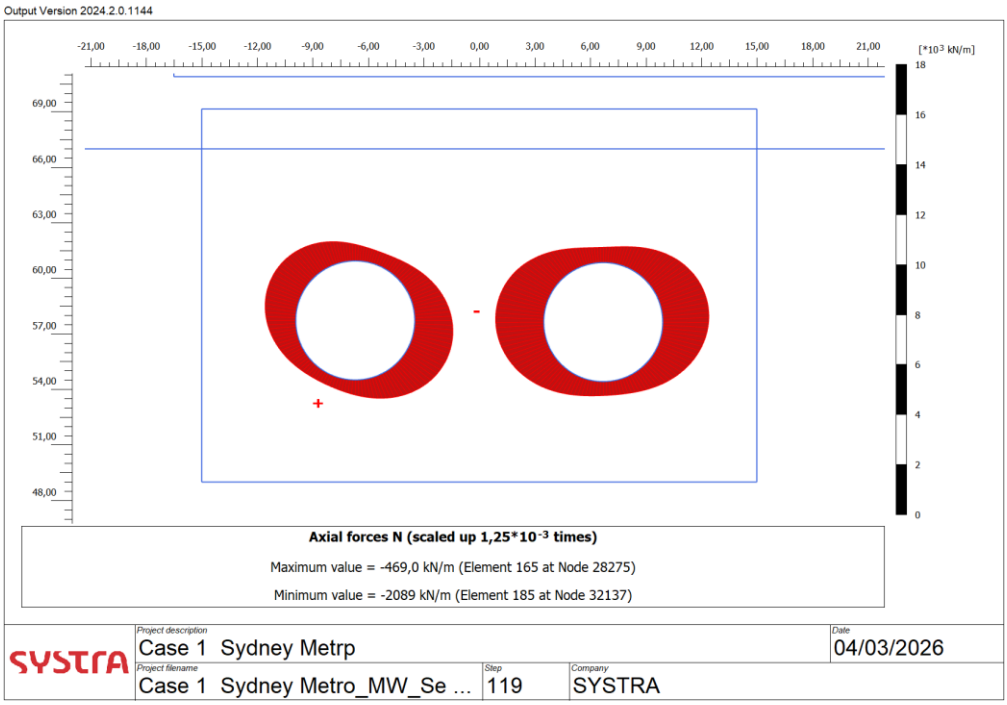
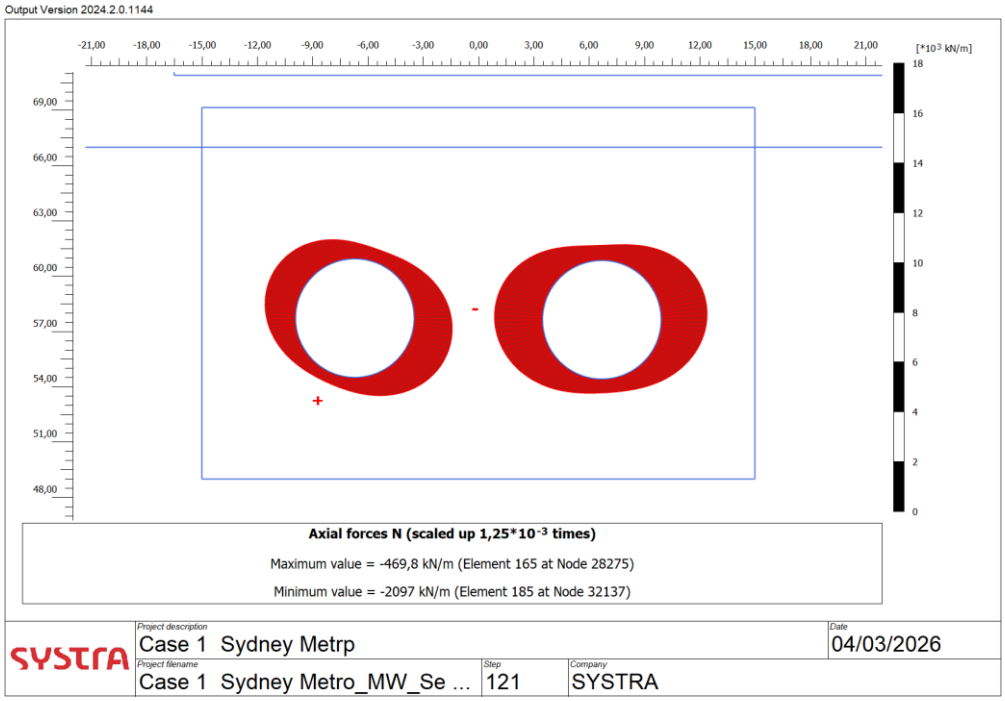
Characteristic Axial Force N (kN/m) - Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



Characteristic Axial Force N (kN/m) - Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



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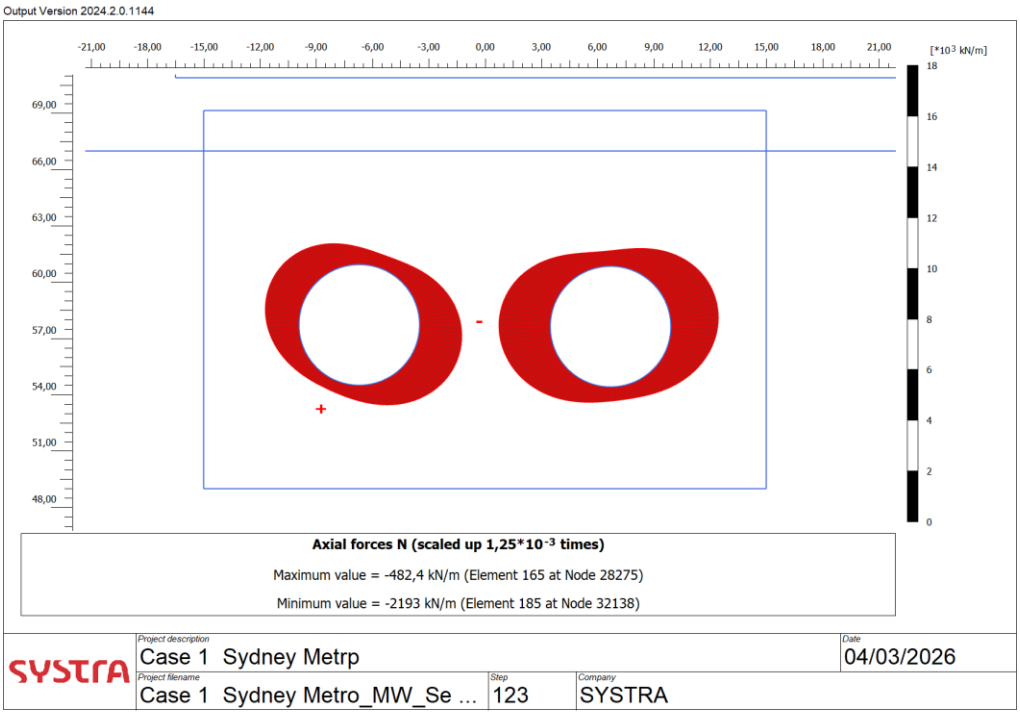
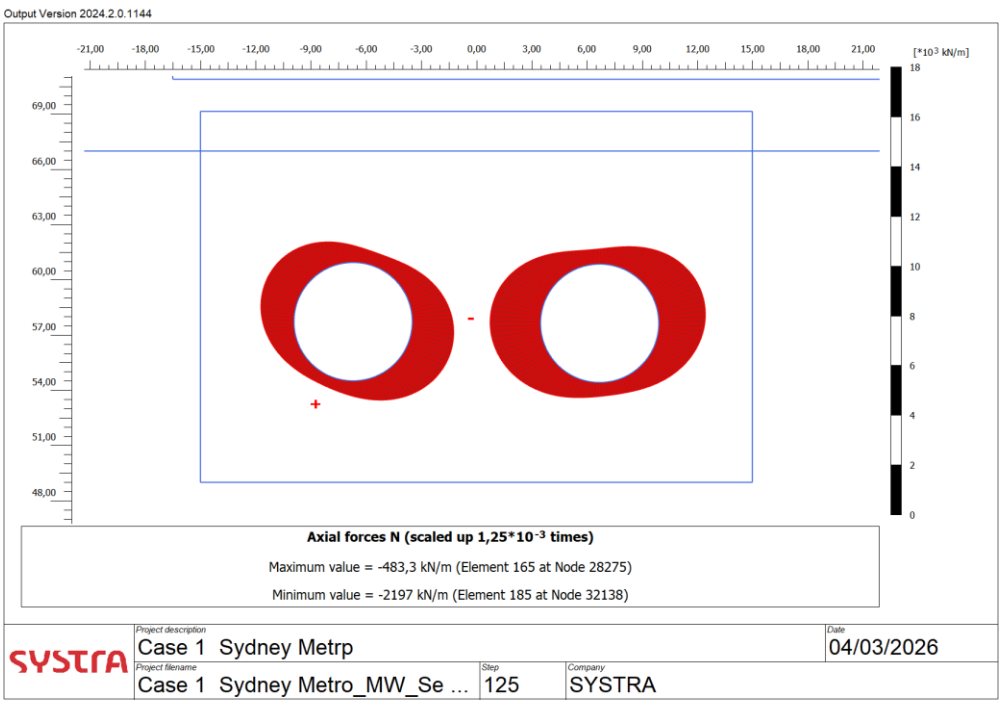
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 11 (Load Case 5)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



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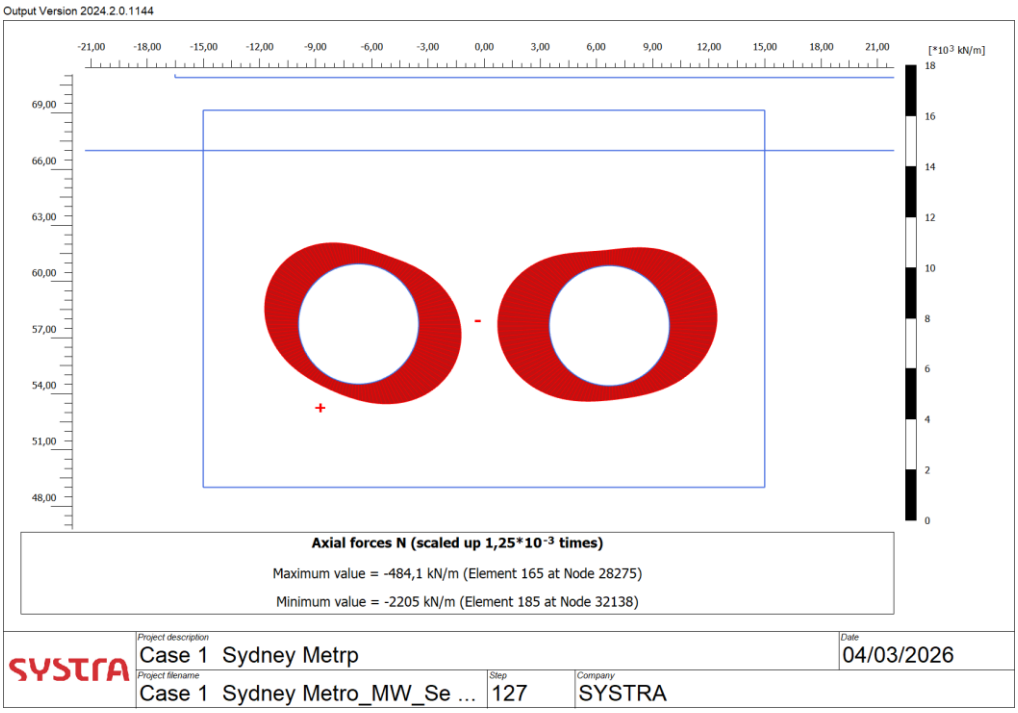
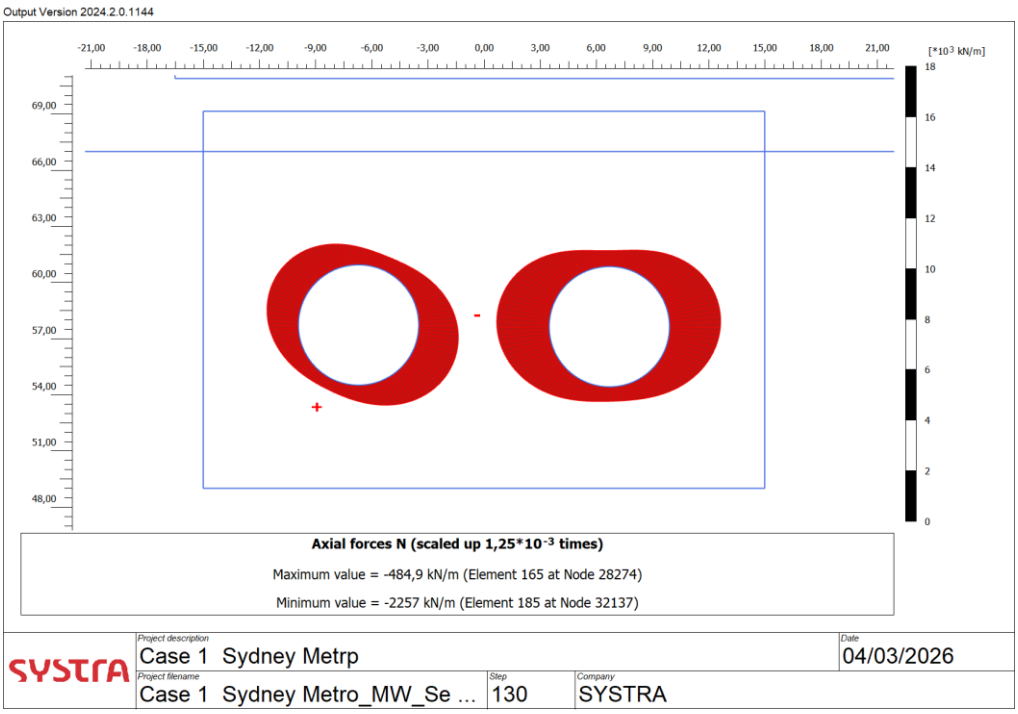
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 14 (Load Case 6)



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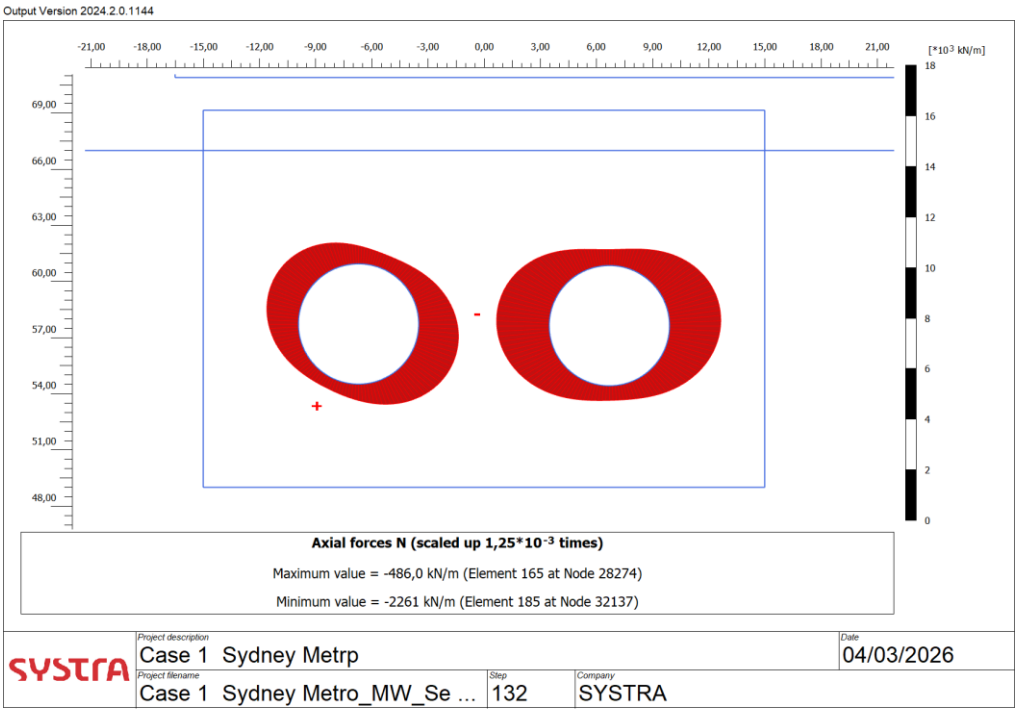
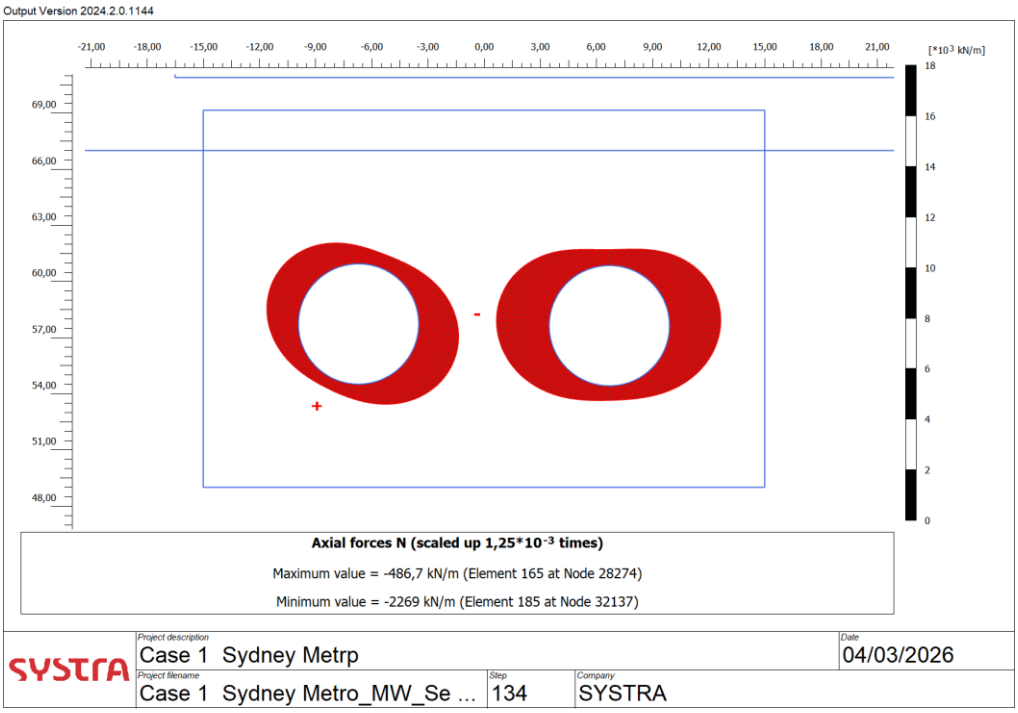
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 14 +Exceptional Wedge Load (Load Case 6.1)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



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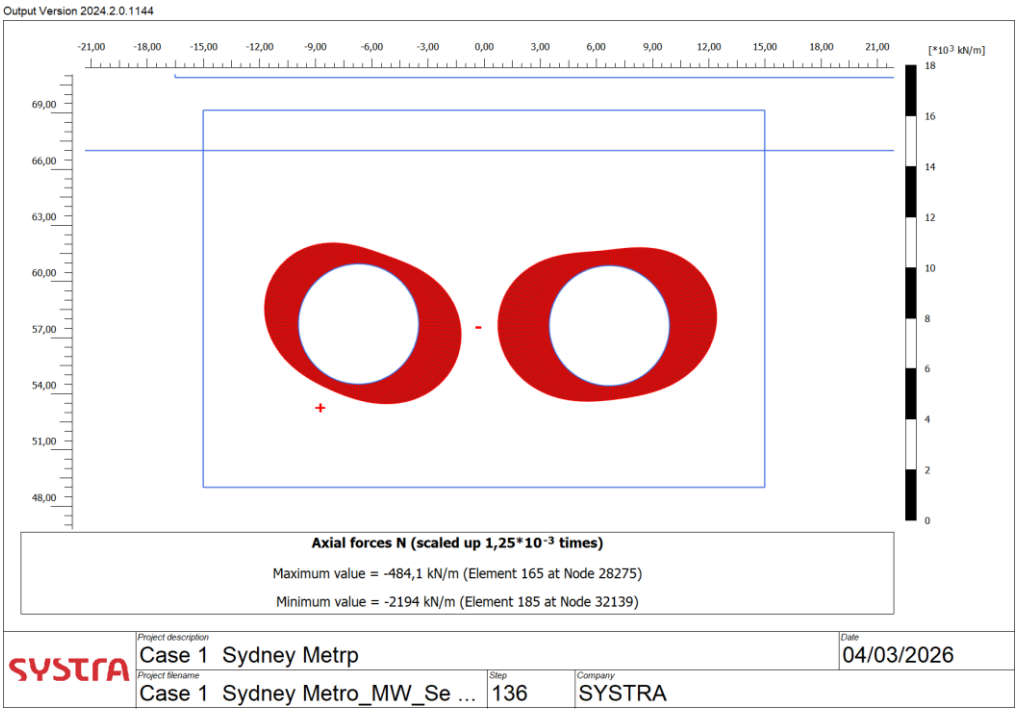
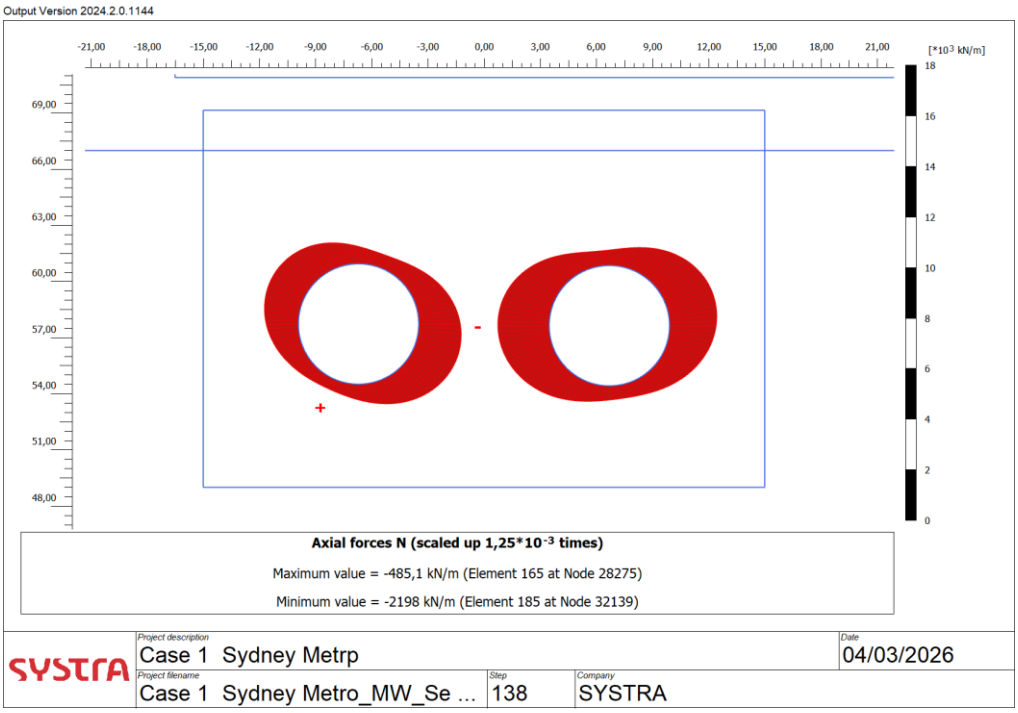
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 15 (Load Case 7)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



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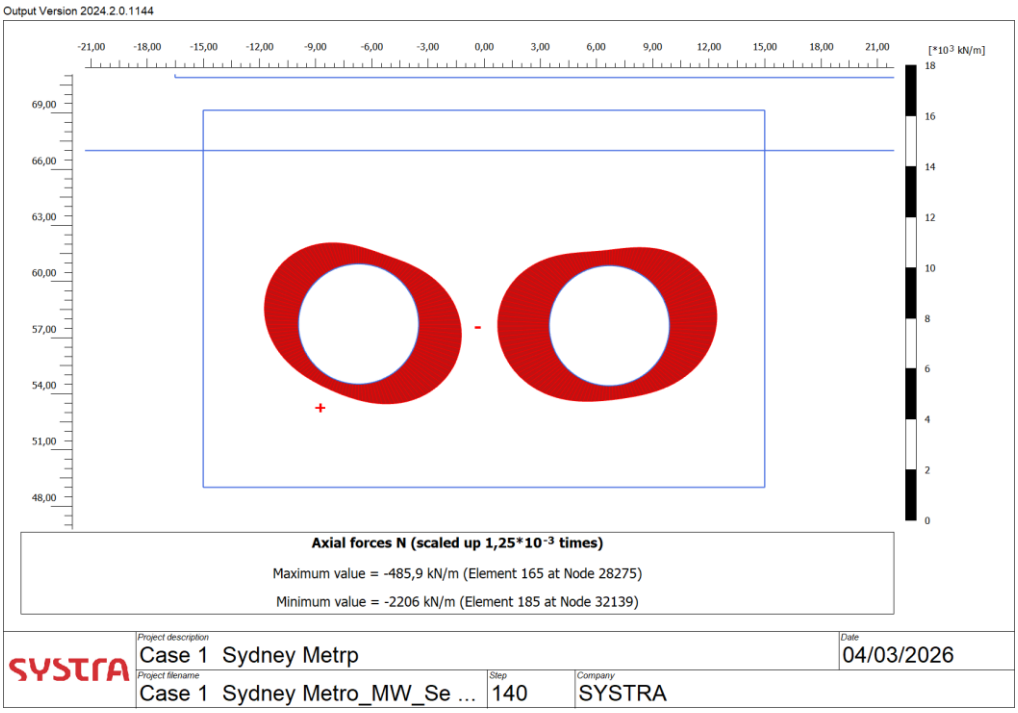
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 1 +Typical Wedge Load (Load Case 7.2)



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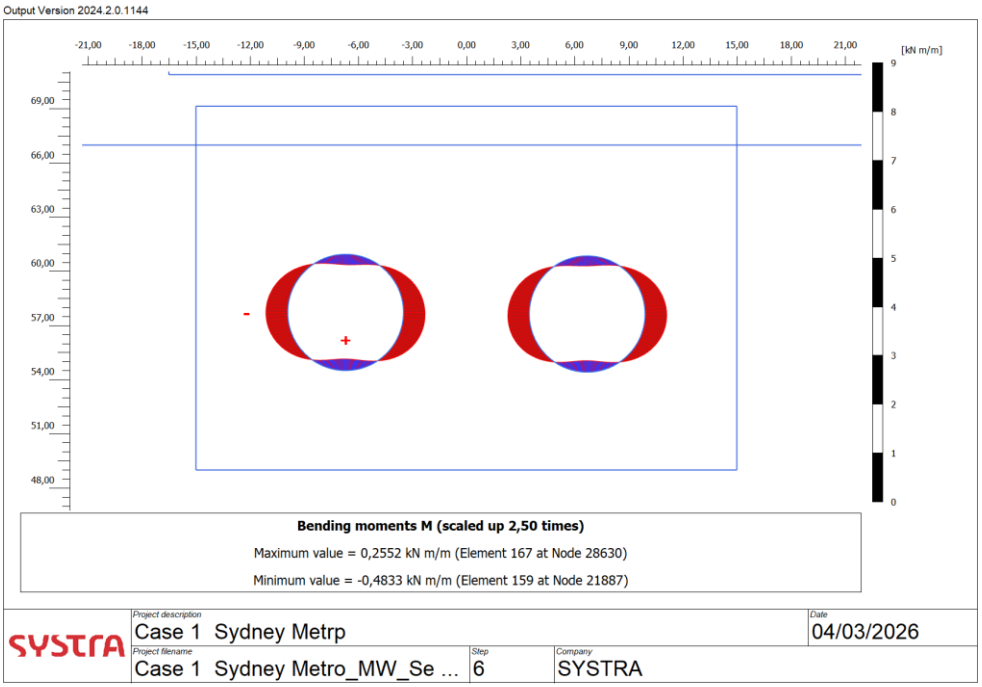
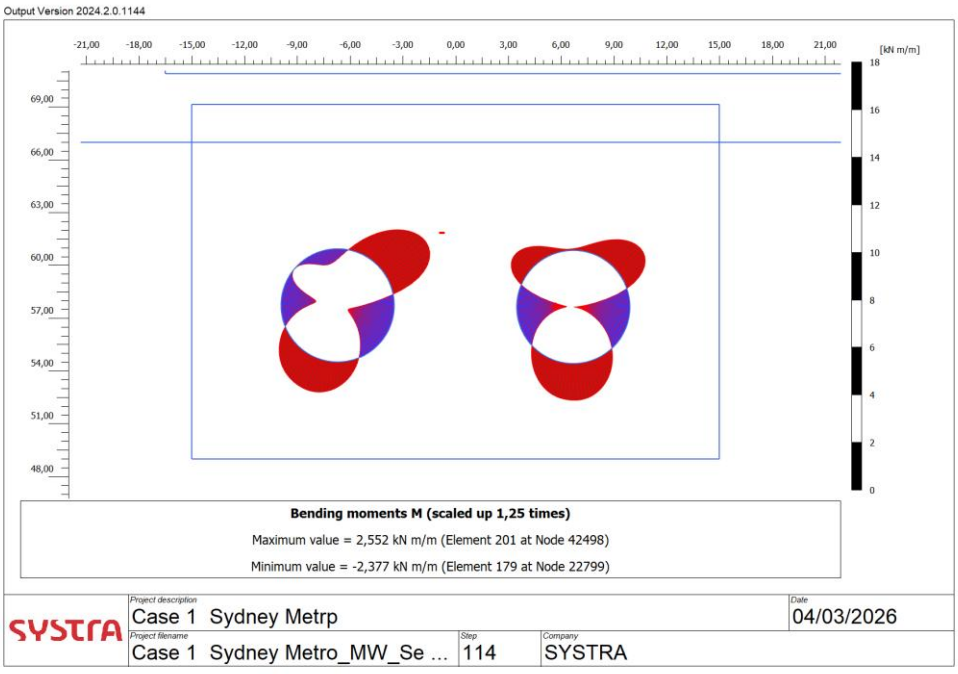
CHARACTERISTIC BENDING MOMENT ON THE LINER

Characteristic Bending Moment M (kNm/m) - Stage 0: Metro tunnels lining installation (Load Case 1)



Characteristic Bending Moment M (kNm/m) - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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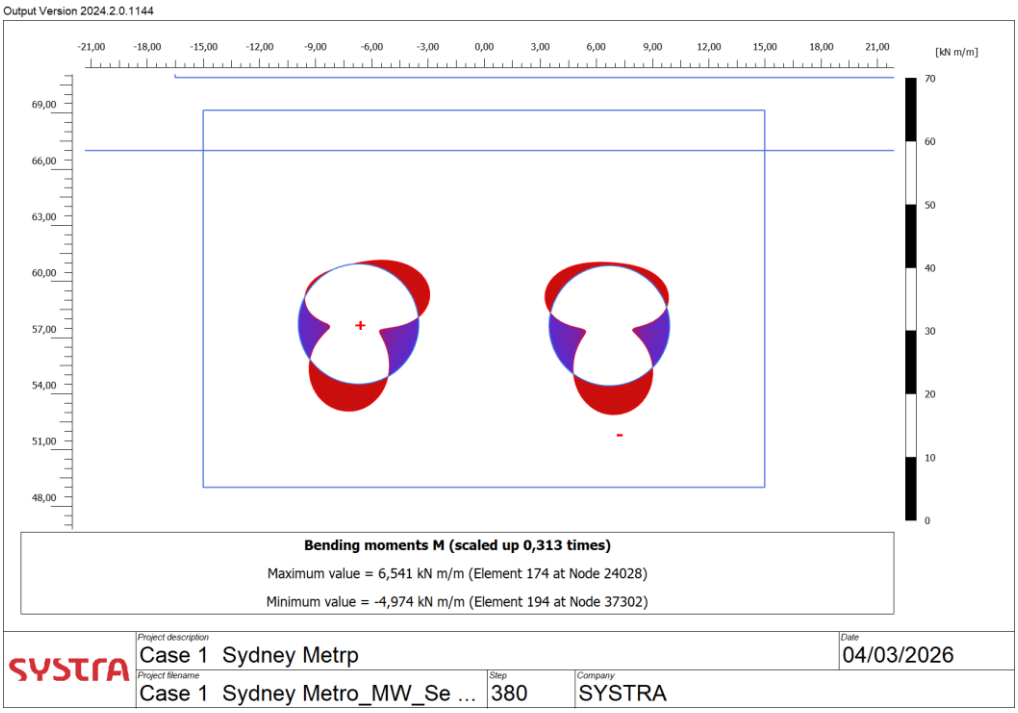
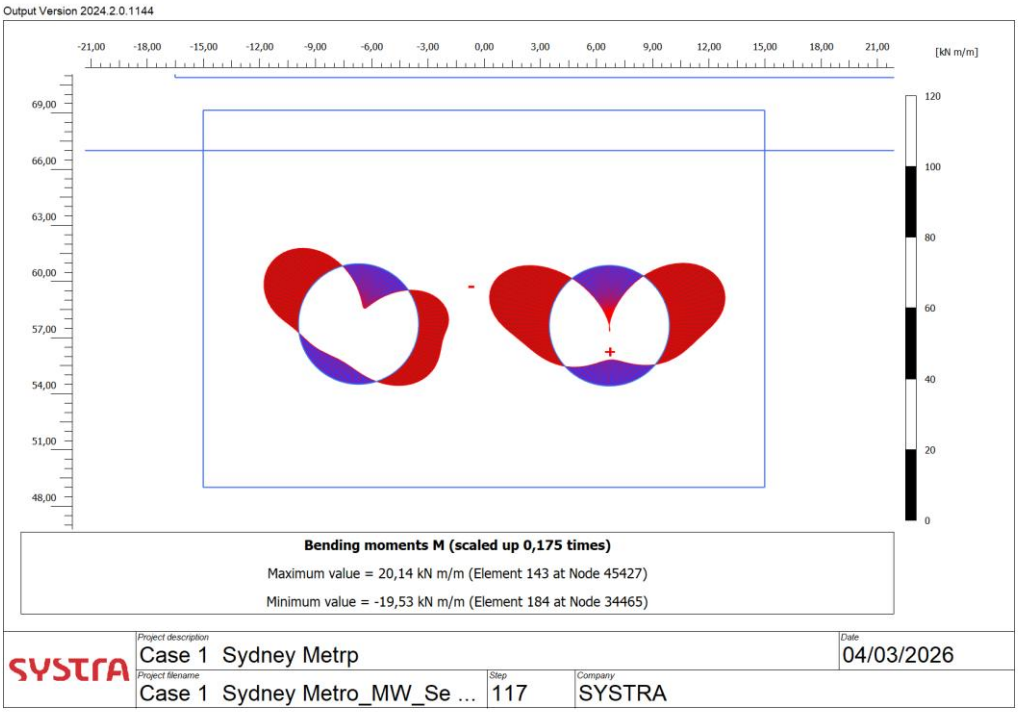
Characteristic Bending Moment M (kNm/m) - Stage 1: Excavate proposed basement (Load Case 3)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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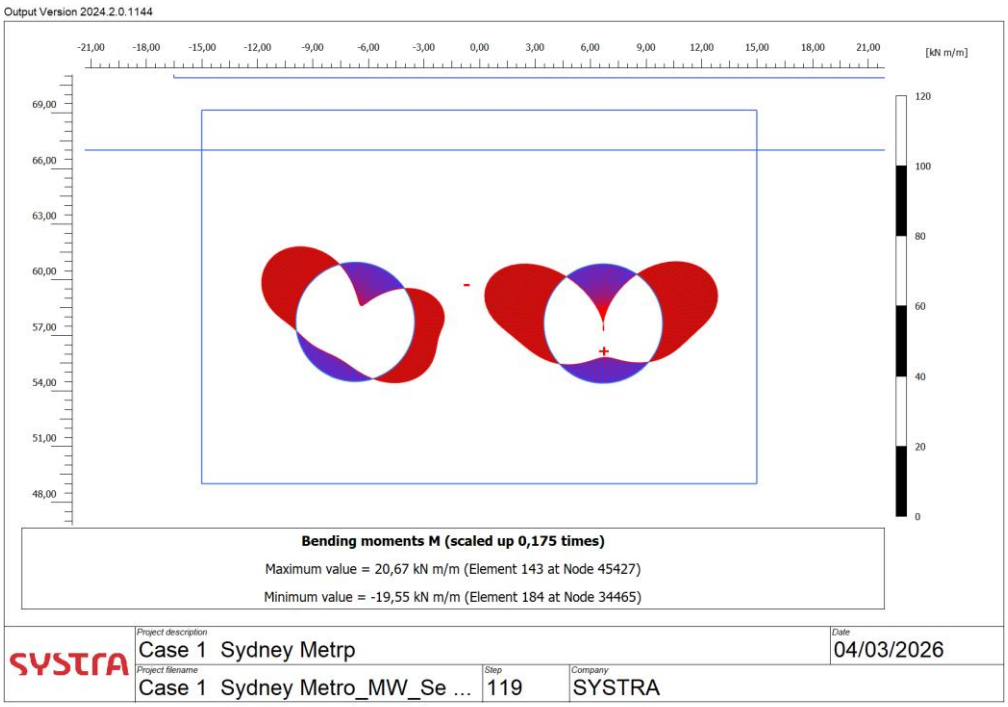
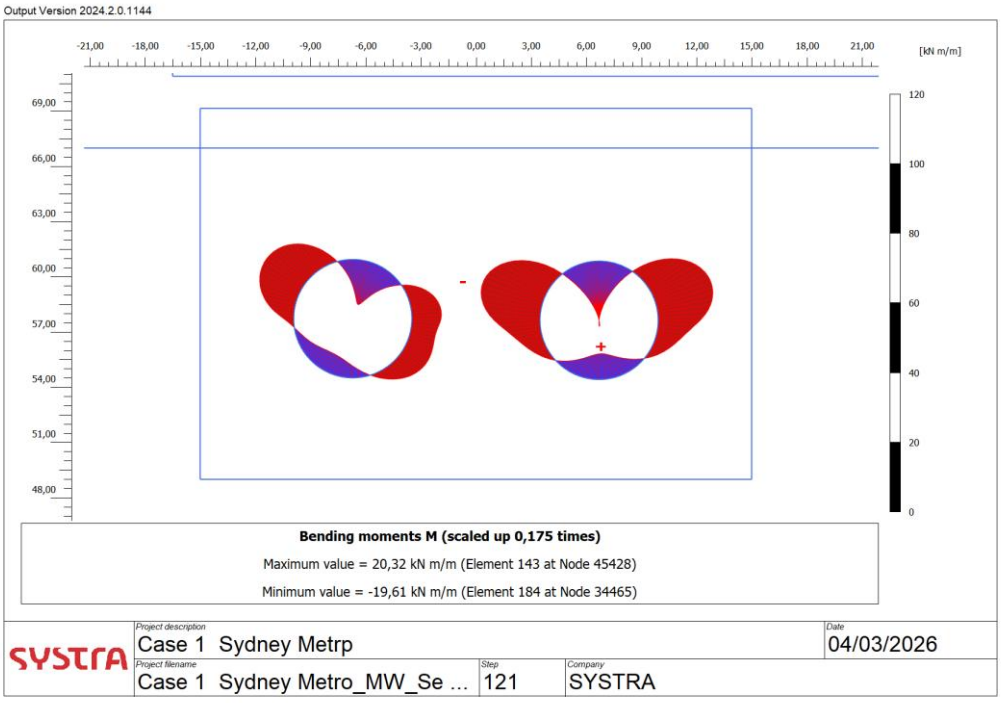
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



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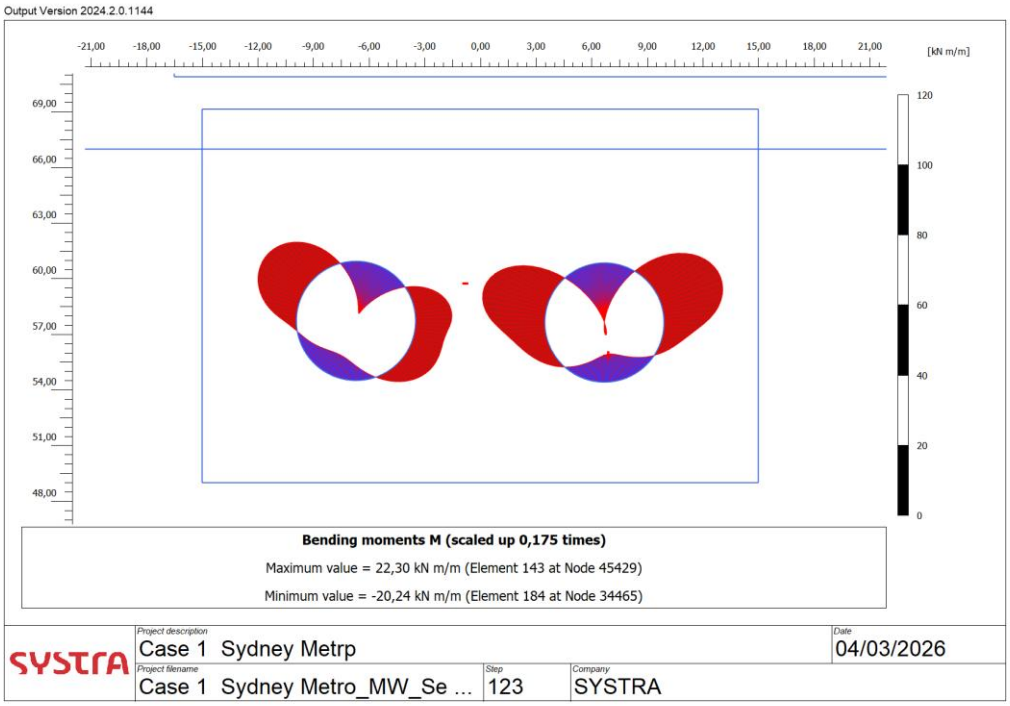
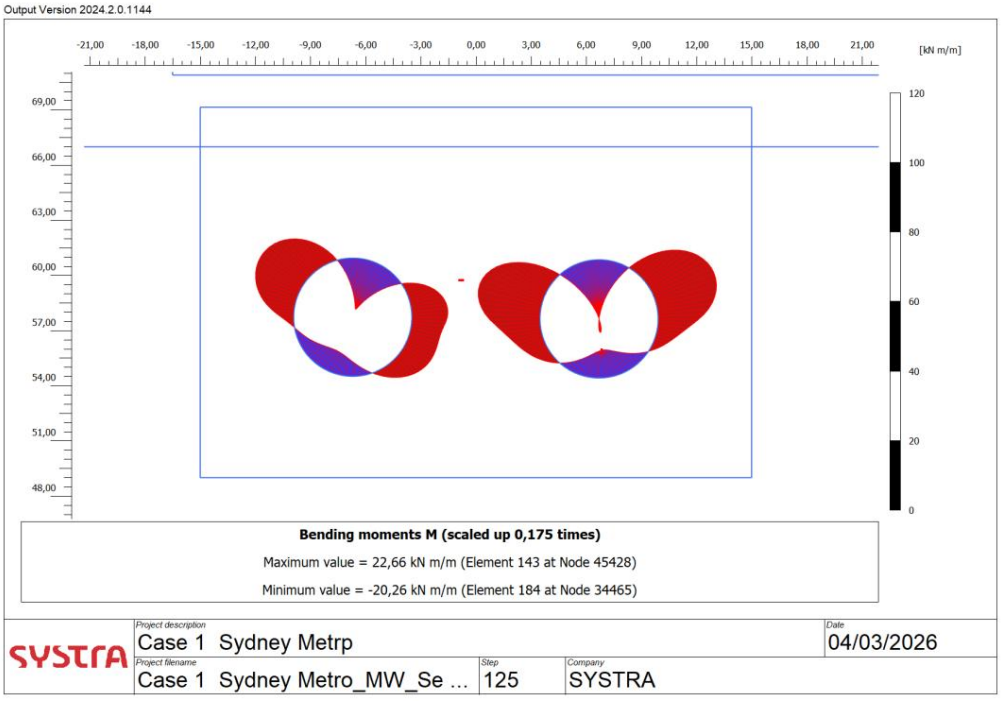
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 (Load Case 5)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



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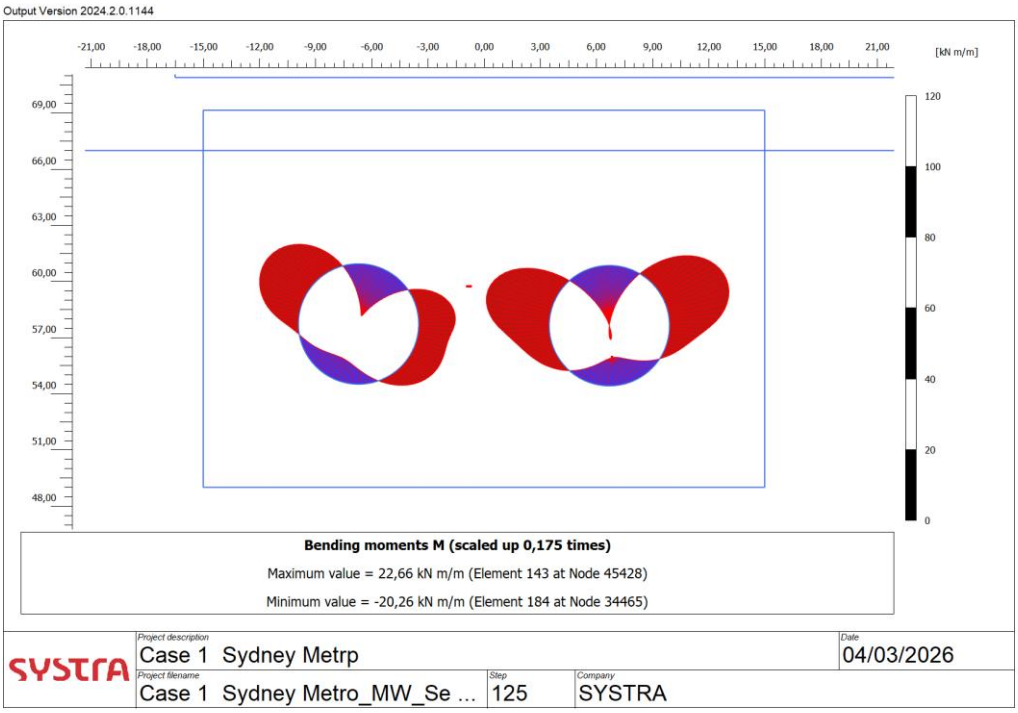
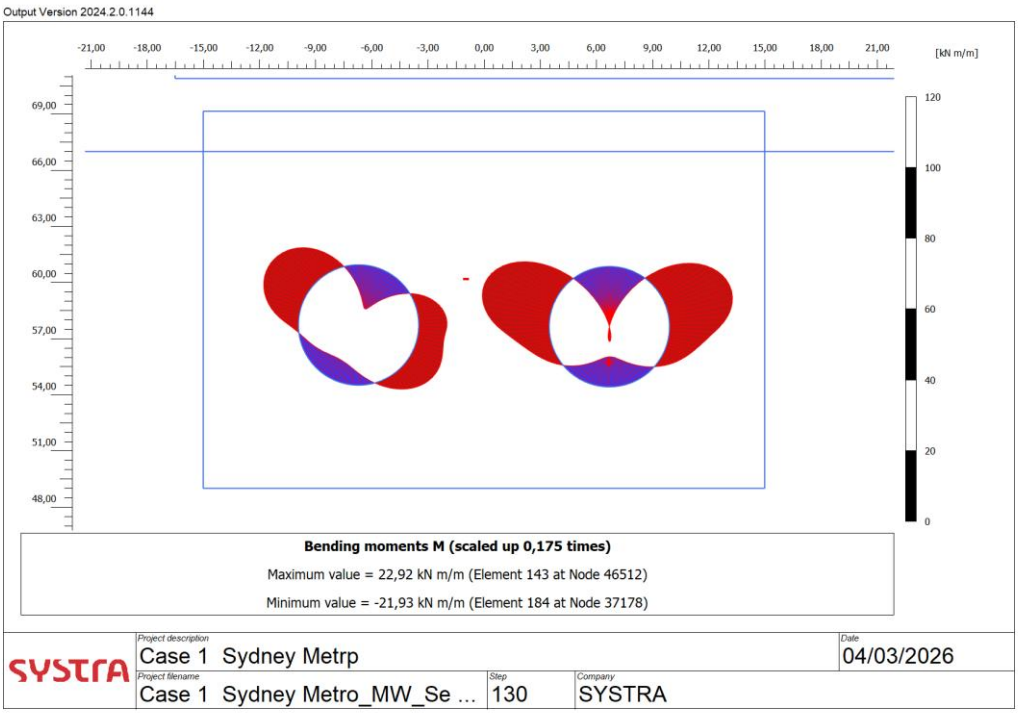
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 (Load Case 6)



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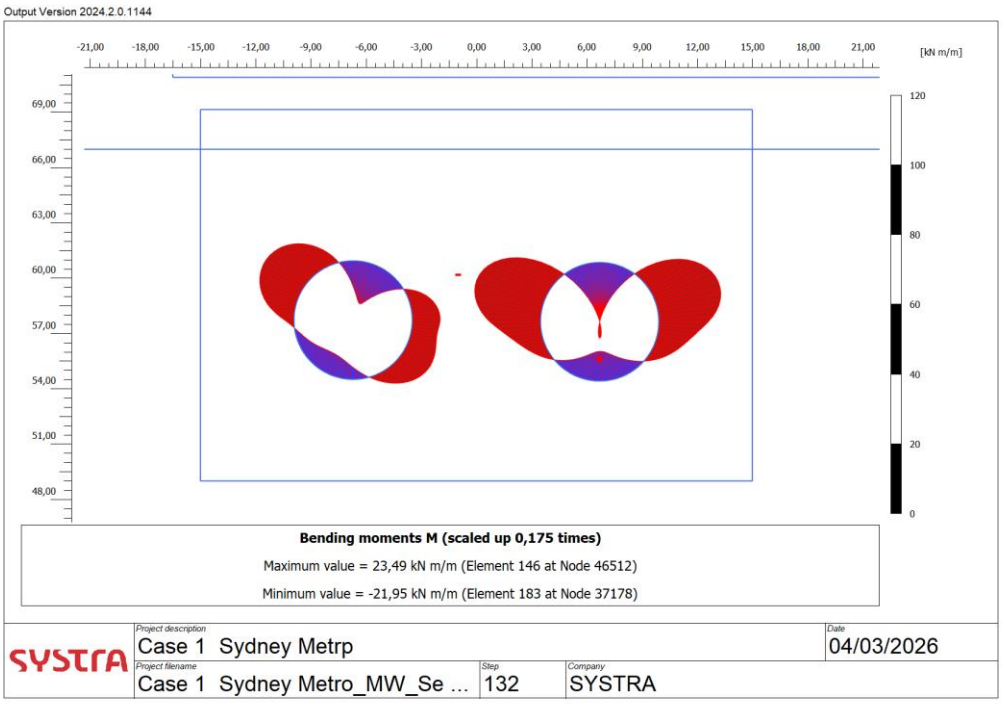
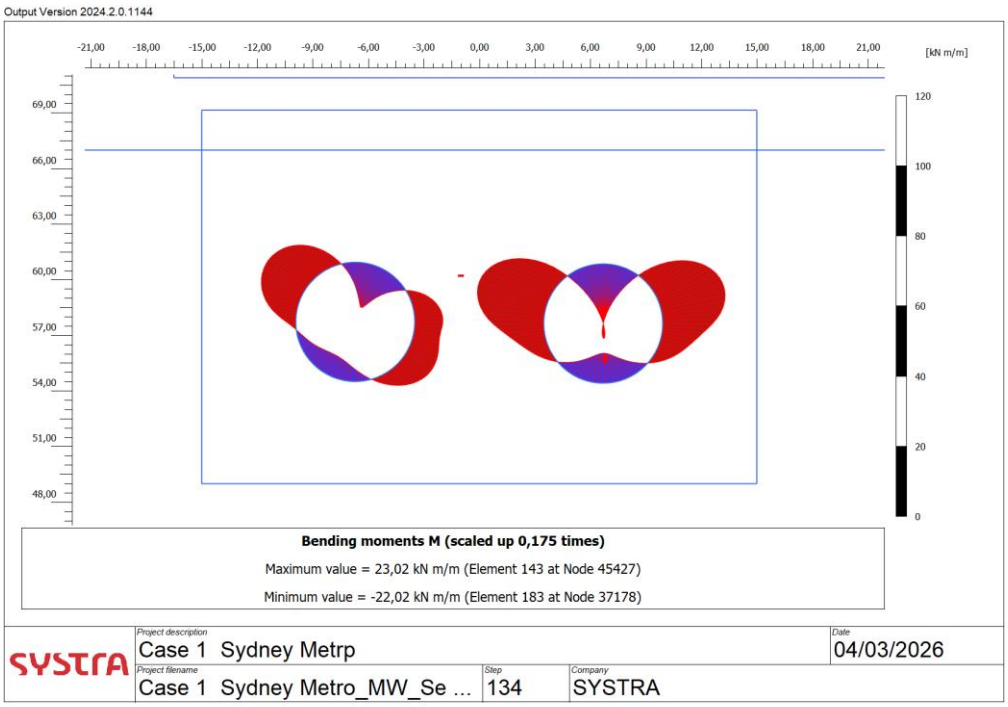


Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



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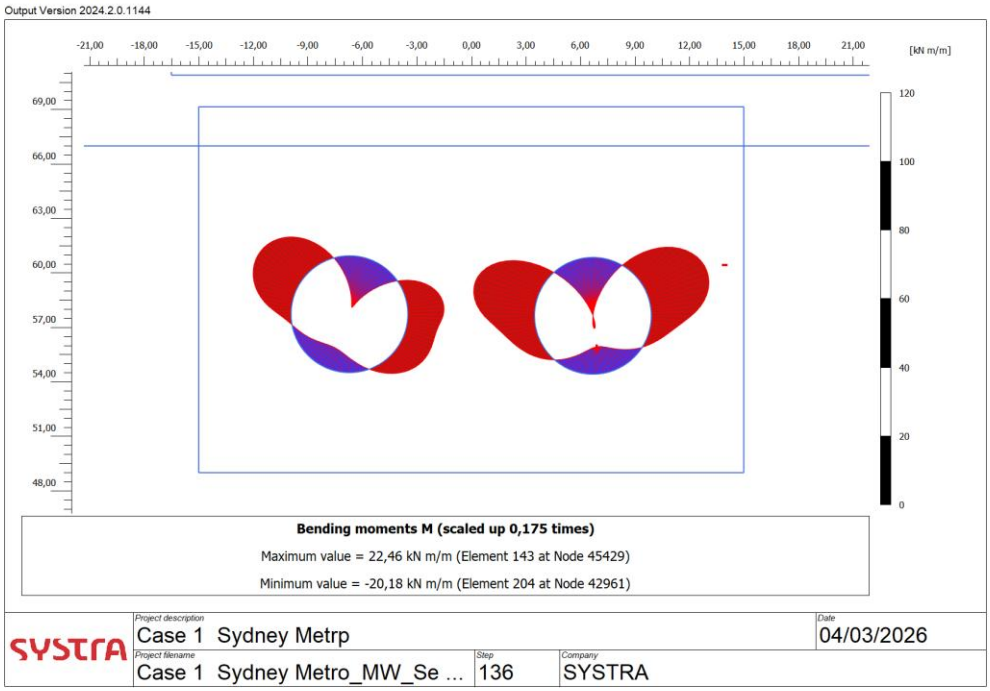
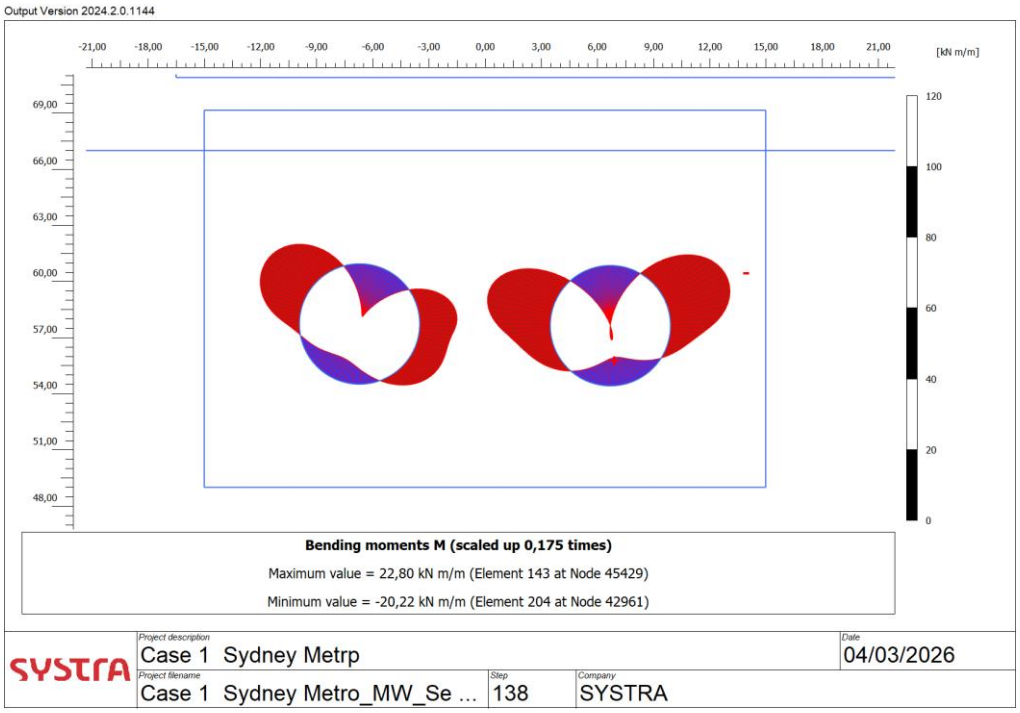
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 15 (Load Case 7)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



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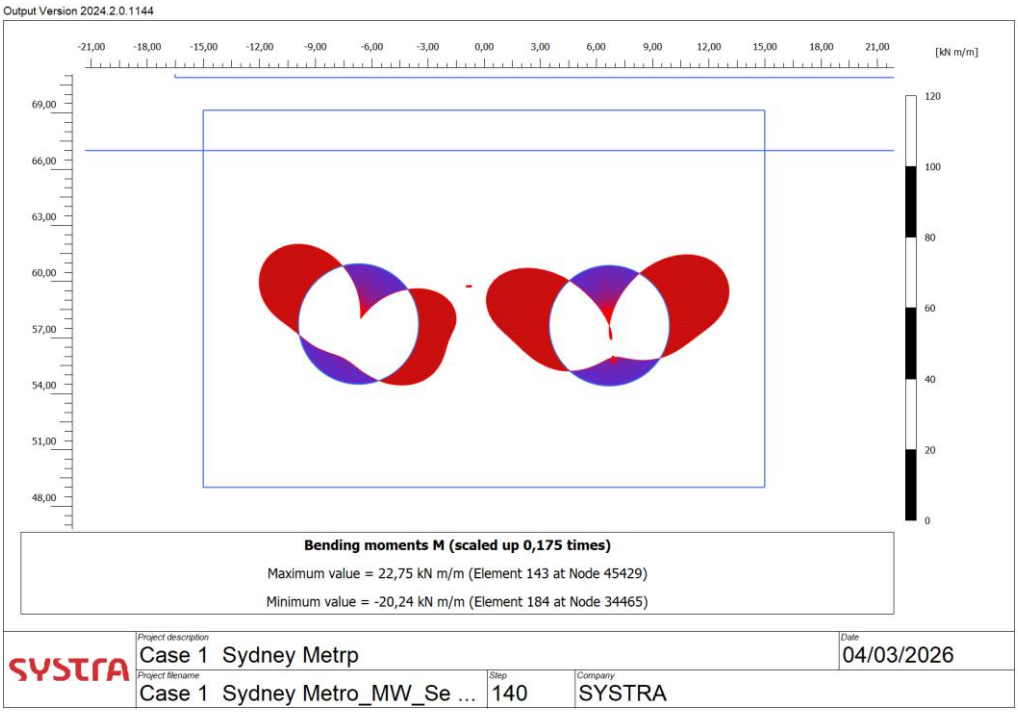
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 1 +Typical Wedge Load (Load Case 7.2)



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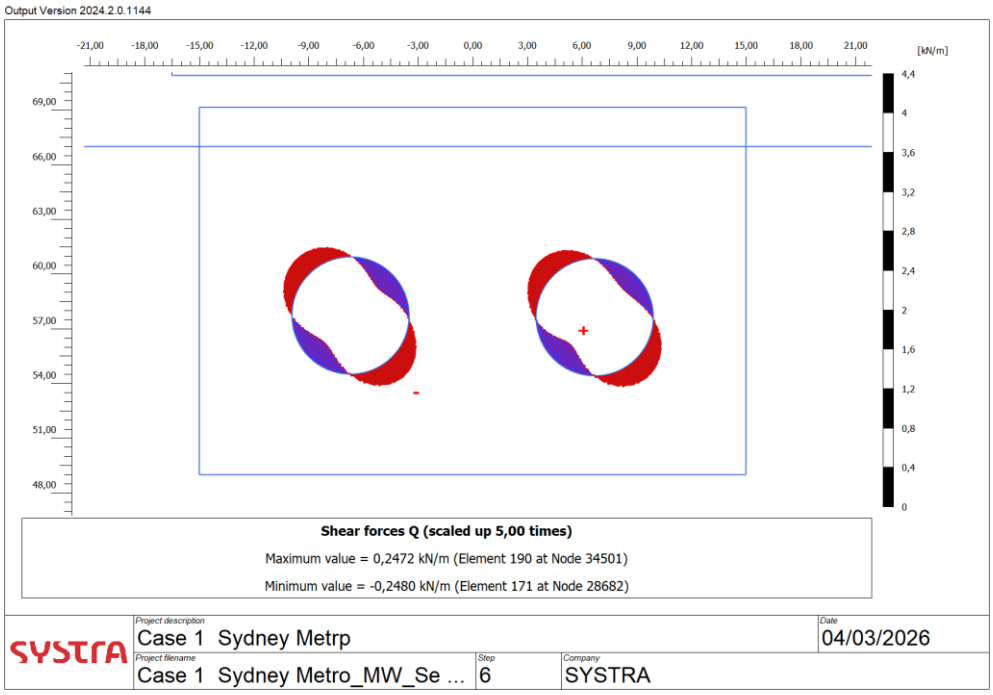
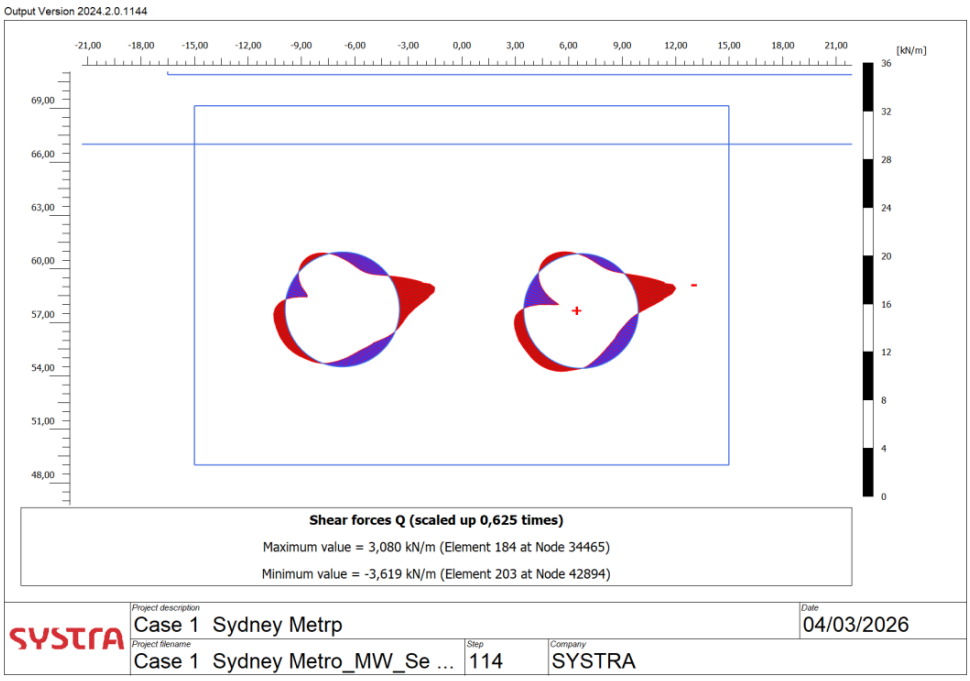
CHARACTERISTIC SHEAR FORCE ON THE LINER

Characteristic Shear Force Q (kN/m) - Stage 0: Metro tunnels lining installation (Load Case 1)



Characteristic Bending Moment M (kNm/m) - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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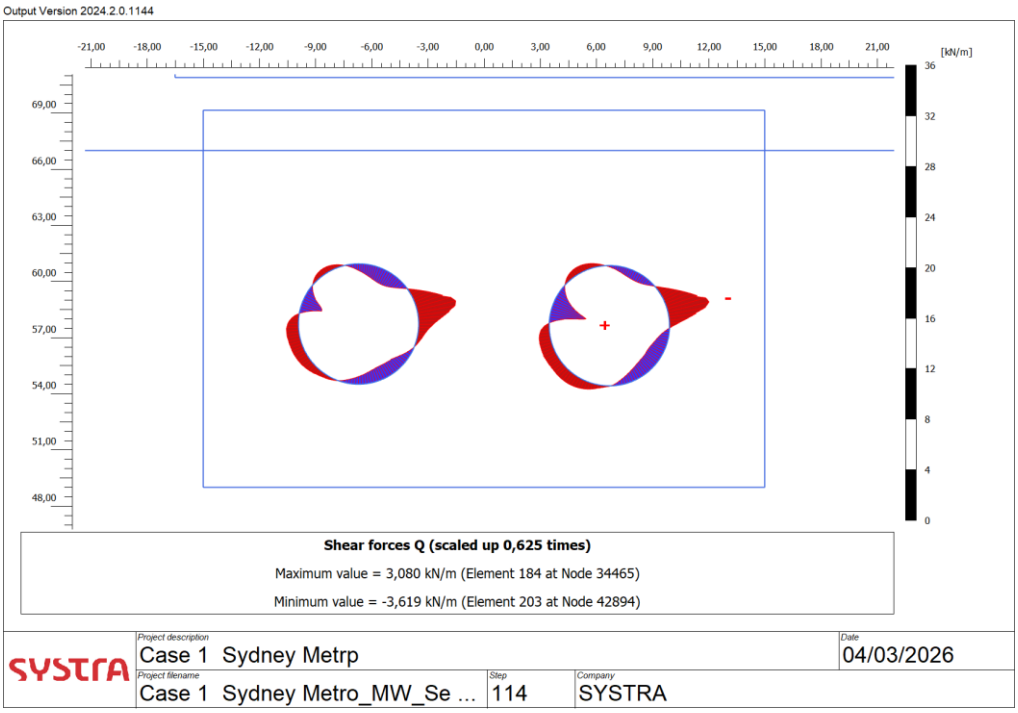
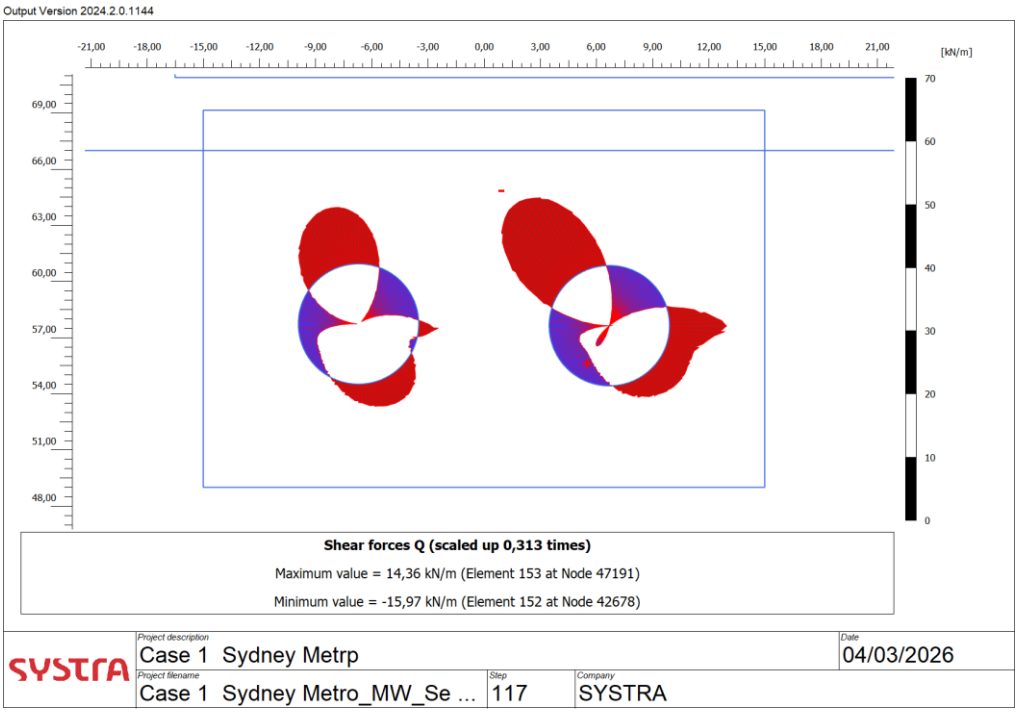
Characteristic Bending Moment M (kNm/m) - Stage 1: Excavate proposed basement (Load Case 3)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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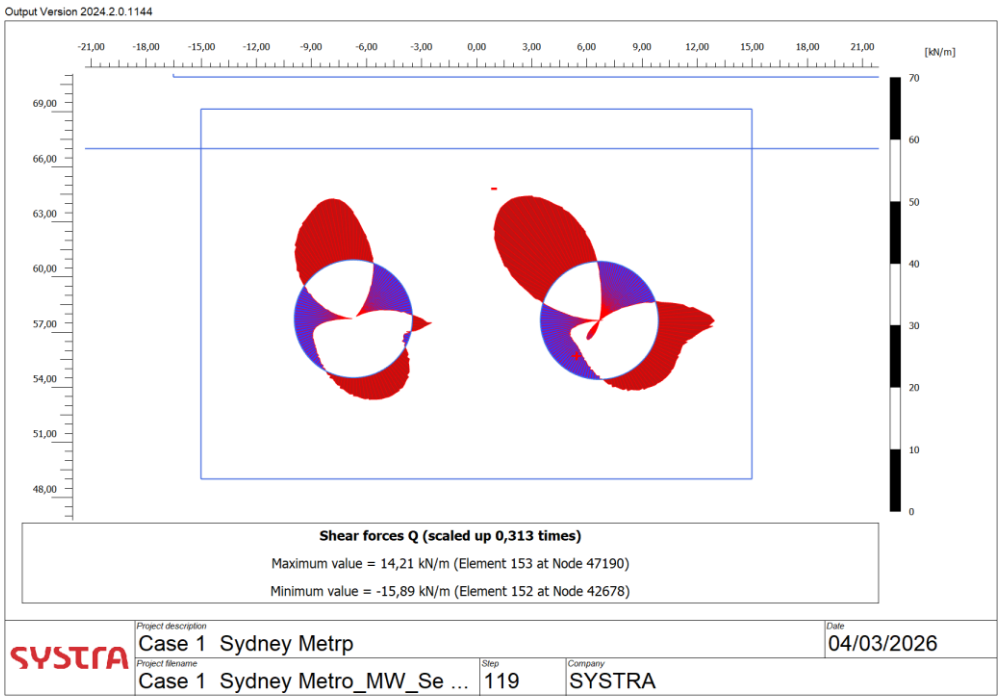
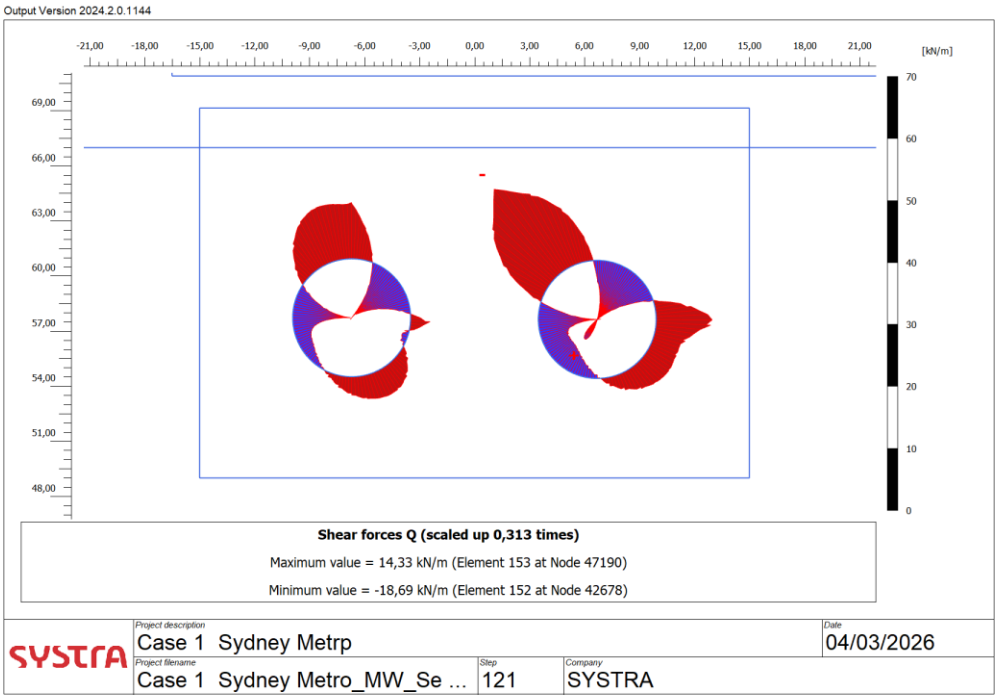
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



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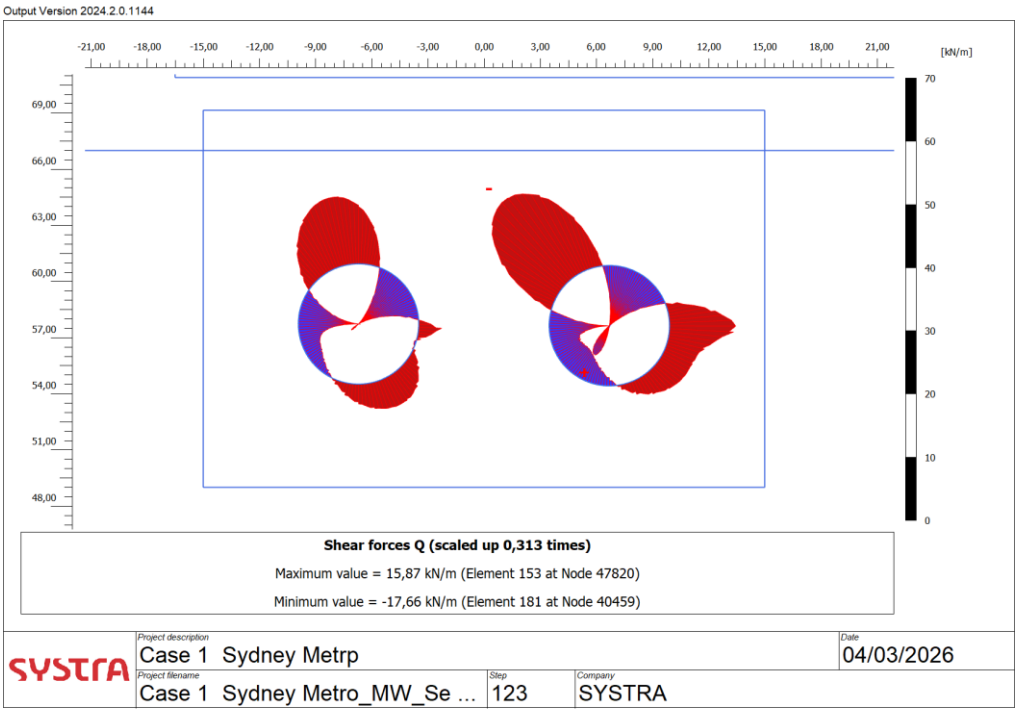
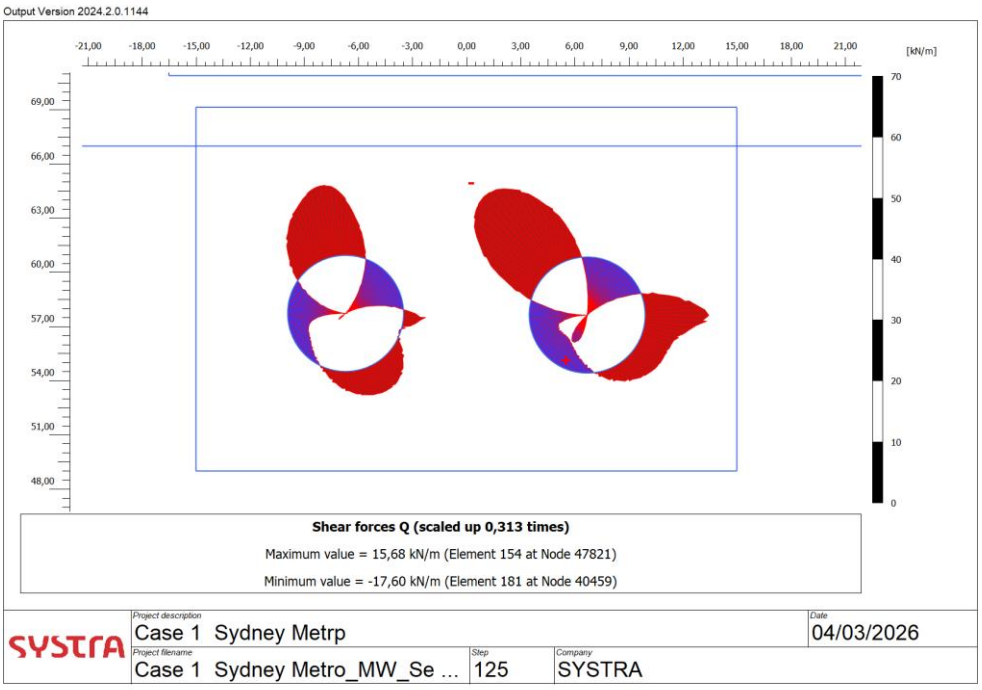
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 (Load Case 5)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



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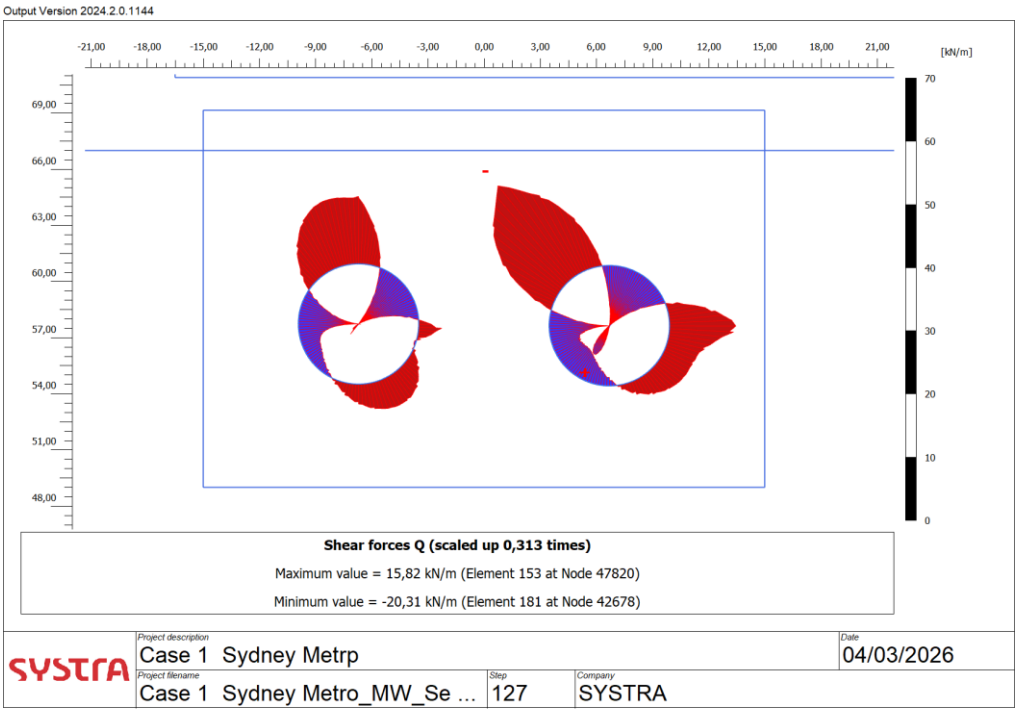
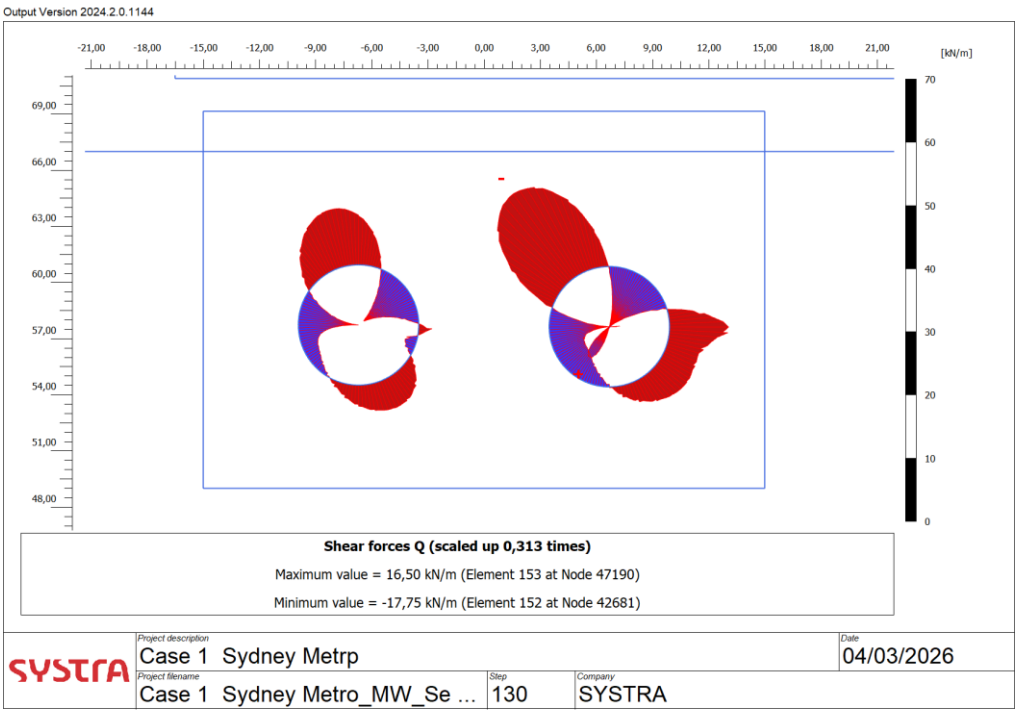
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 (Load Case 6)



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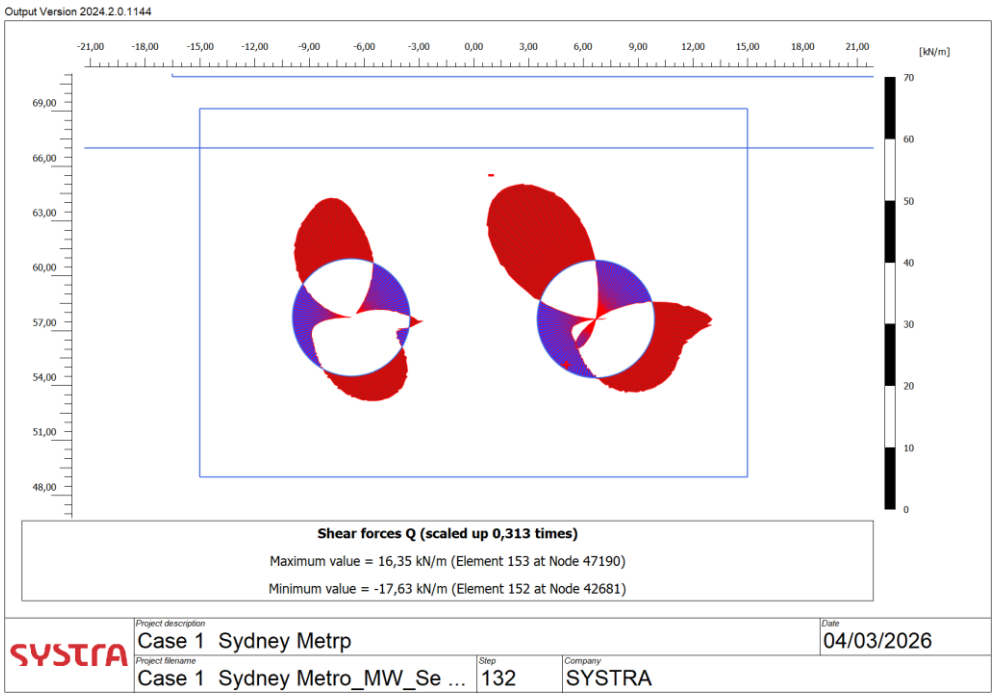
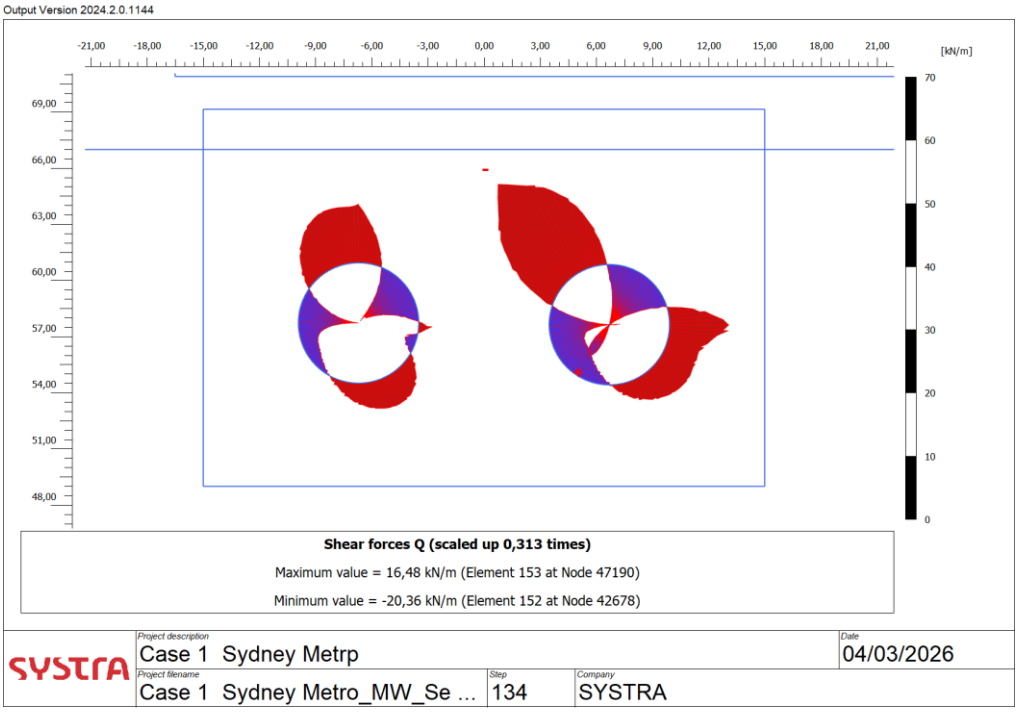
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 +Exceptional Wedge Load (Load Case 6.1)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



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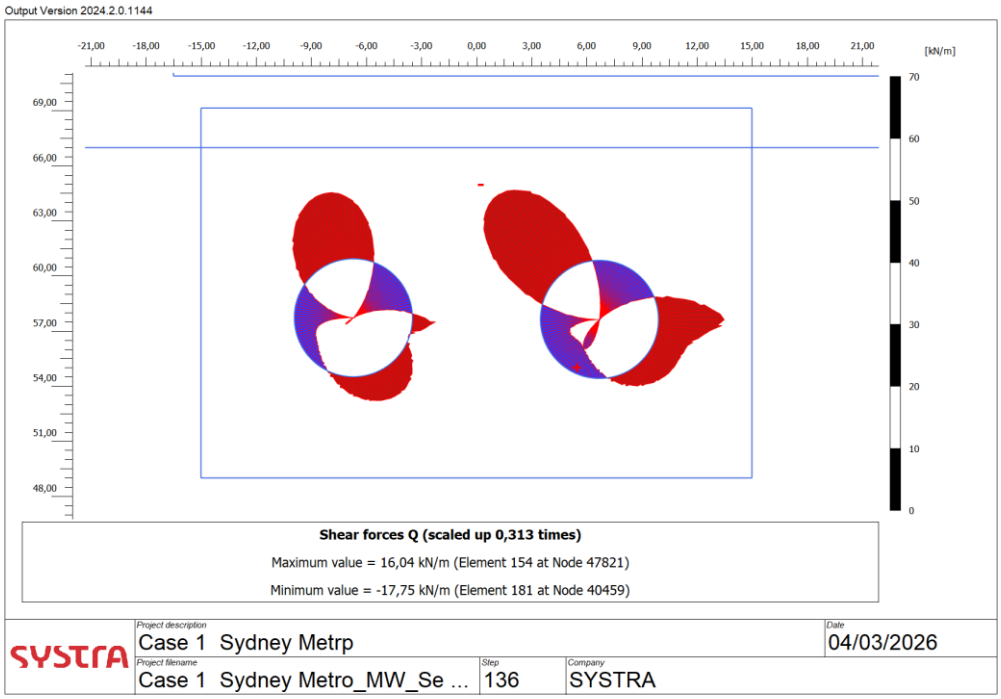
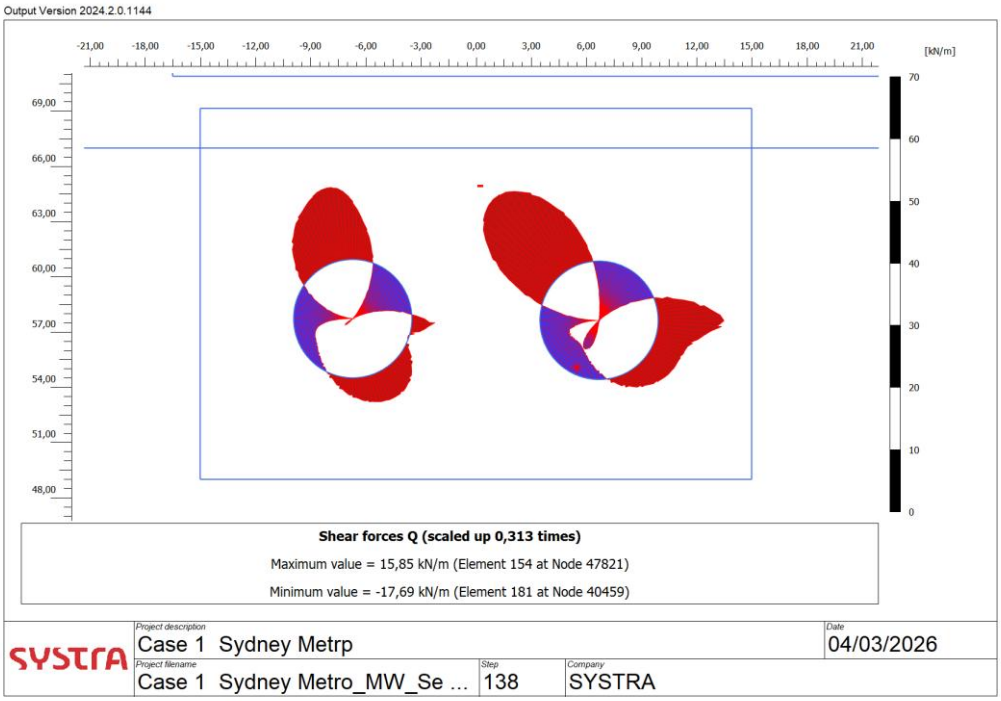
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 15 (Load Case 7)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



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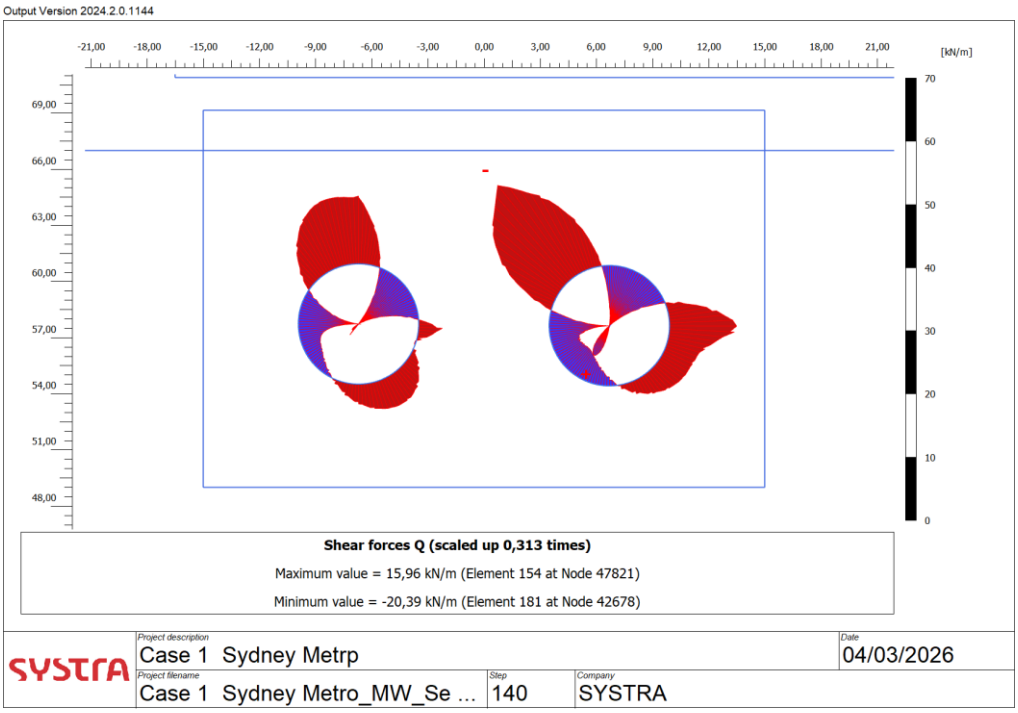
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 1 +Typical Wedge Load (Load Case 7.2)



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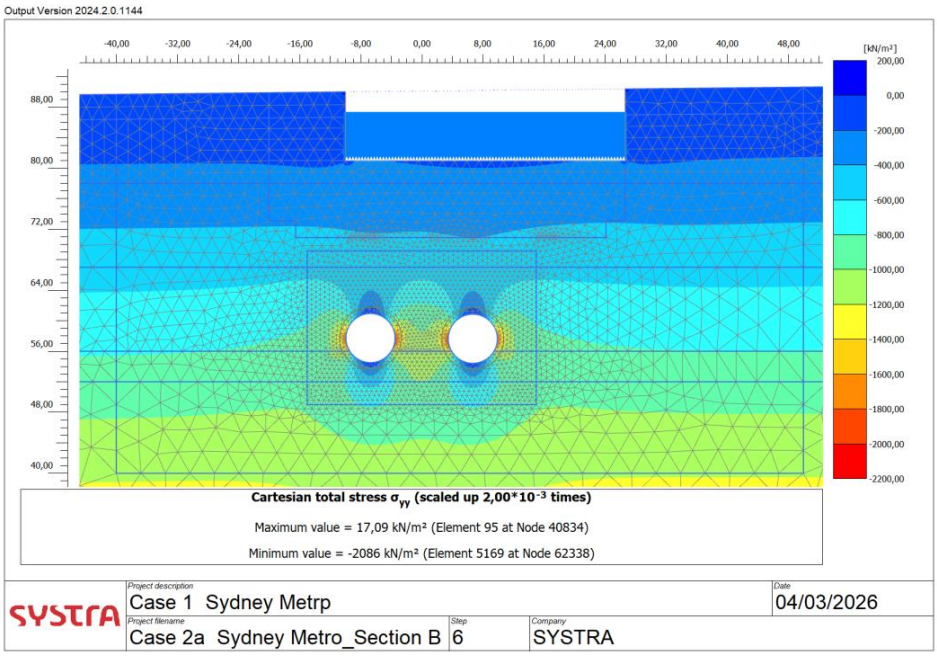
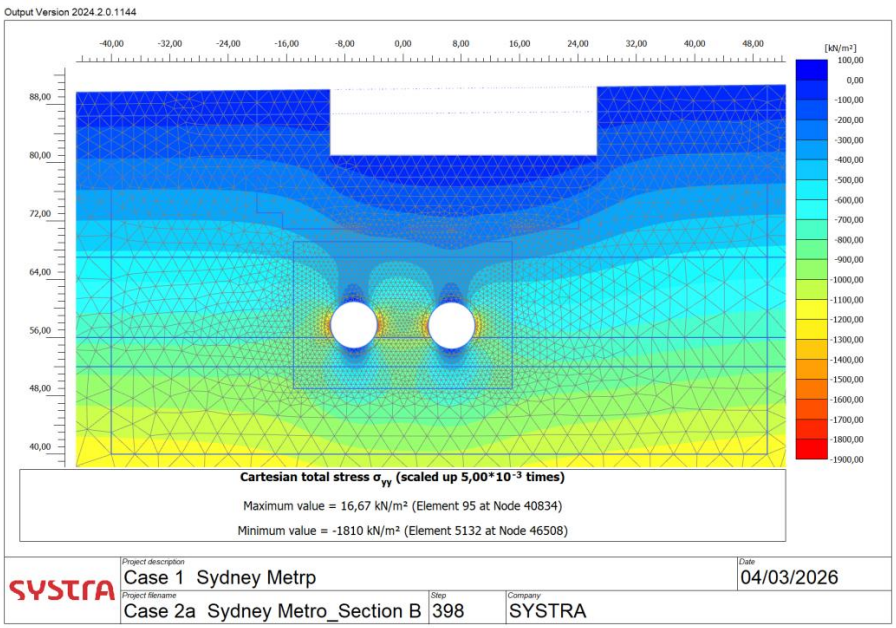
CASE 2 (SENSTIVITY CASE)

TOTAL VERTICAL STRESS

Total vertical stress - Stage 0: Metro tunnel lining installation (Load Case 1)



Total vertical stress - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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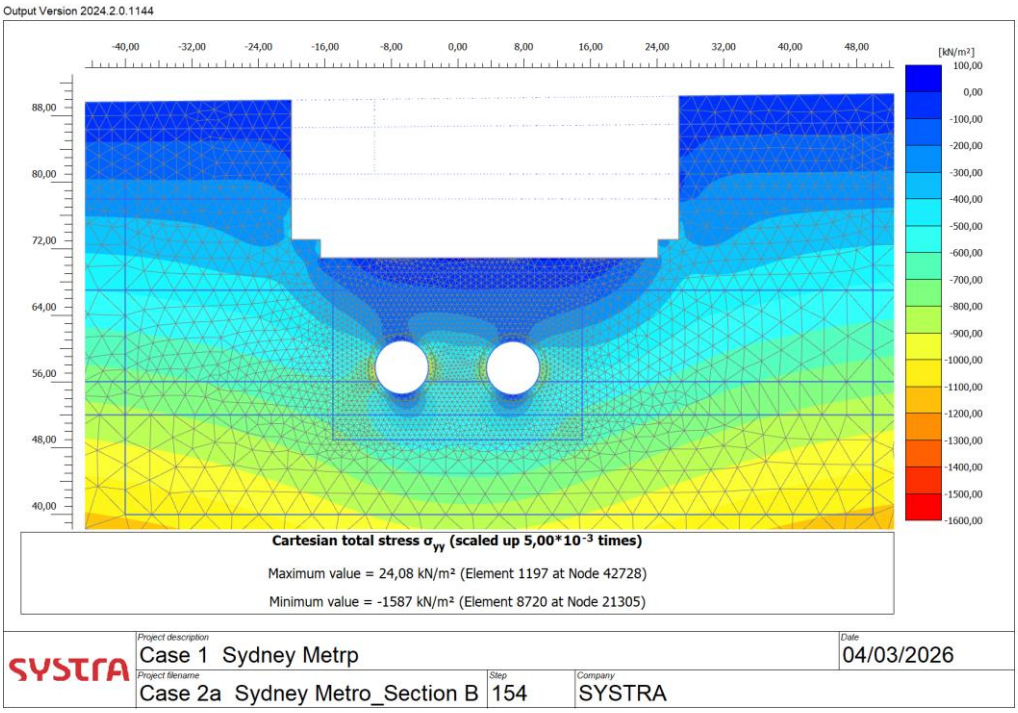
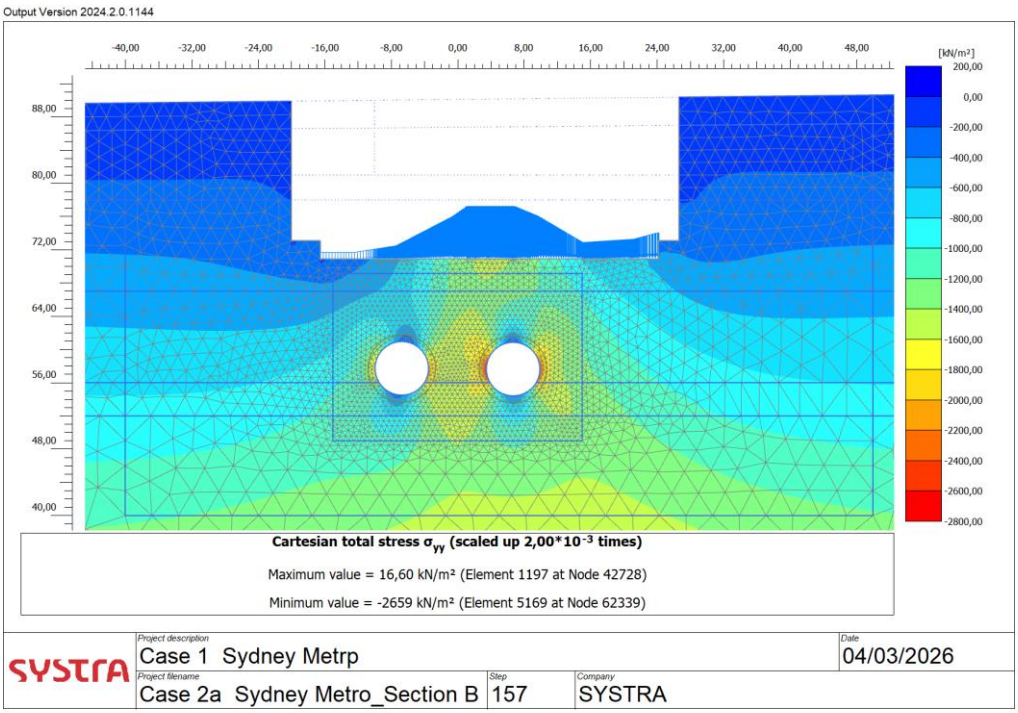
Total vertical stress - Stage 1: Excavate proposed basement (Load Case 3)



Total vertical stress - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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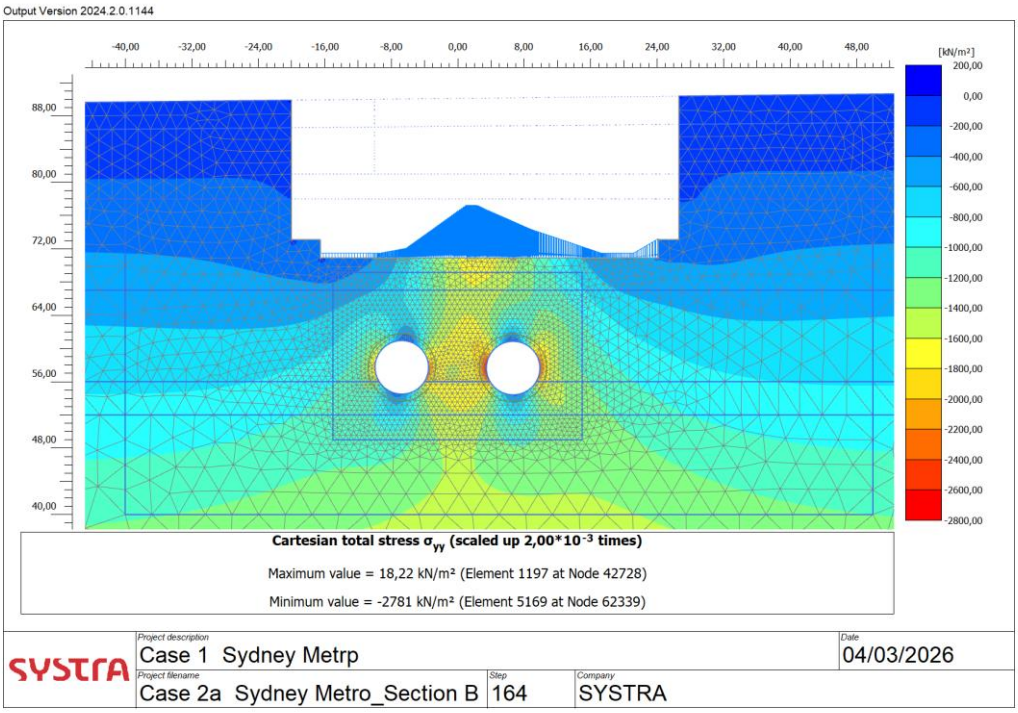
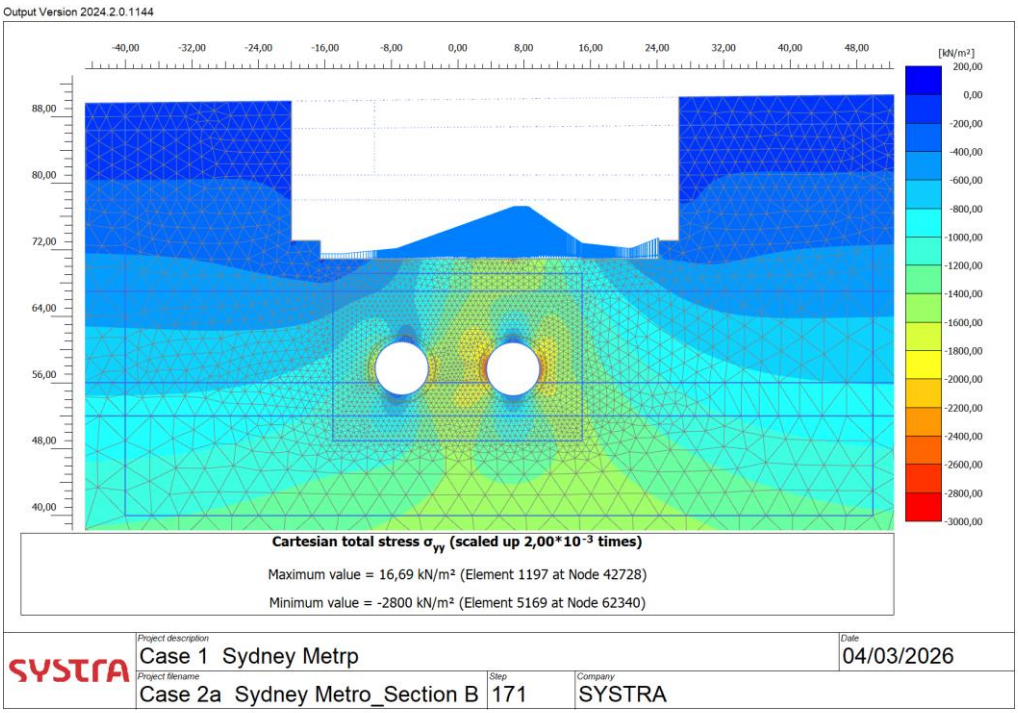
Total vertical stress - Stage 2: Apply wind building load case 11 (Load Case 5)



Total vertical stress - Stage 2: Apply wind building load case 14 (Load Case 6)



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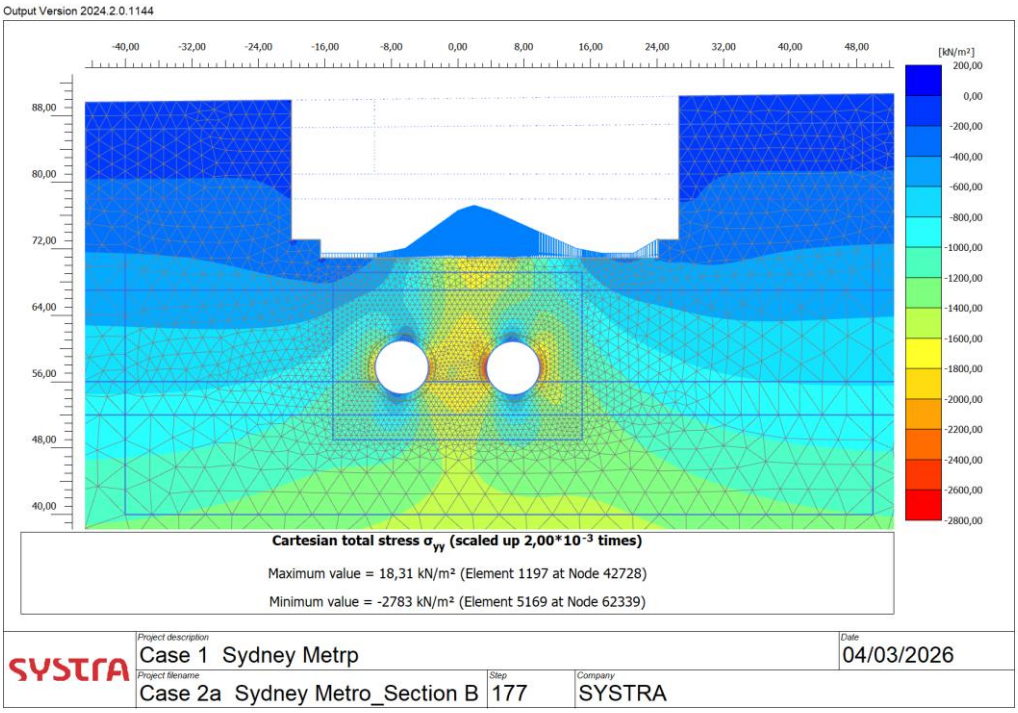
Total vertical stress - Stage 2: Apply wind building load case 15 (Load Case 7)



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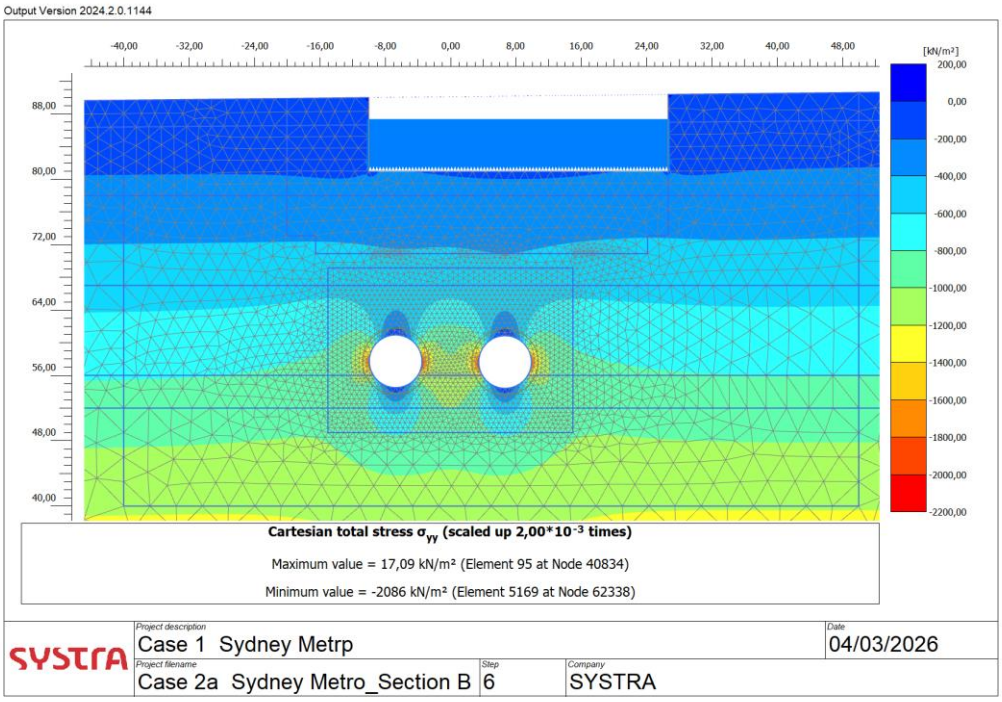
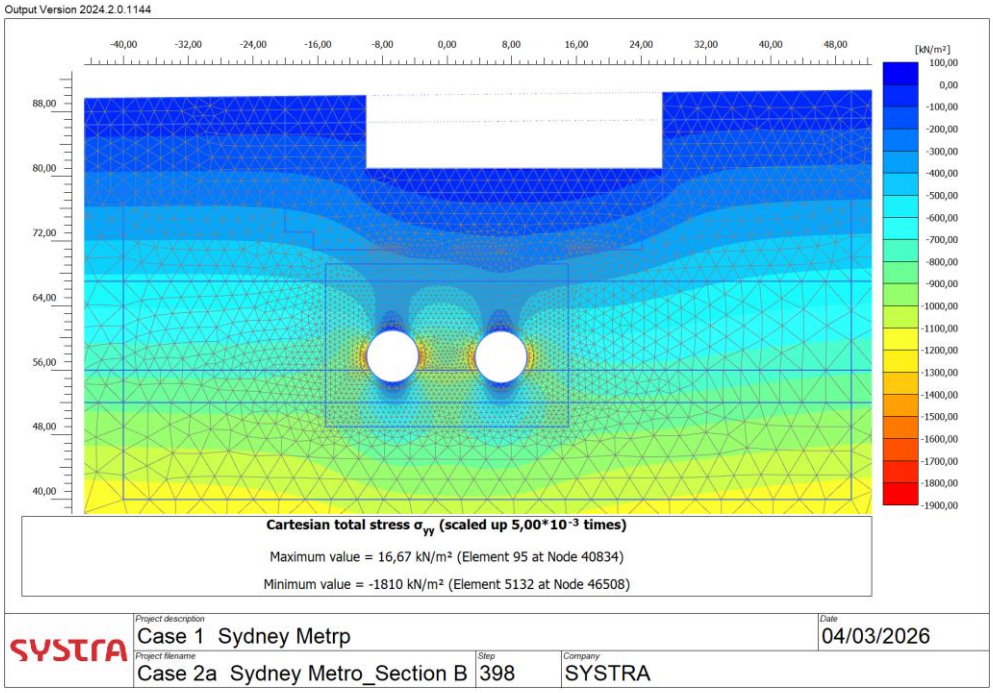
TOTAL HORIZONTAL STRESS

Total horizontal stress - Stage 0: Metro tunnel lining installation (Load Case 1)



Total horizontal stress - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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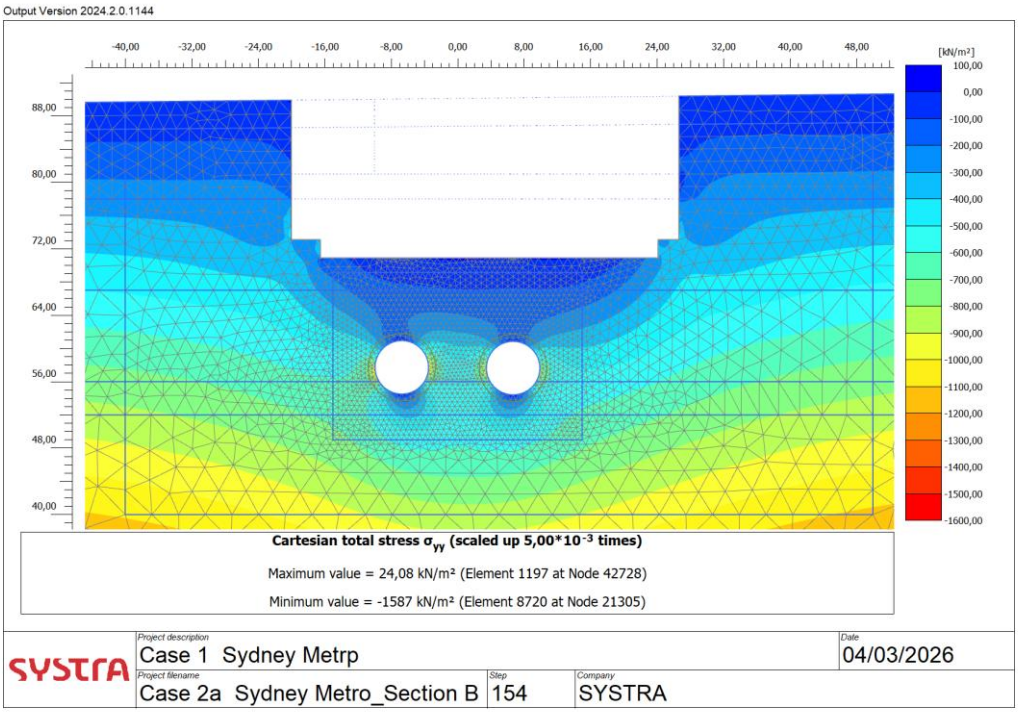
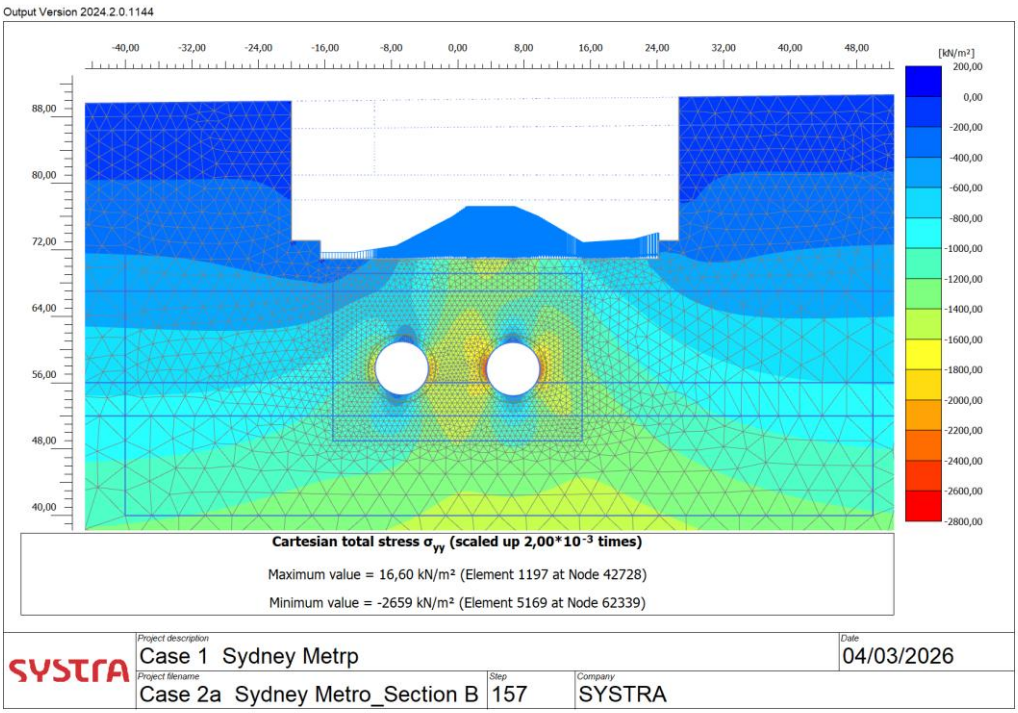
Total horizontal stress - Stage 1: Excavate proposed basement (Load Case 3)



Total horizontal stress - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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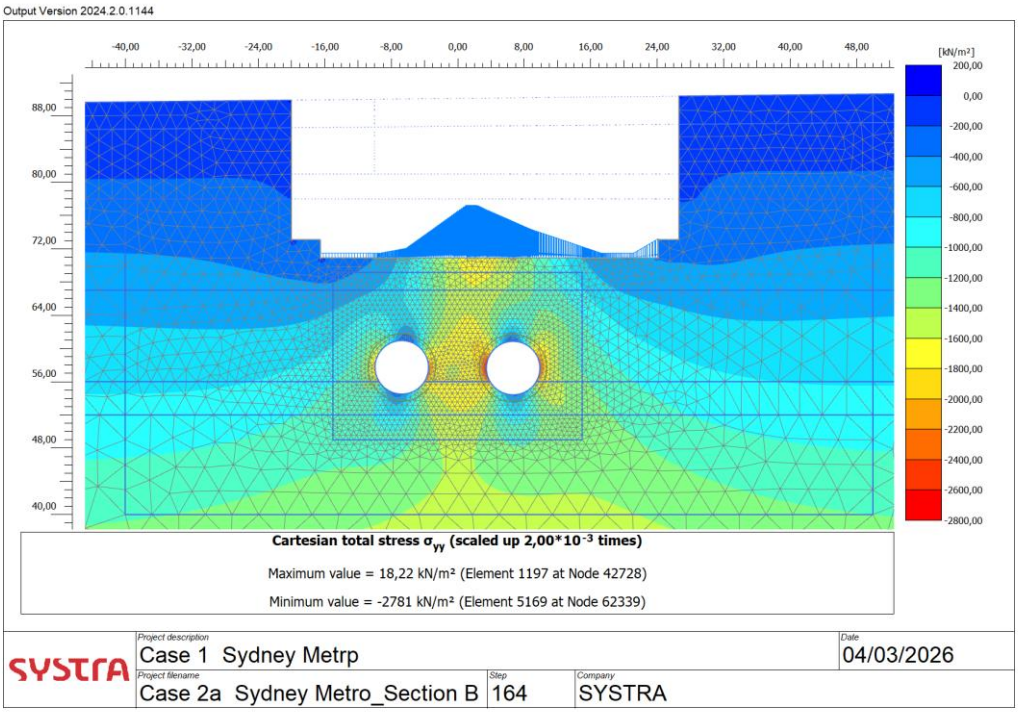
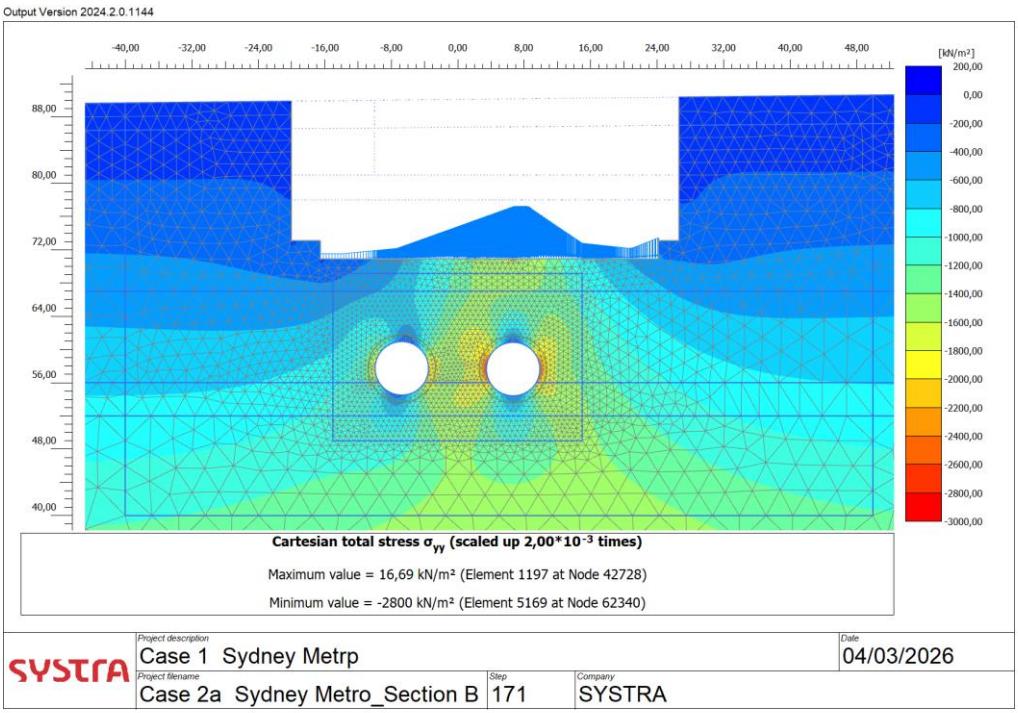
Total horizontal stress - Stage 2: Apply wind building load case 11 (Load Case 5)



Total horizontal stress - Stage 2: Apply wind building load case 14 (Load Case 6)



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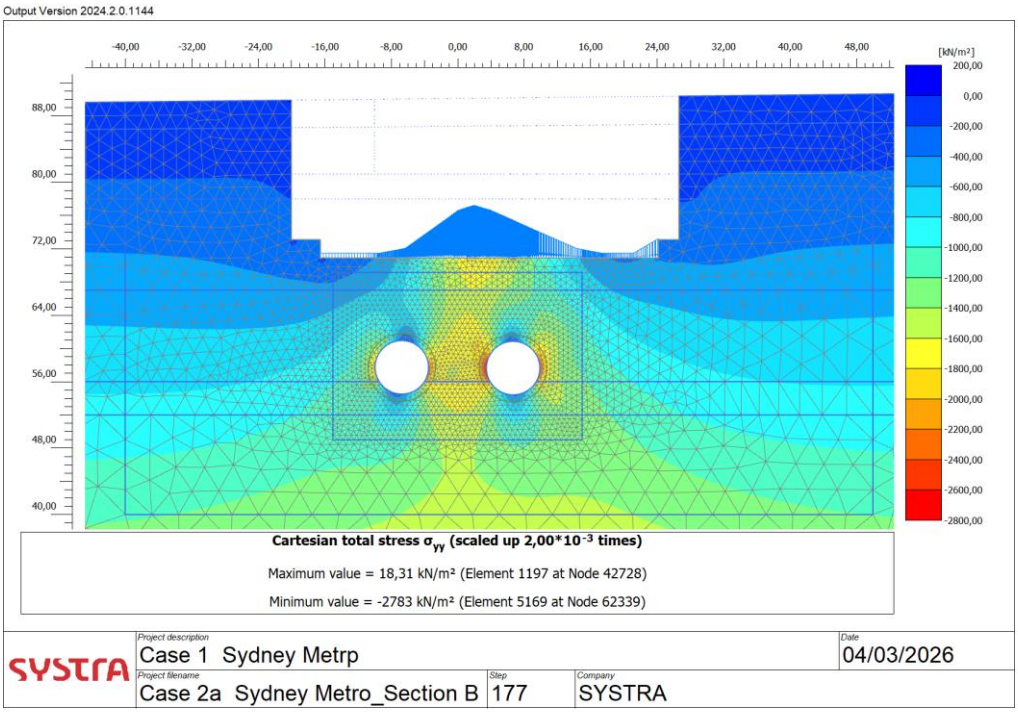
Total horizontal stress - Stage 2: Apply wind building load case 15 (Load Case 7)



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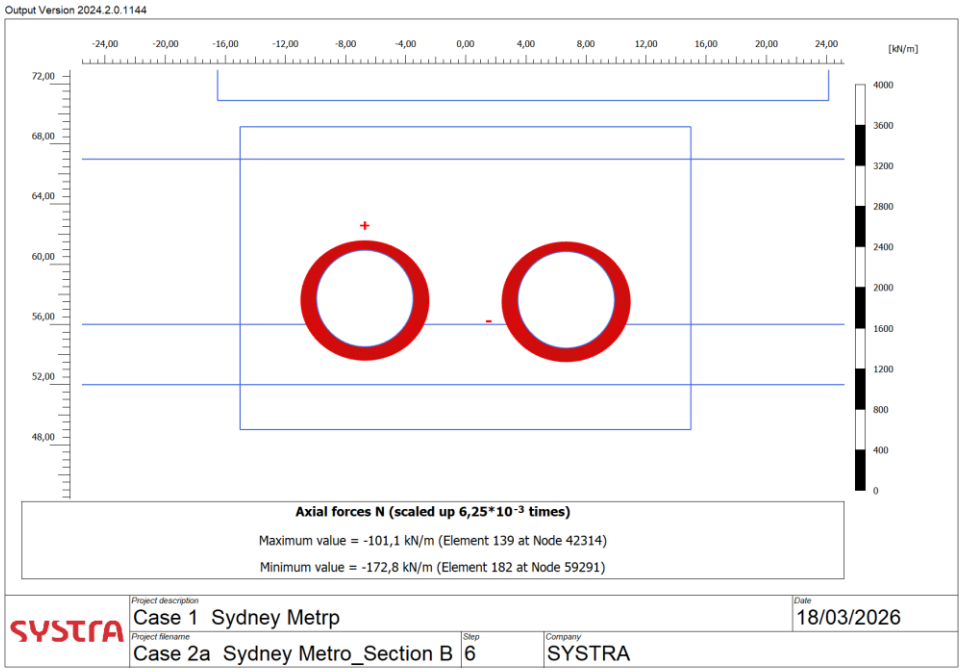
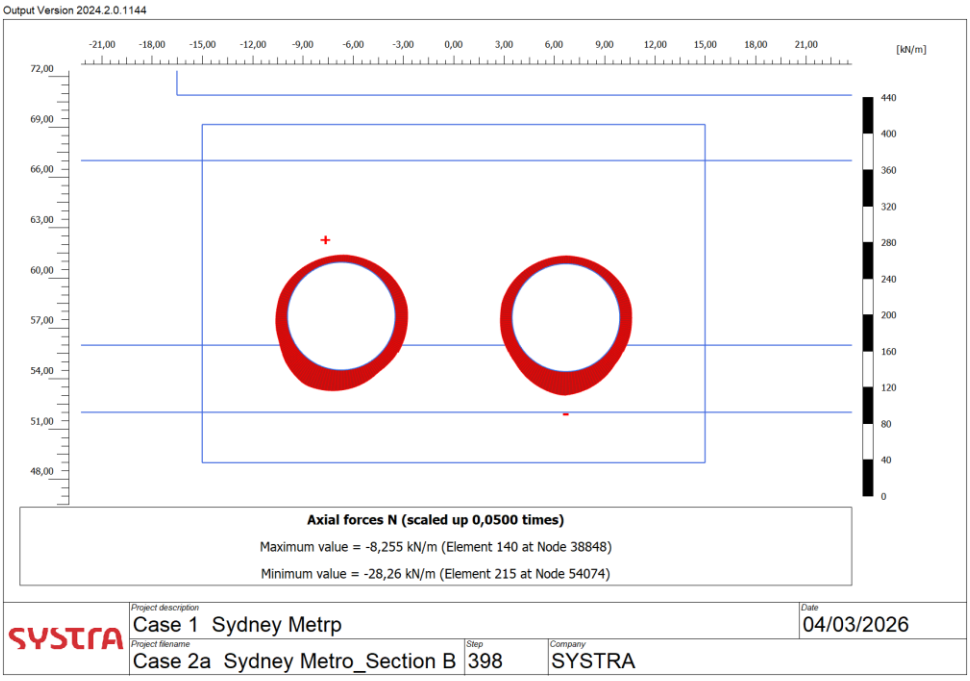
CHARACTERISTIC AXIAL FORCES ON THE LINER

Characteristic Axial Force N (kN/m) - Stage 0: Metro tunnels lining installation (Load Case 1)



Characteristic Axial Force N (kN/m) - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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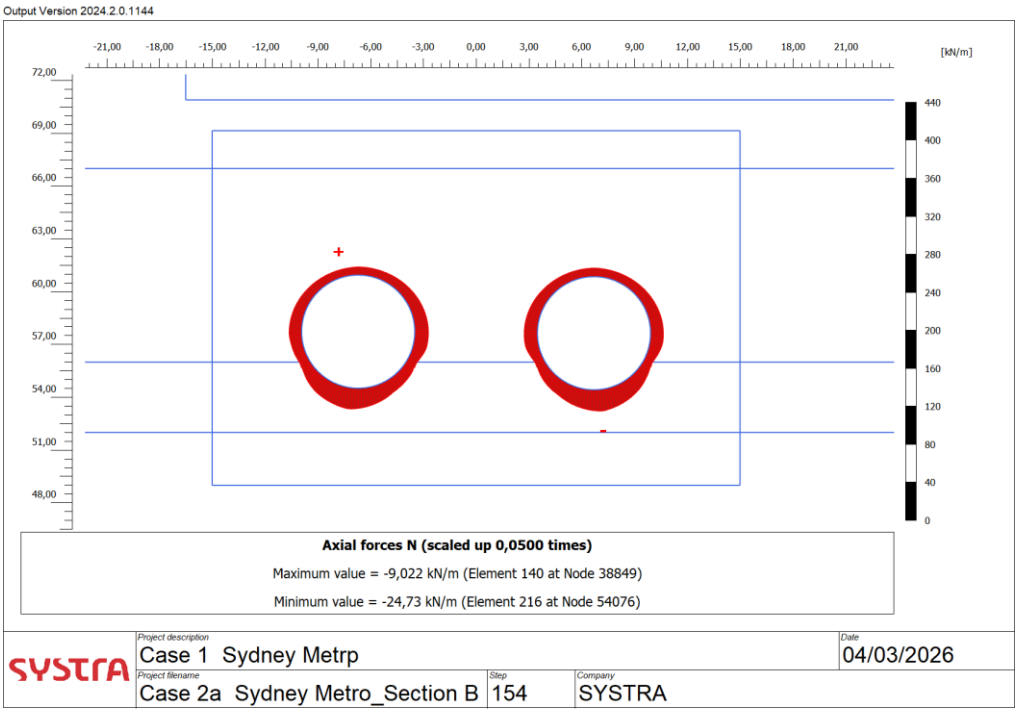
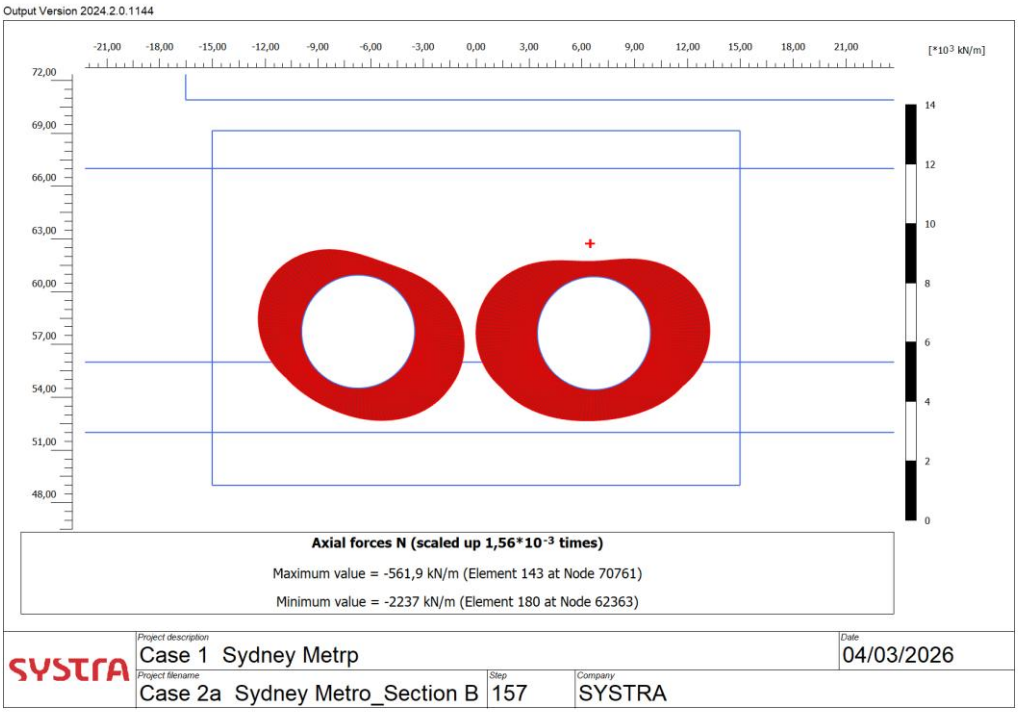
Characteristic Axial Force N (kN/m) - Stage 1: Excavate proposed basement (Load Case 3)



Characteristic Axial Force N (kNm/m) - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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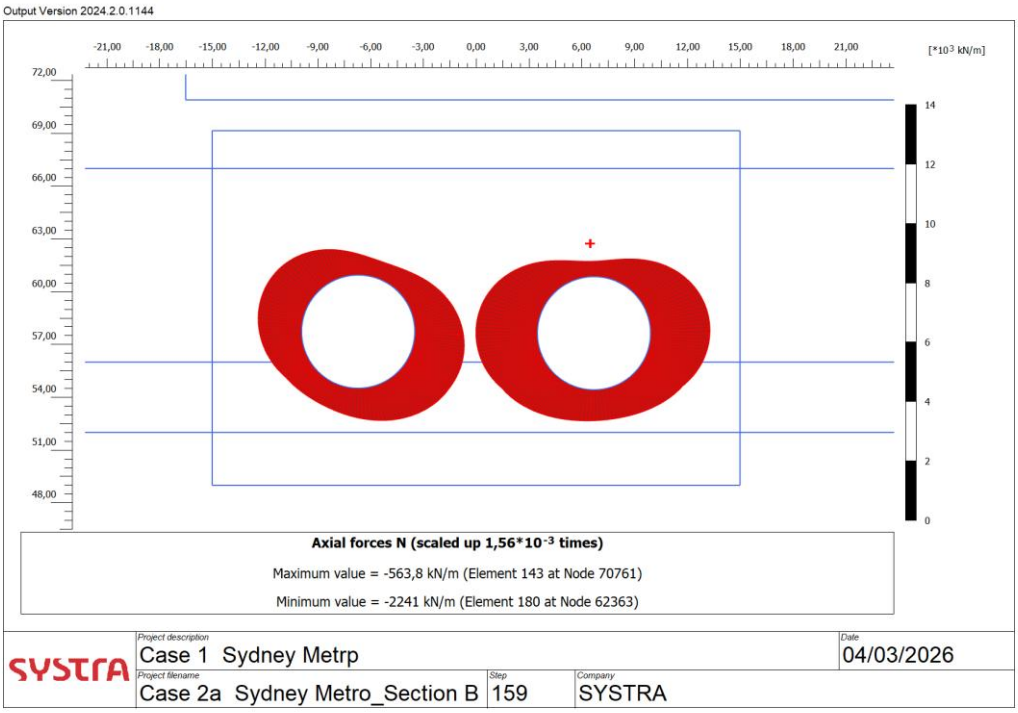
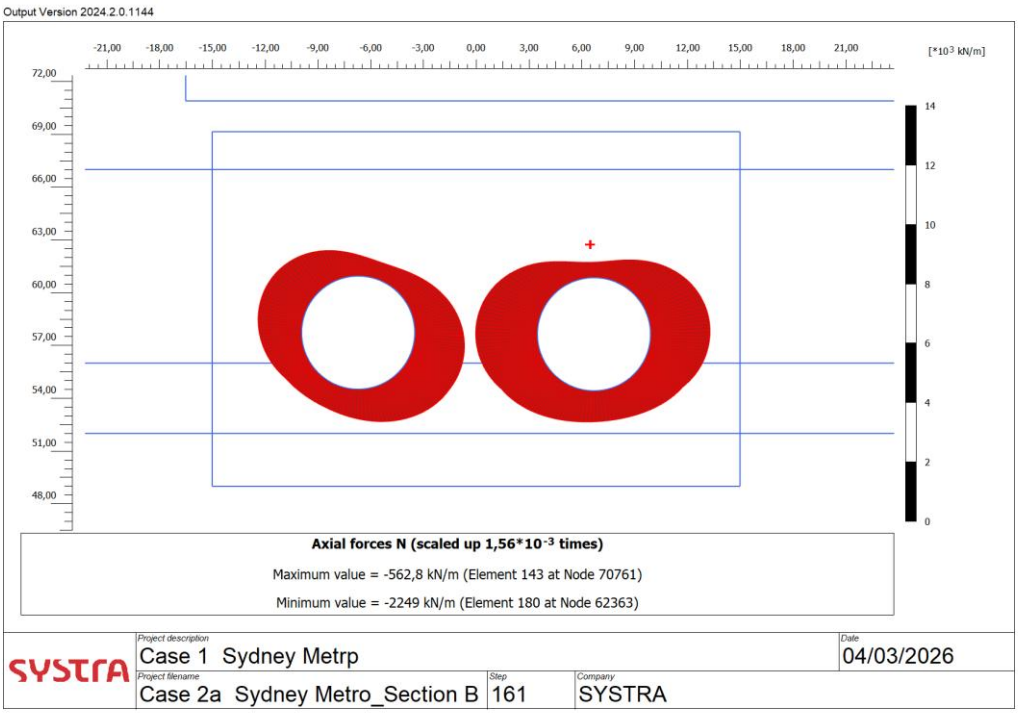
Characteristic Axial Force N (kN/m) - Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



Characteristic Axial Force N (kN/m) - Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



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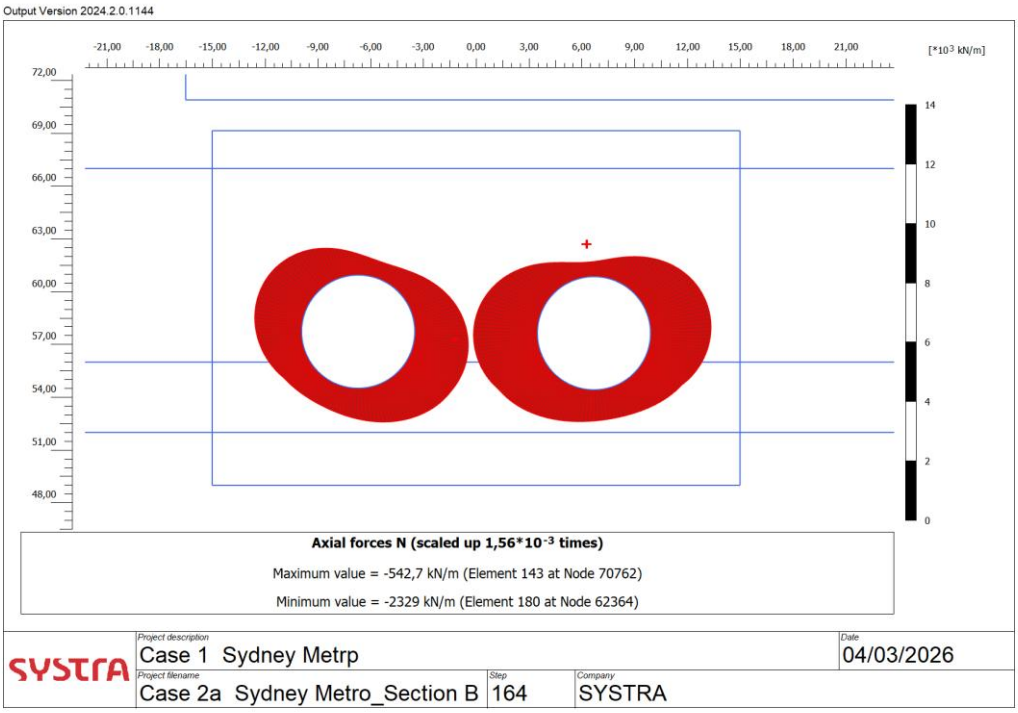
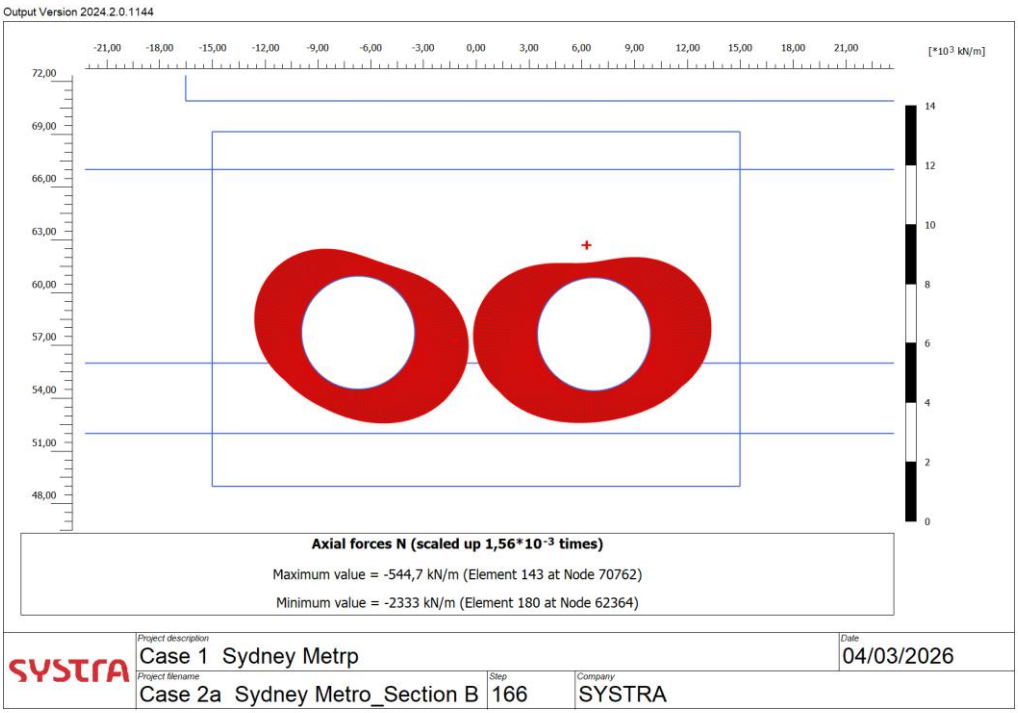
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 11 (Load Case 5)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



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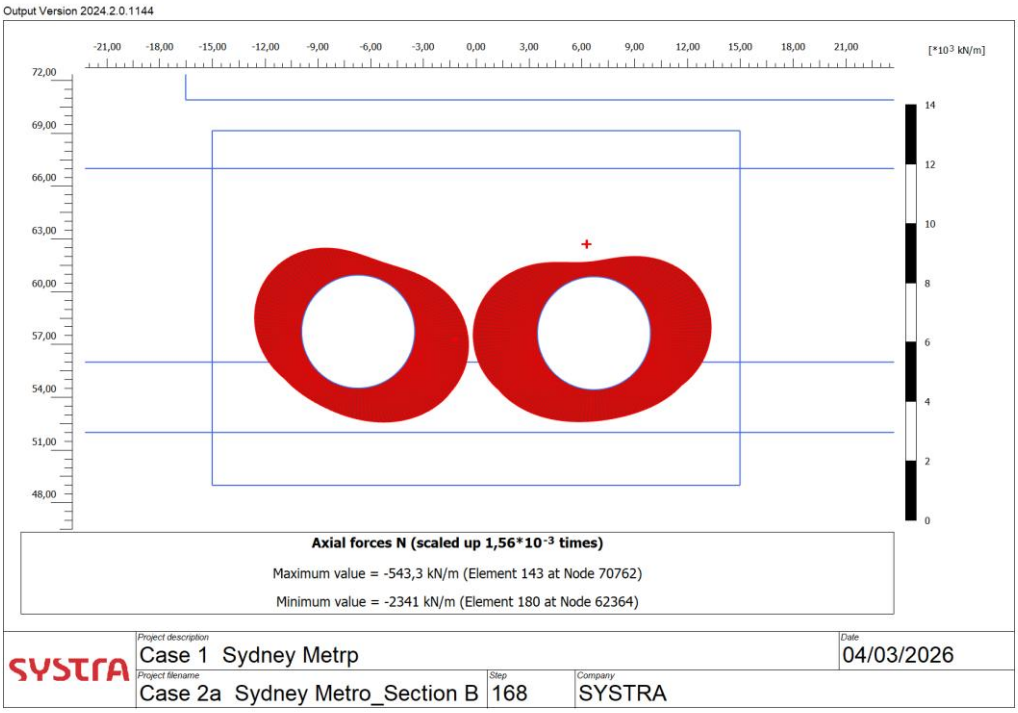
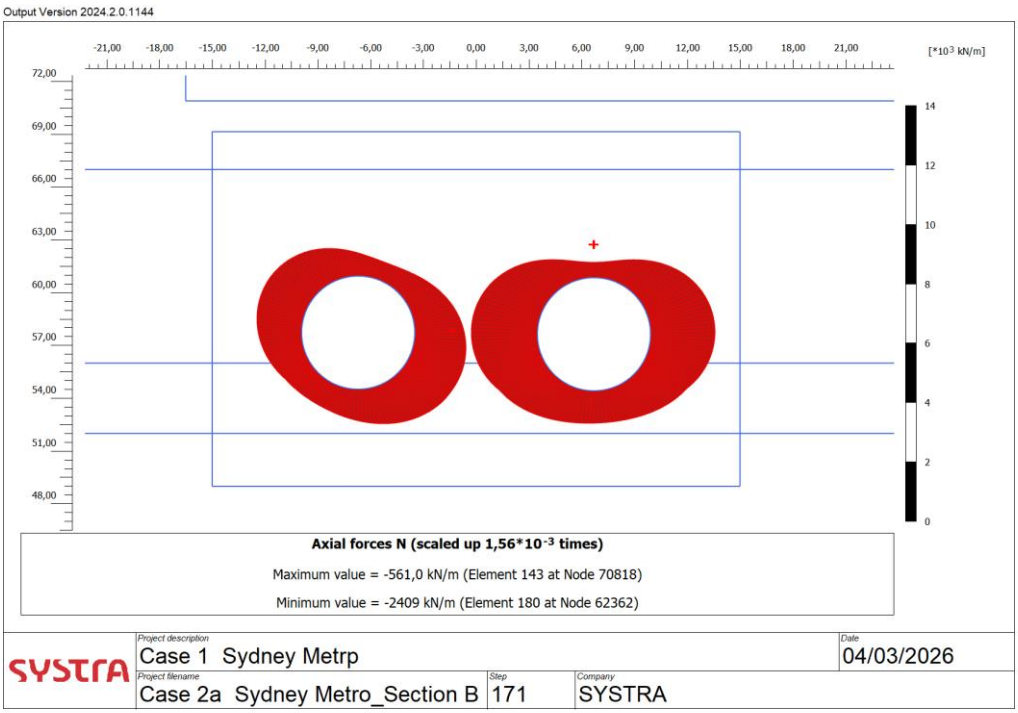
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 14 (Load Case 6)



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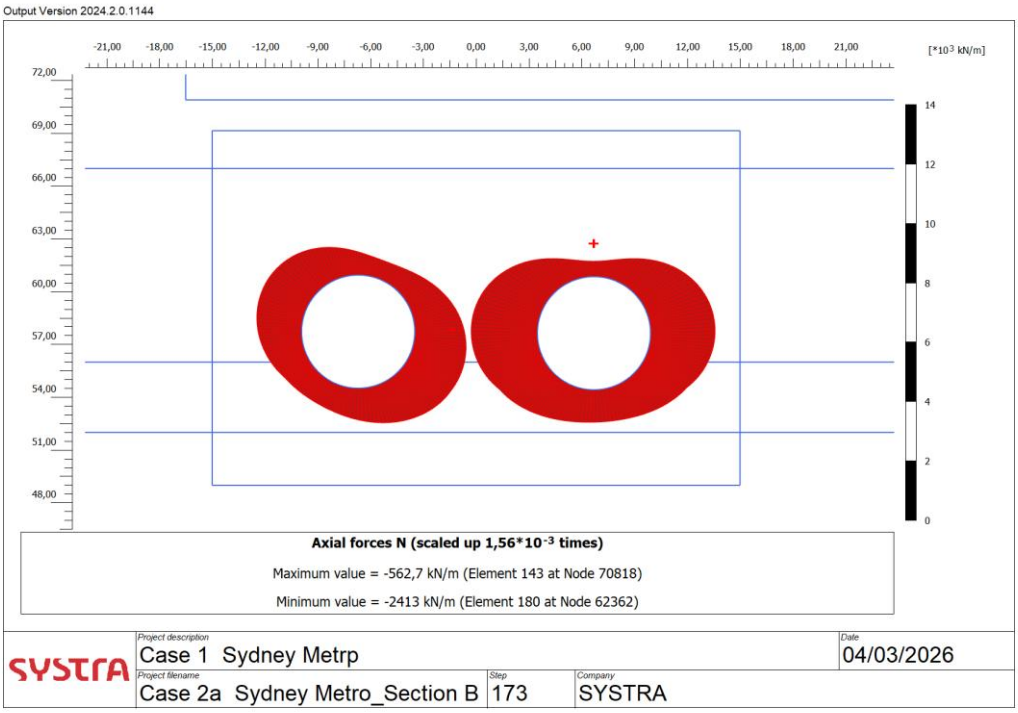
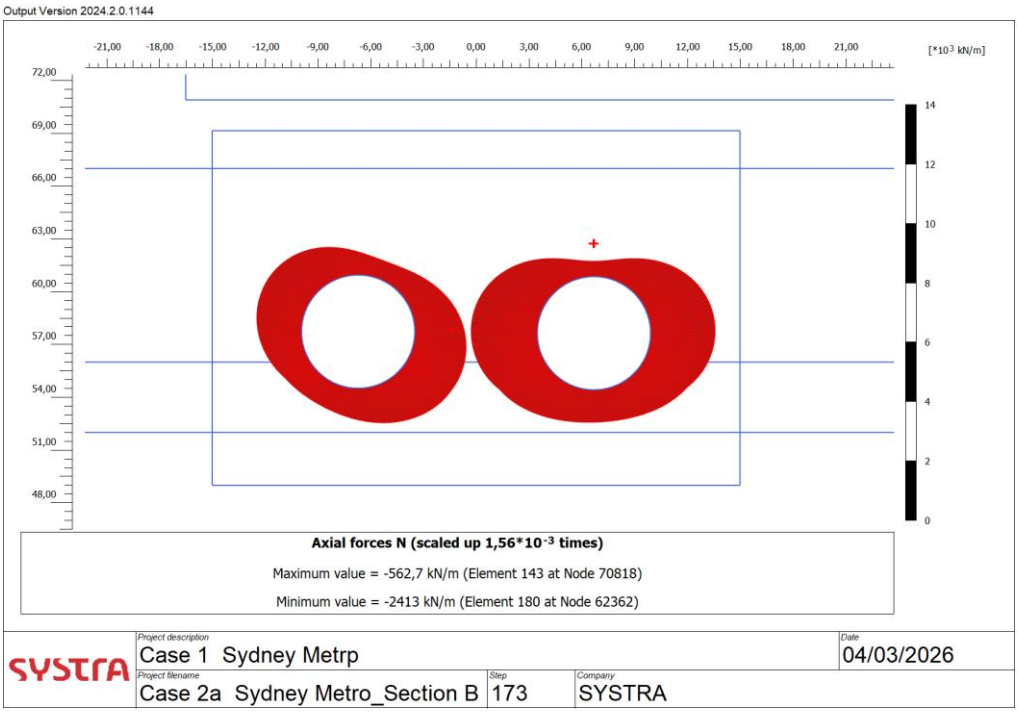
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 14 +Exceptional Wedge Load (Load Case 6.1)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



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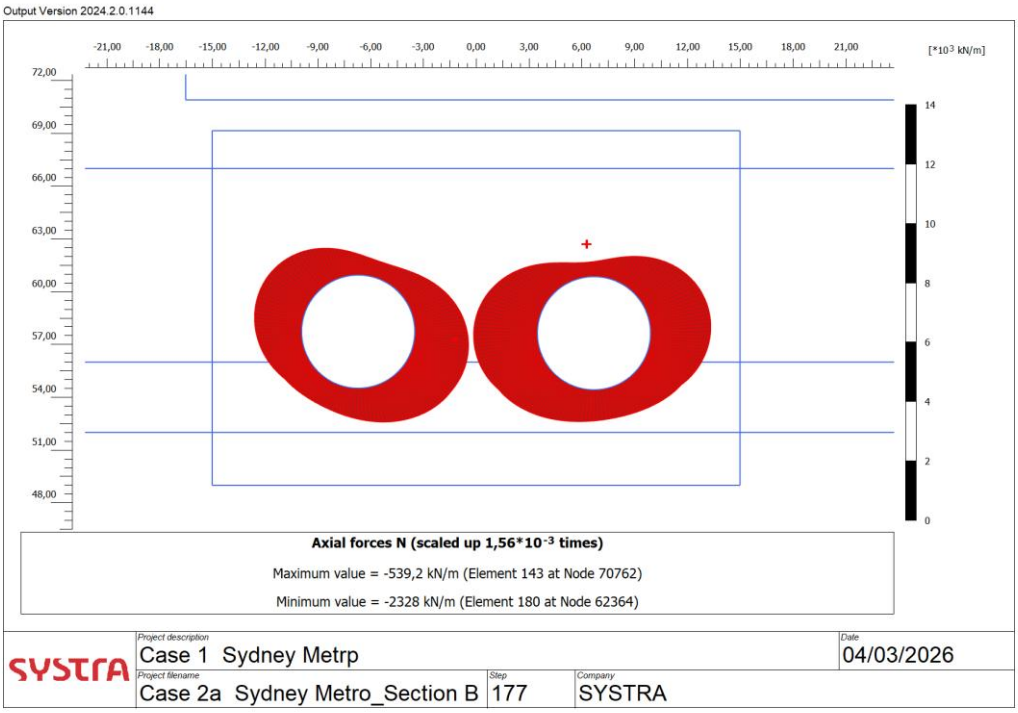
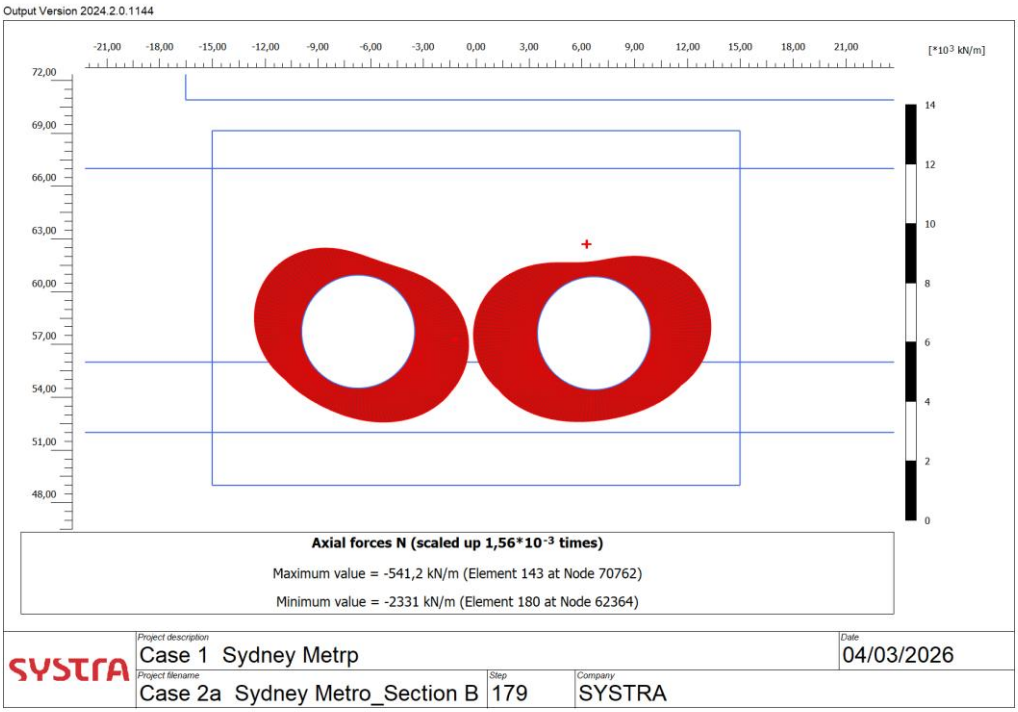
Characteristic Axial Force N (kNm/m) - Stage 2: Apply wind building load case 15 (Load Case 7)



Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



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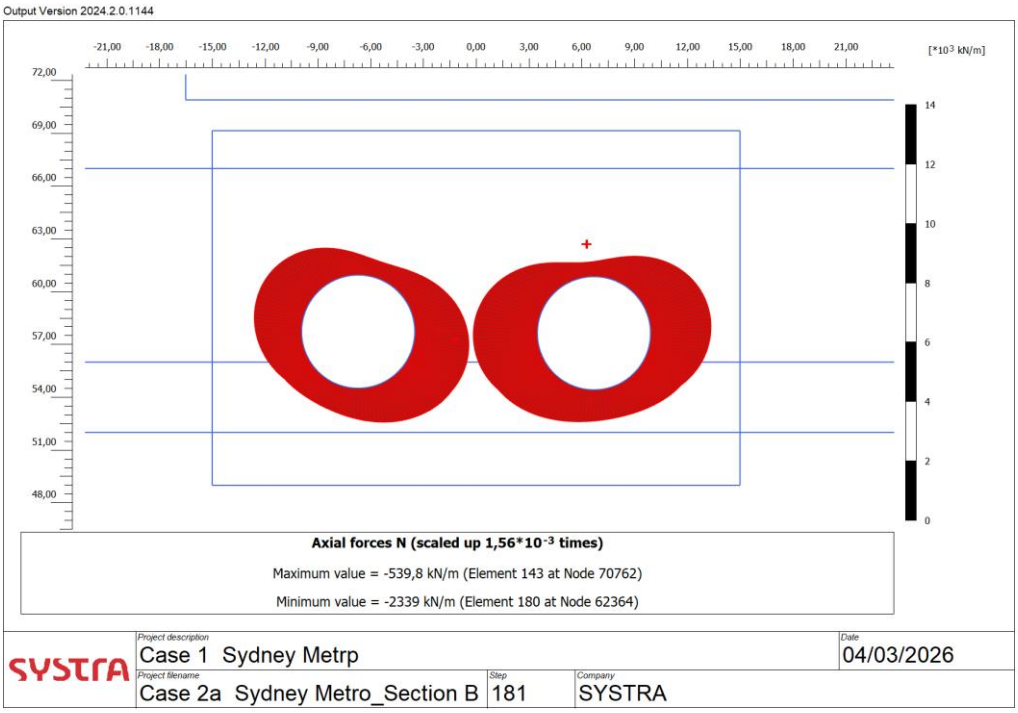
Characteristic Axial Force N (kN/m) - Stage 2: Apply wind building load case 1 +Typical Wedge Load (Load Case 7.2)



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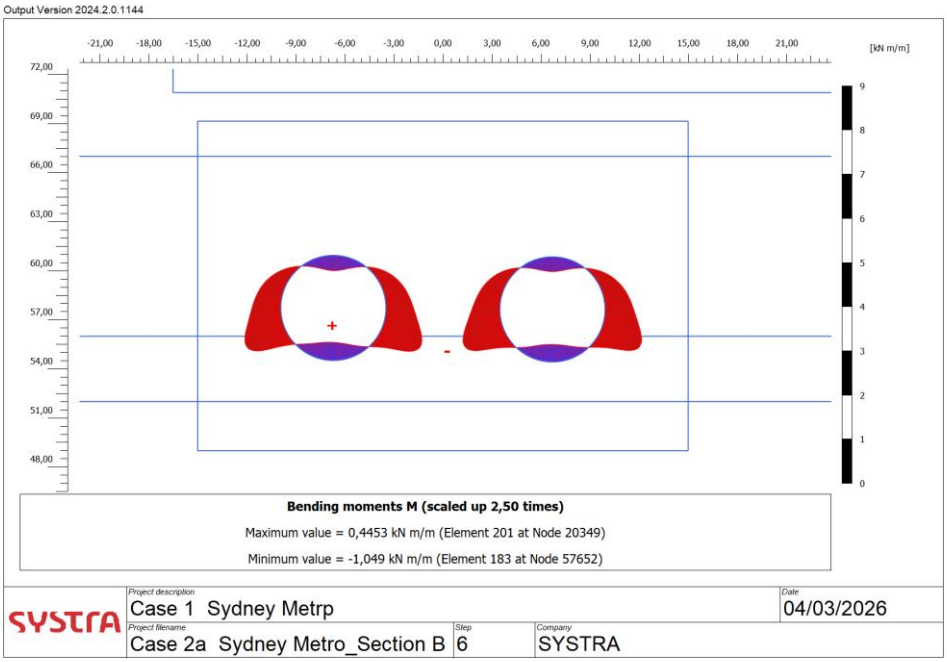
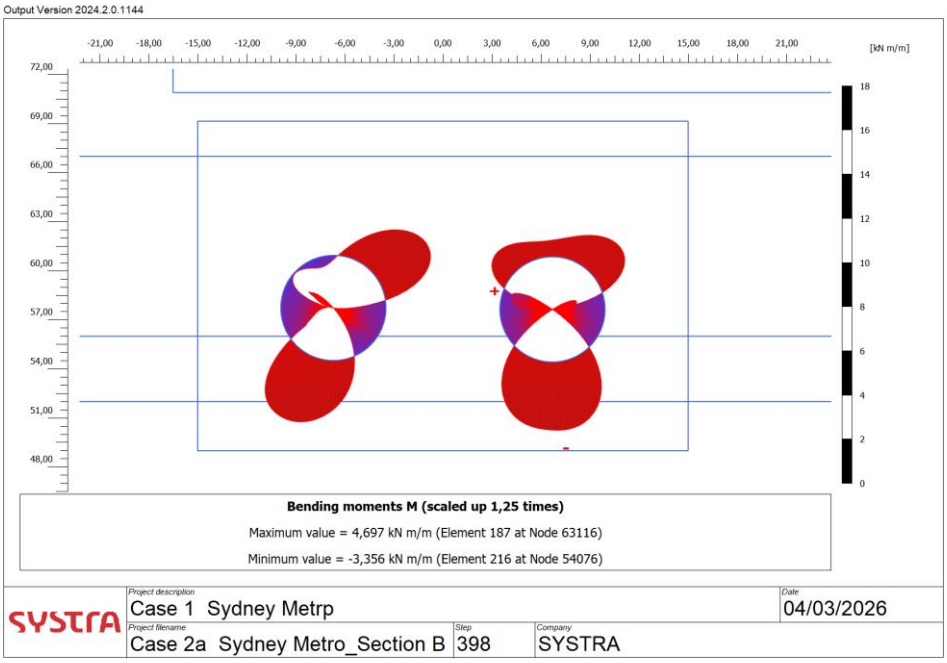
CHARACTERISTIC BENDING MOMENT ON THE LINER

Characteristic Bending Moment M (kNm/m) - Stage 0: Metro tunnels lining installation (Load Case 1)



Characteristic Bending Moment M (kNm/m) - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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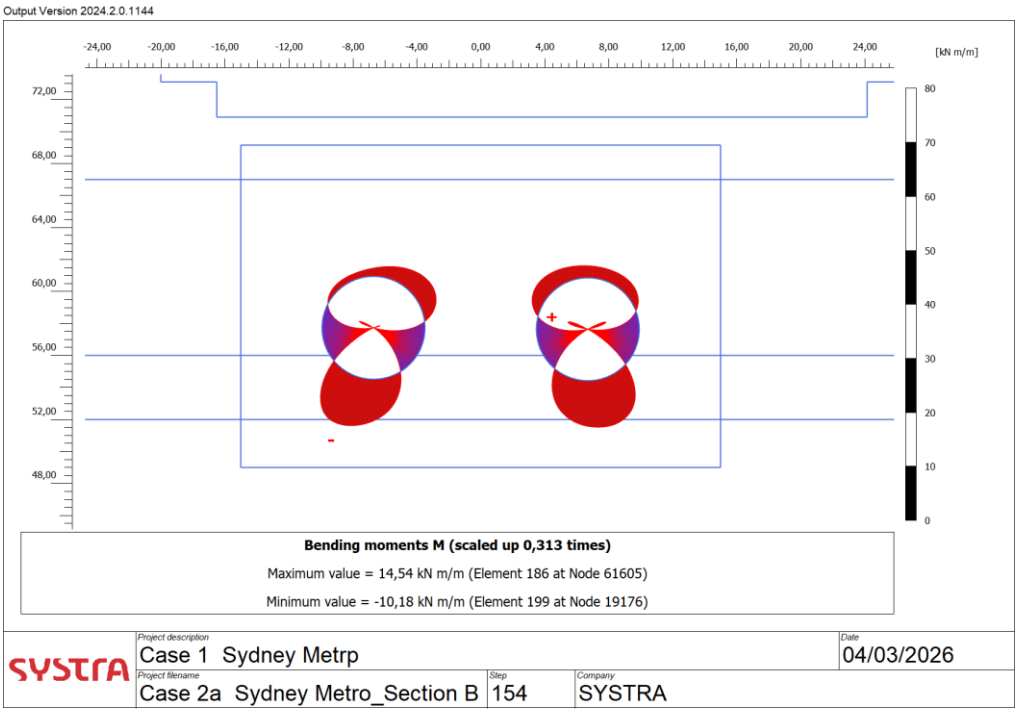
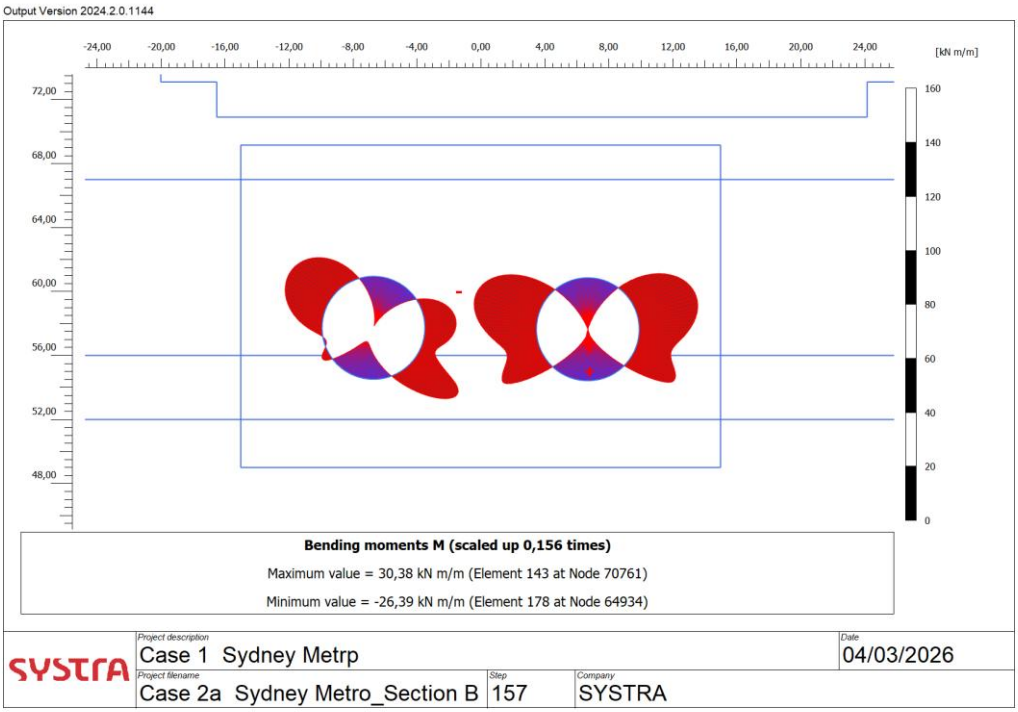
Characteristic Bending Moment M (kNm/m) - Stage 1: Excavate proposed basement (Load Case 3)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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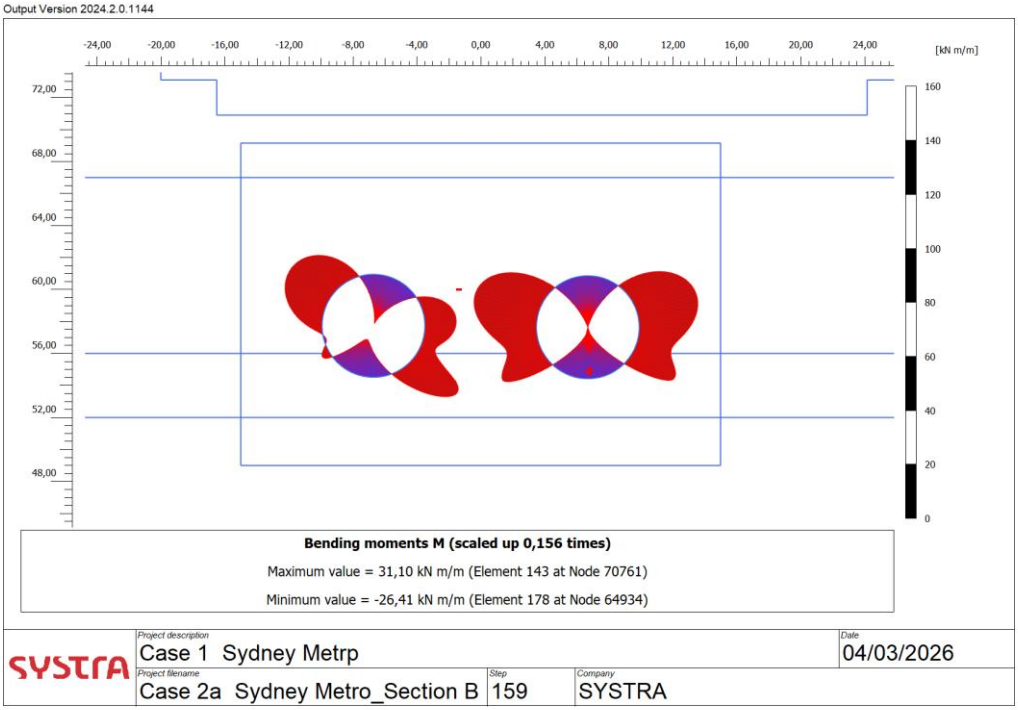
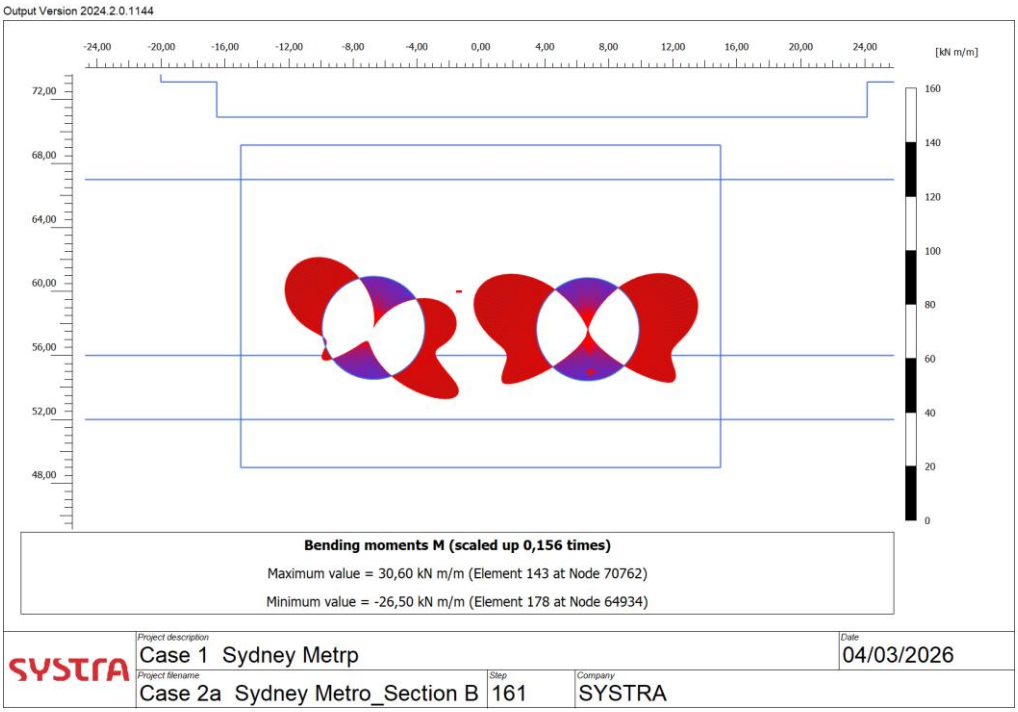
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



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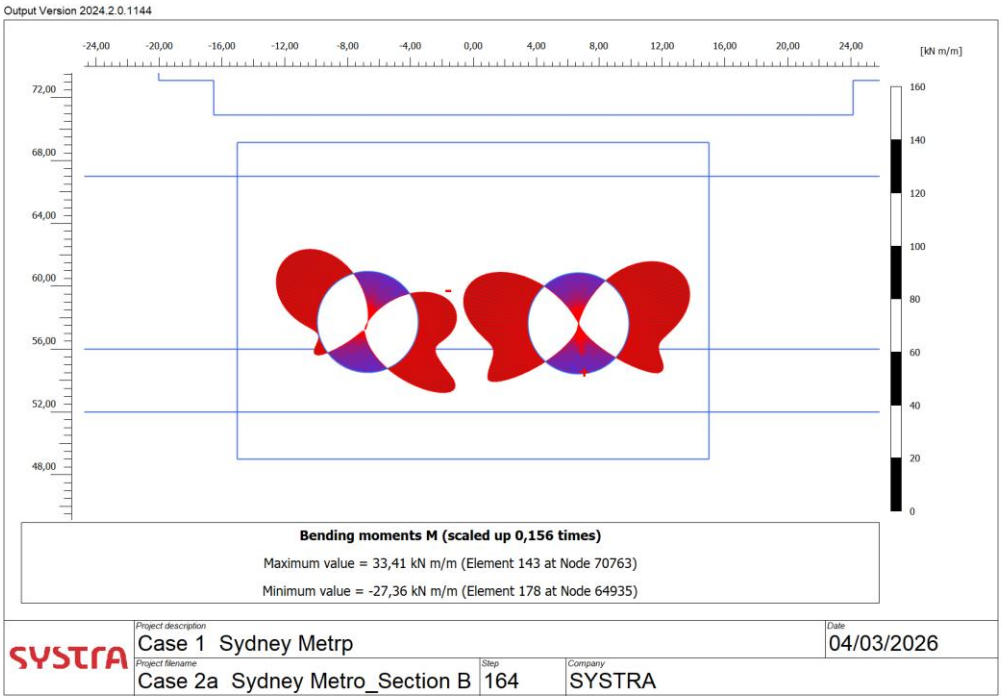
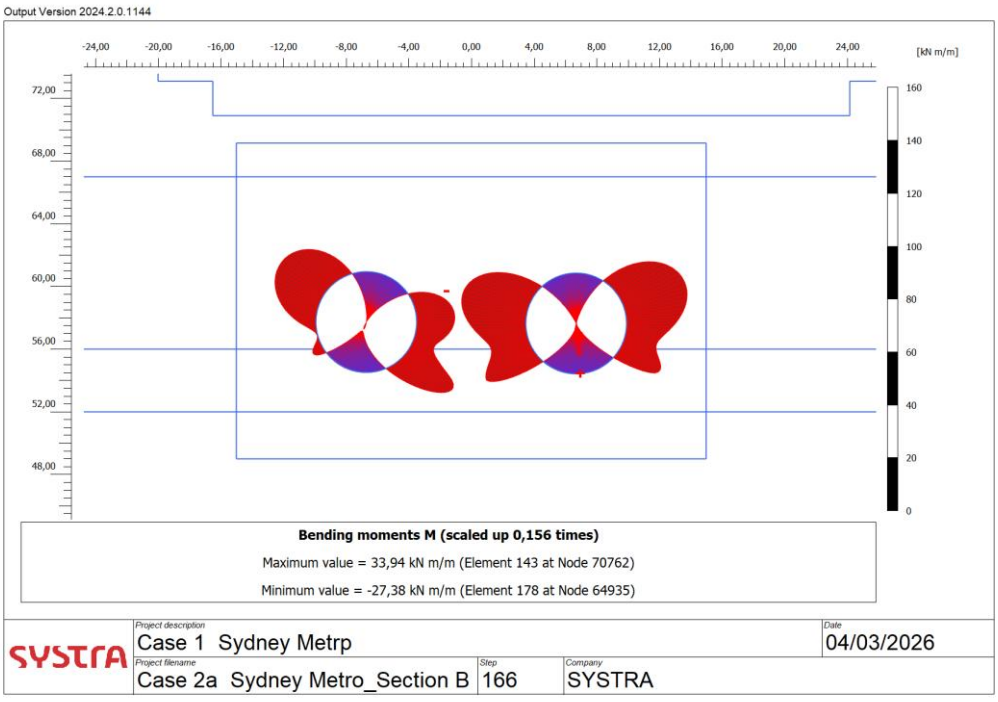
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 (Load Case 5)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



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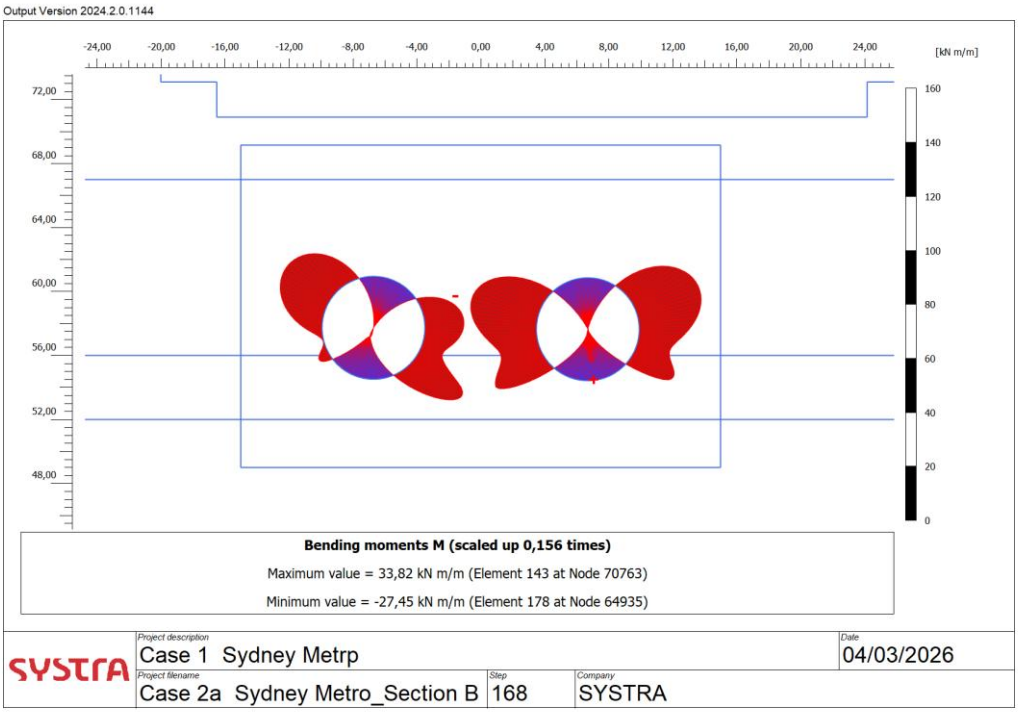
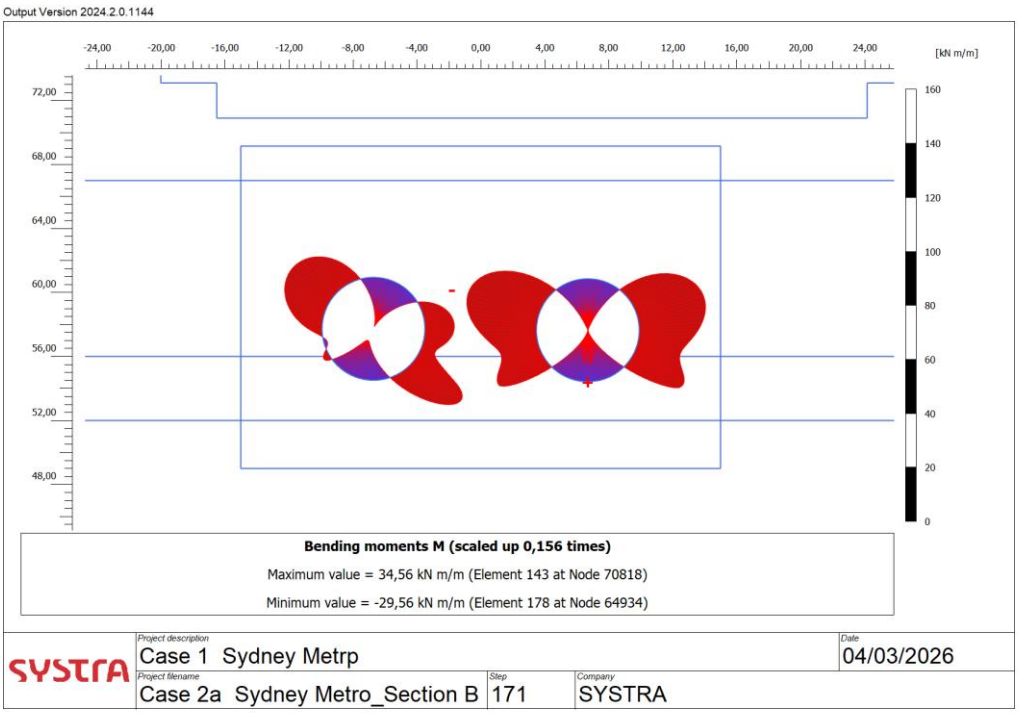
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 (Load Case 6)



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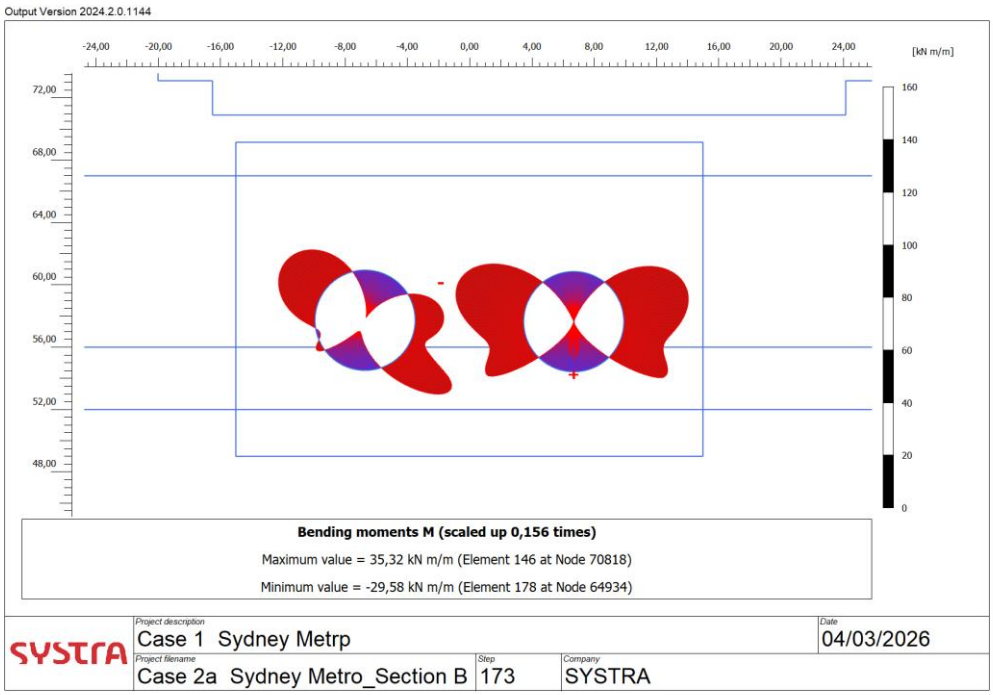
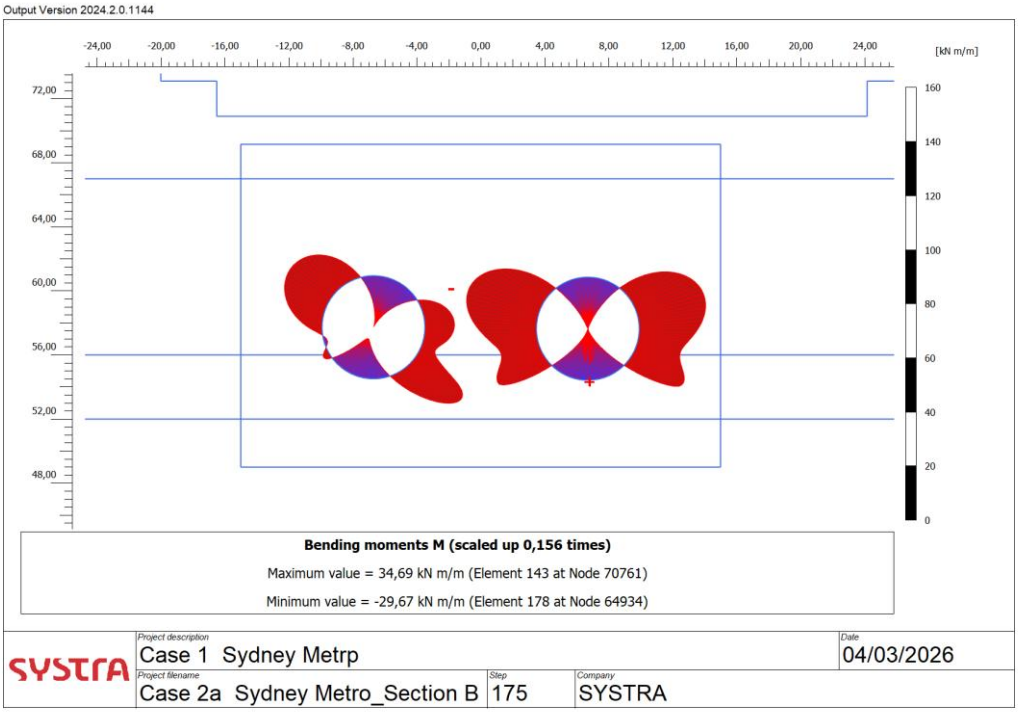
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 +Exceptional Wedge Load (Load Case 6.1)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



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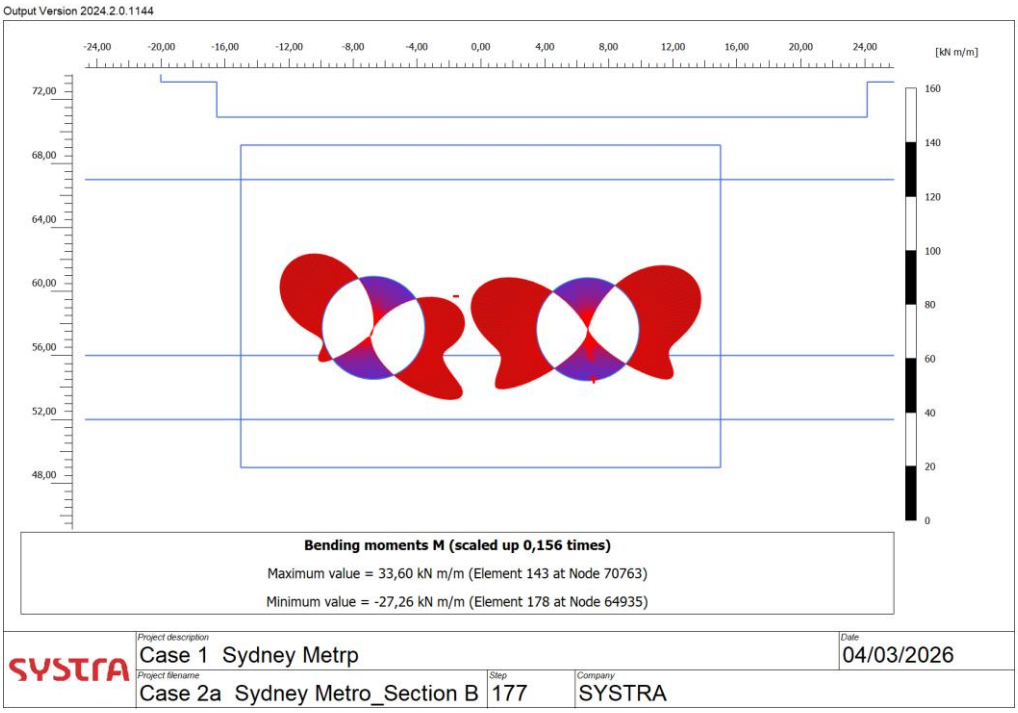
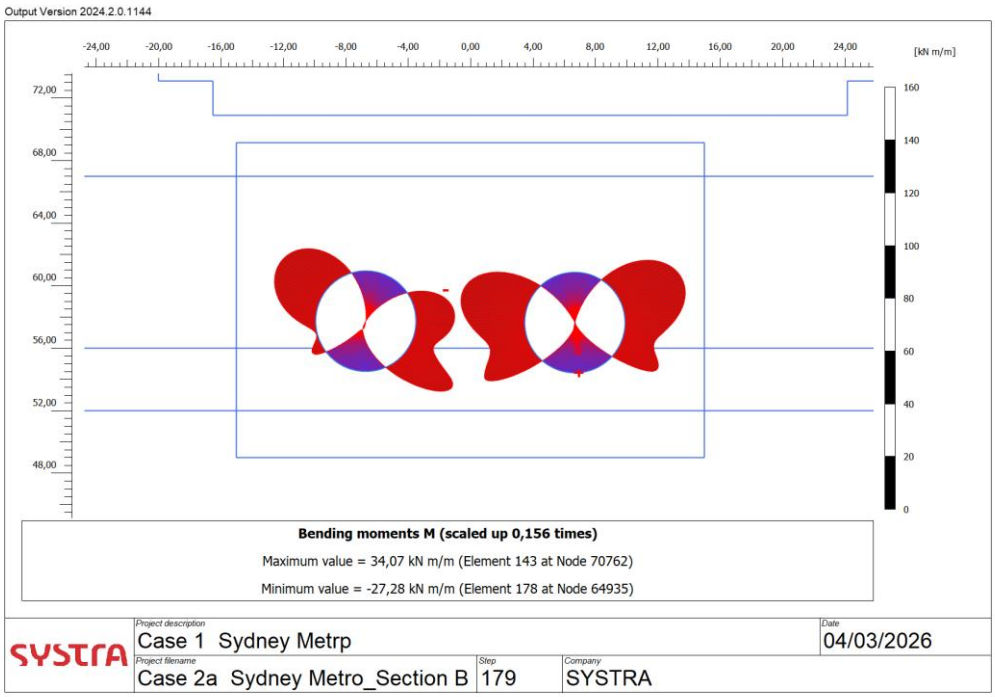
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 15 (Load Case 7)



Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



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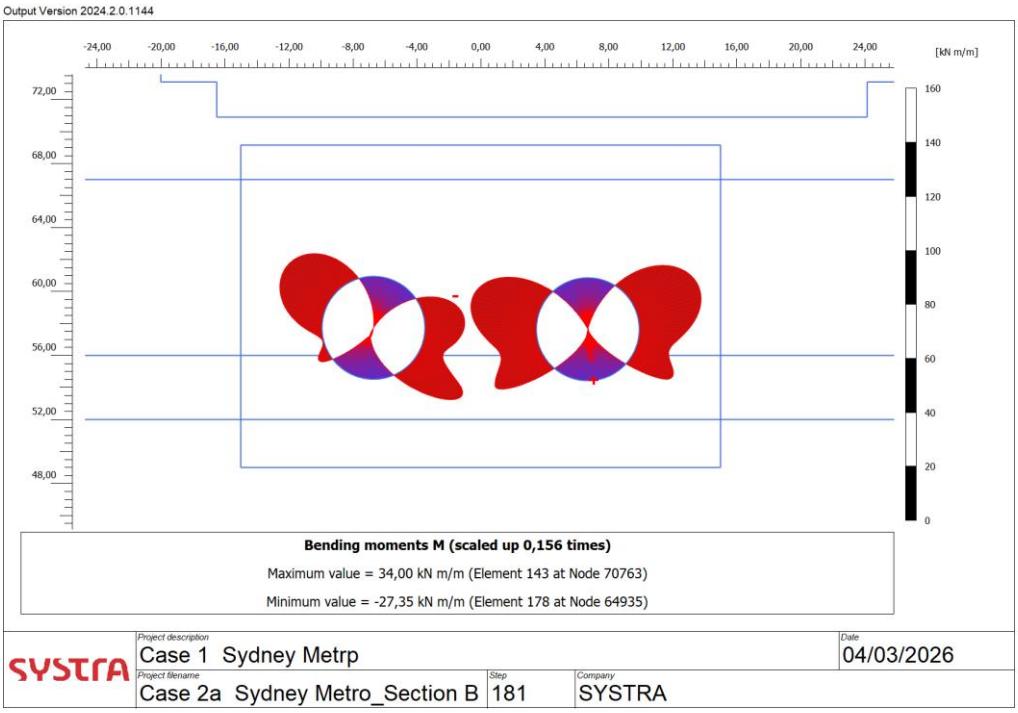
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 1 +Typical Wedge Load (Load Case 7.2)



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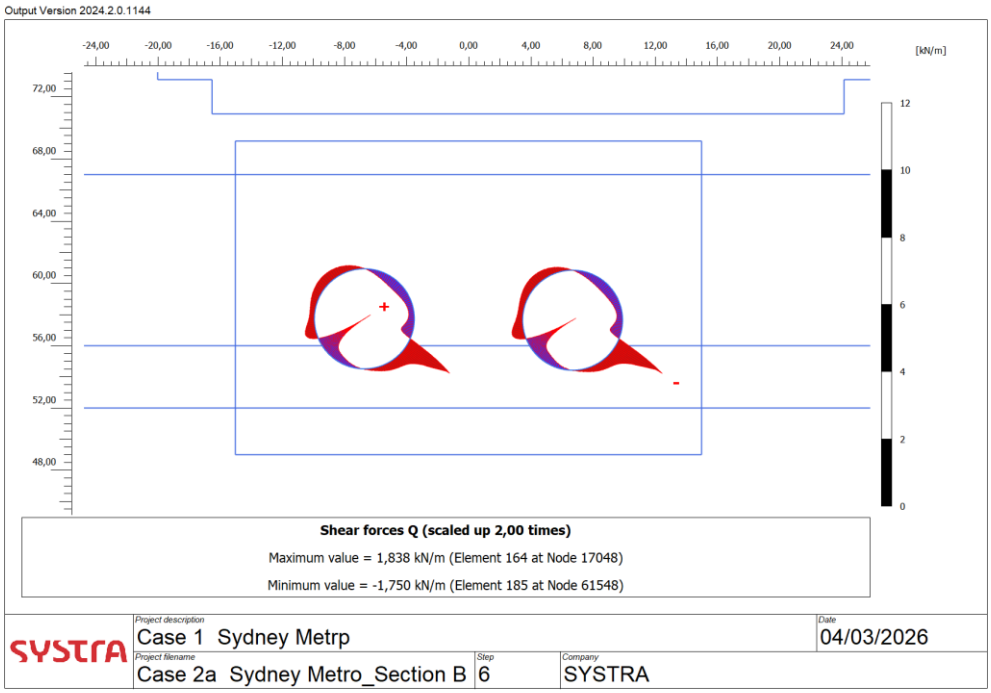
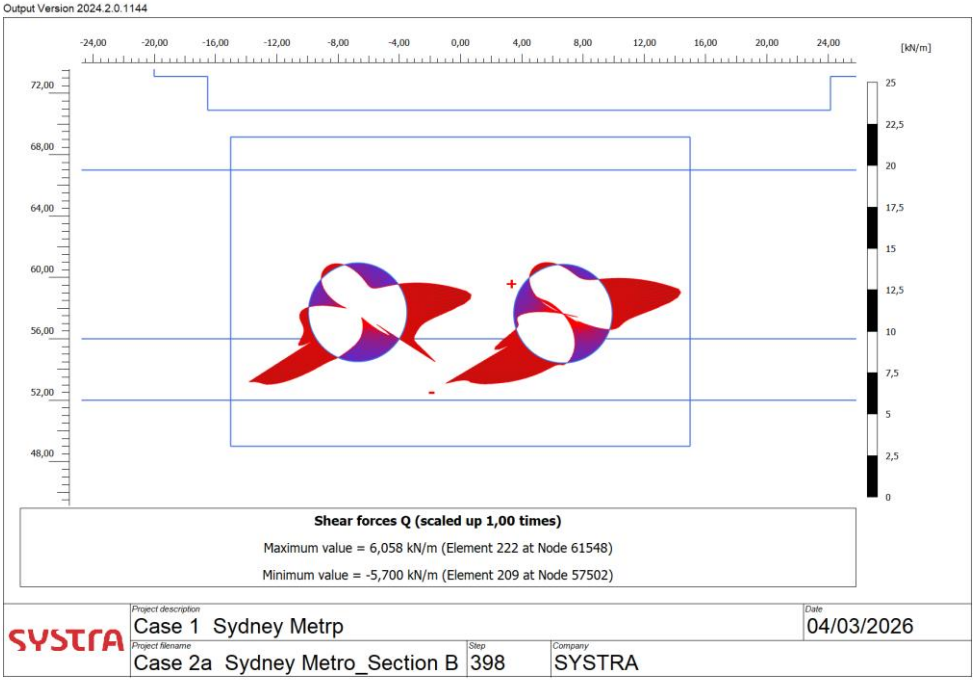
CHARACTERISTIC SHEAR FORCE ON THE LINER

Characteristic Shear Force Q (kN/m) - Stage 0: Metro tunnels lining installation (Load Case 1)



Characteristic Shear Force Q (kN/m) - Stage 1: Reset displacements and remove applied loads on the site to simulate demolition (Load Case 2)



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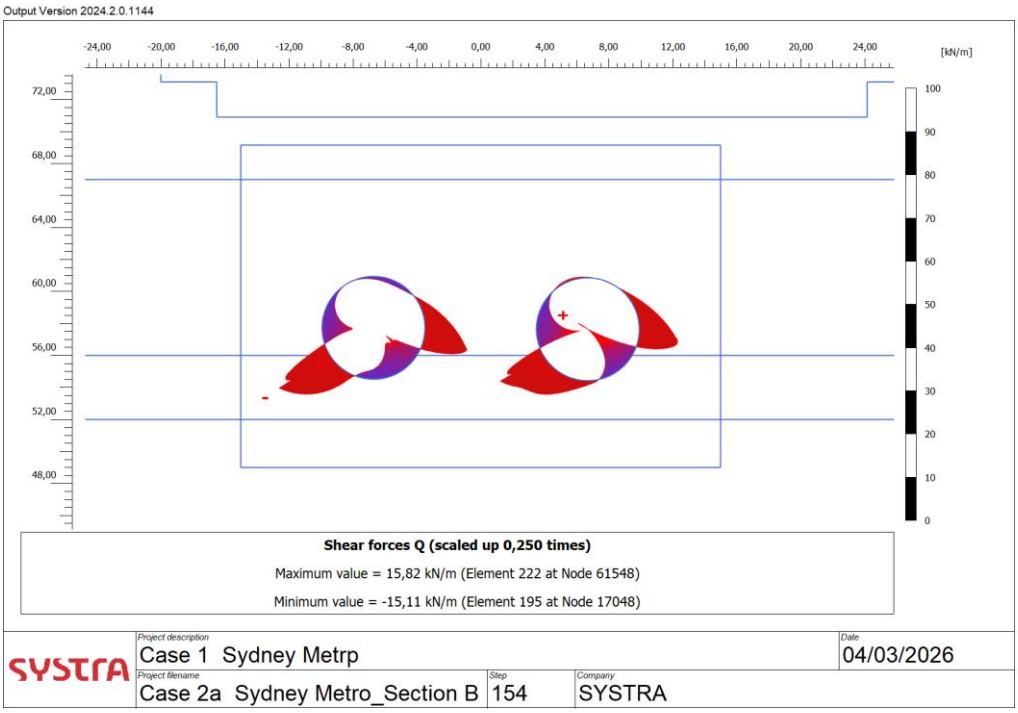
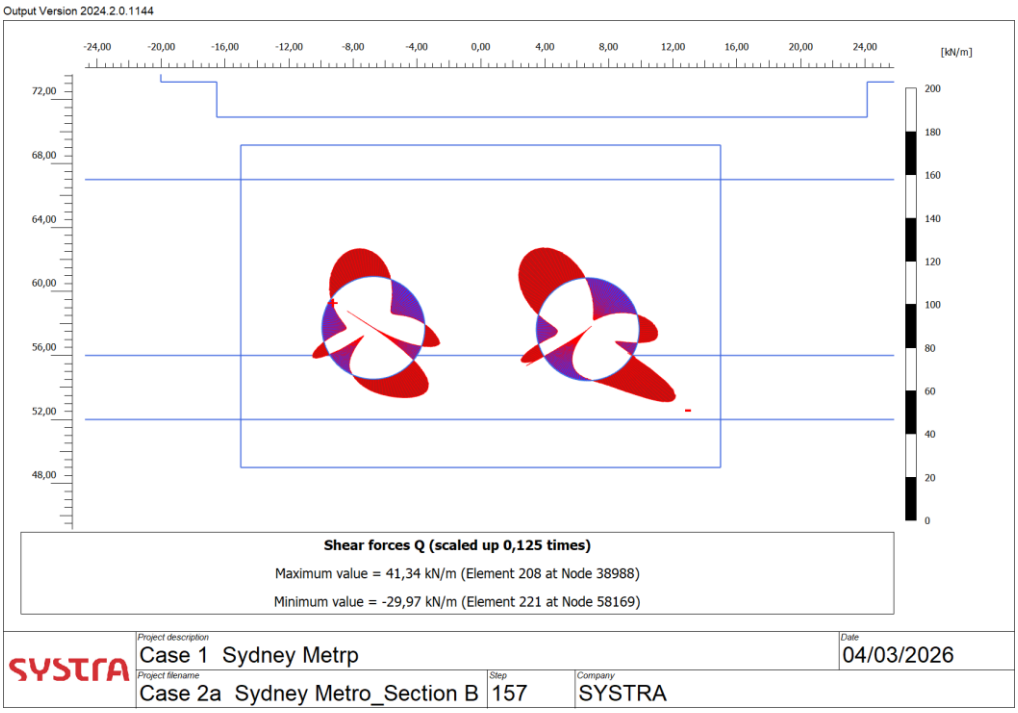
Characteristic Shear Force Q (kN/m) - Stage 1: Excavate proposed basement (Load Case 3)



Characteristic Shear Force Q (kN/m) - Stage 2: Apply new G+0.7Q building load (Load Case 4)



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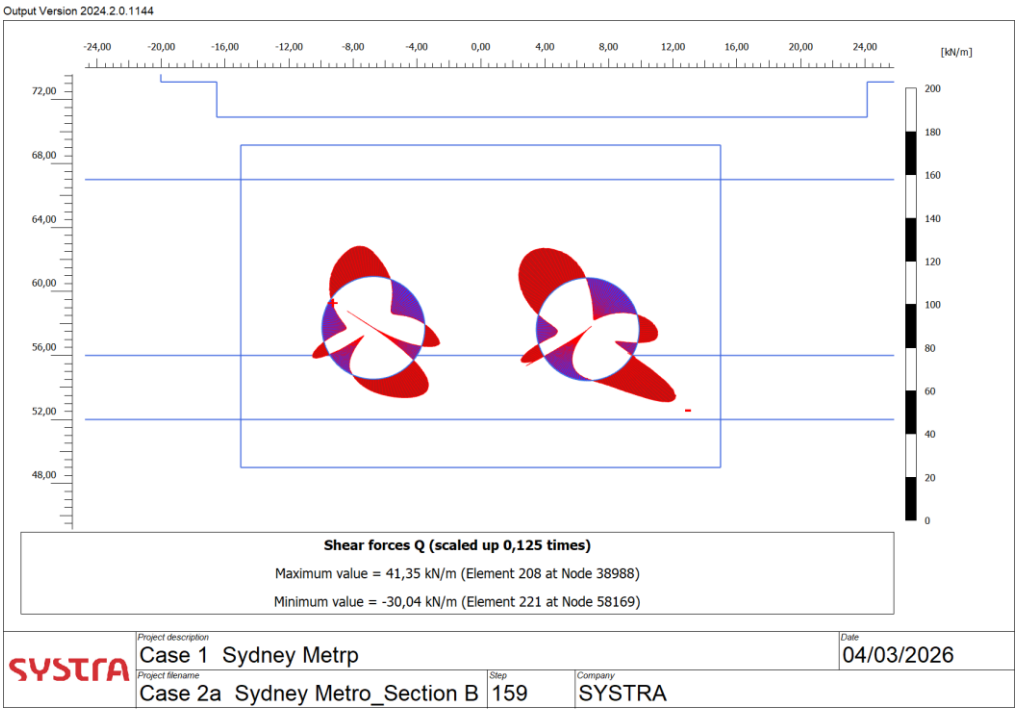
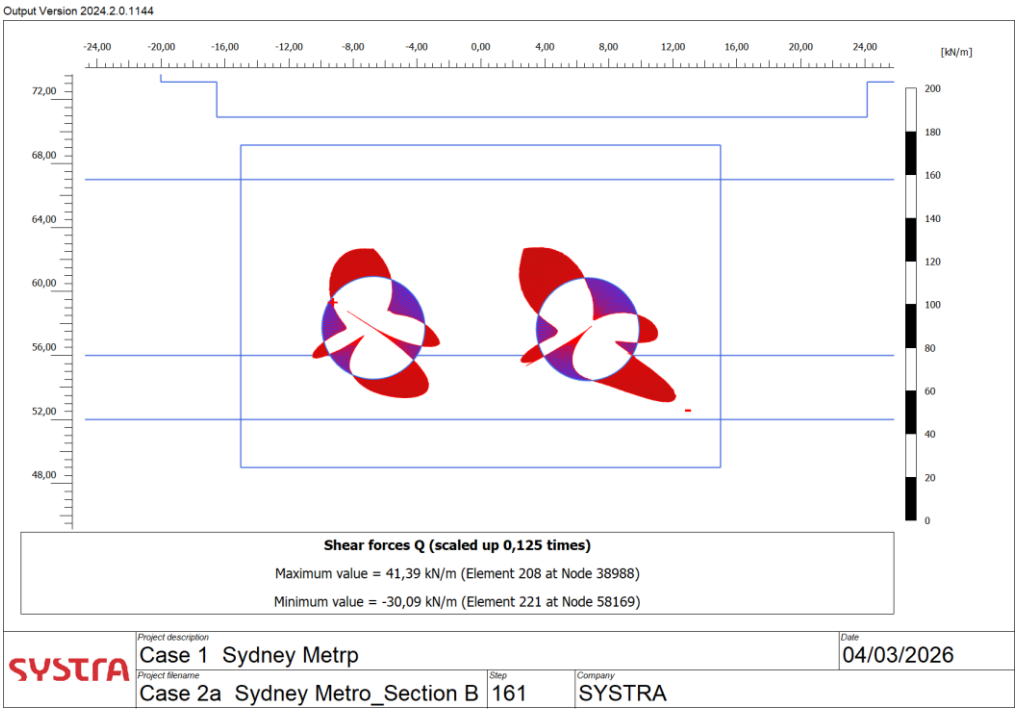
Characteristic Shear Force Q (kN/m) - Stage 2: Apply new G+0.7Q building load +Exceptional Wedge Load (Load Case 4.1)



Characteristic Shear Force Q (kN/m) - Stage 2: Apply new G+0.7Q building load +Typical Wedge Load (Load Case 4.2)



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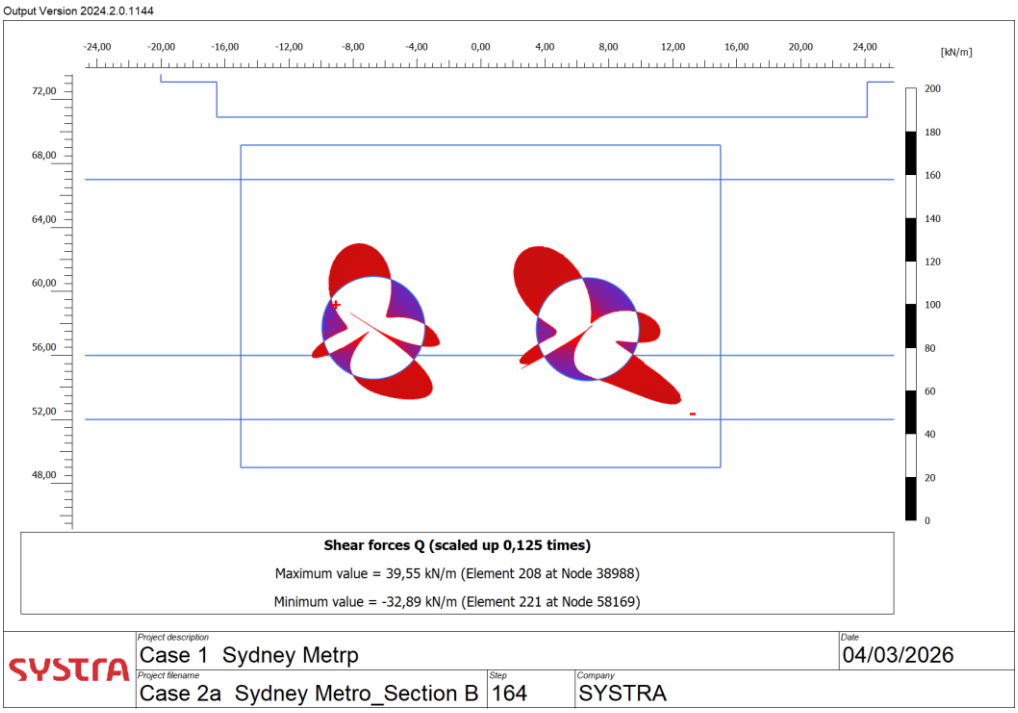
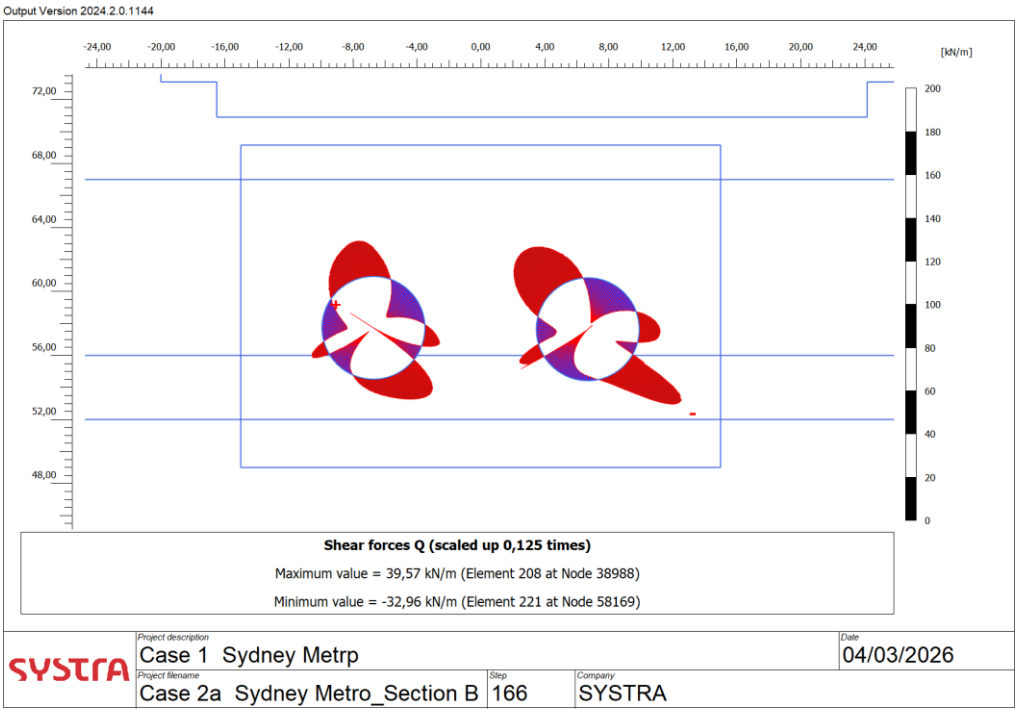
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 (Load Case 5)



Characteristic Shear Force Q (kN/m) - Stage 2: Apply wind building load case 11 +Exceptional Wedge Load (Load Case 5.1)



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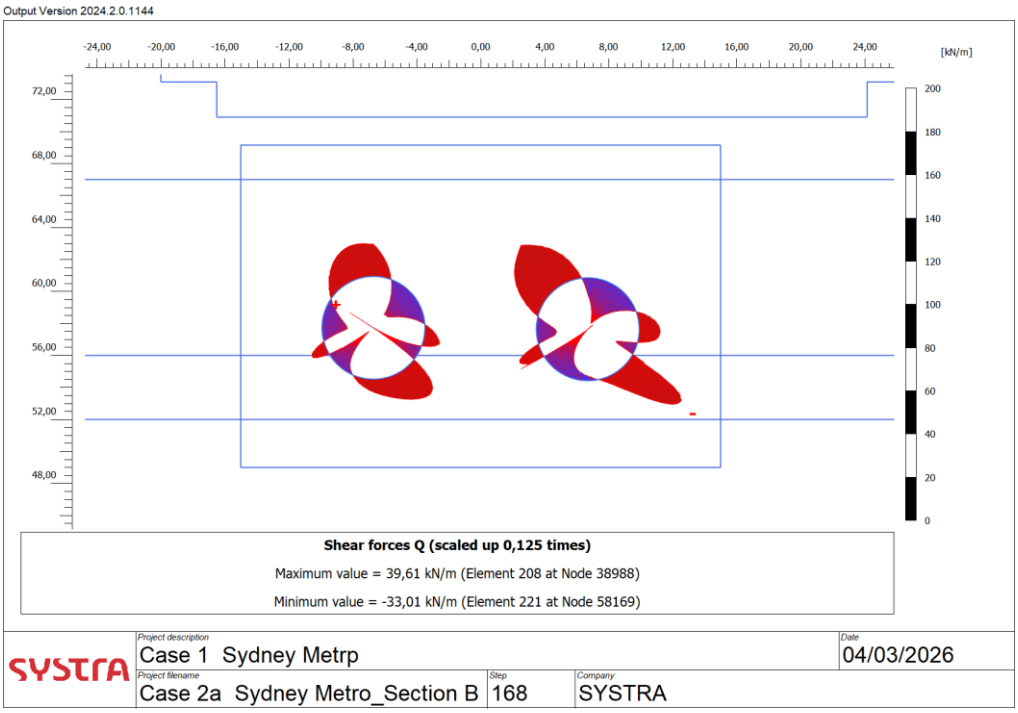
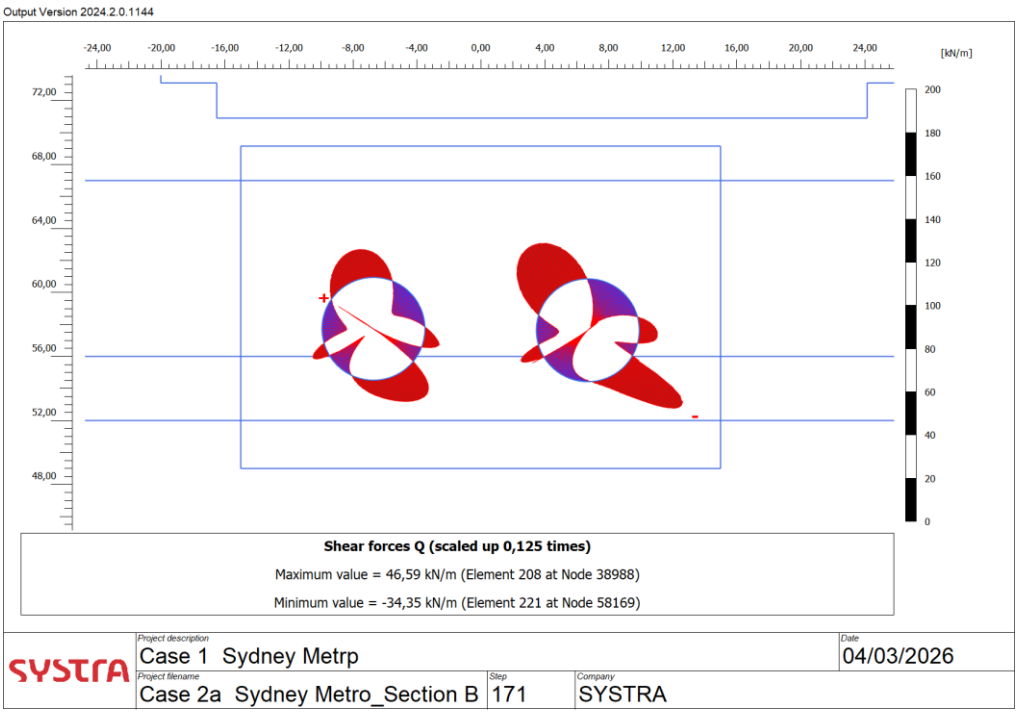
Characteristic Bending Moment M (kNm/m) - Stage 2: Apply wind building load case 11 +Typical Wedge Load (Load Case 5.2)



Characteristic Shear Force Q (kN/m) - Stage 2: Apply wind building load case 14 (Load Case 6)



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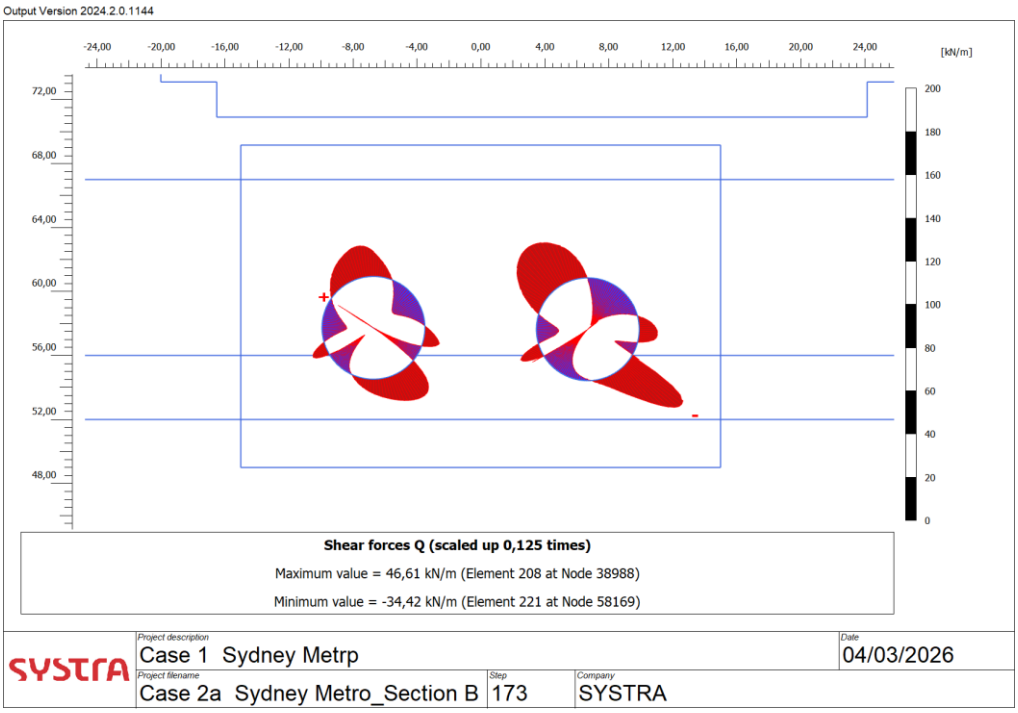
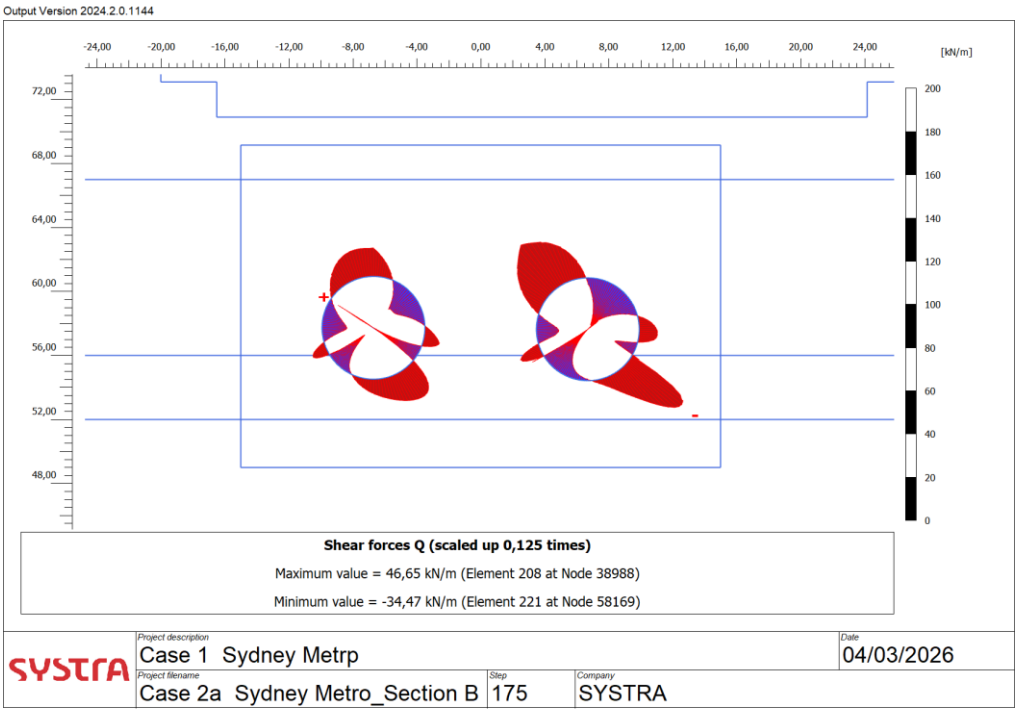


Characteristic Shear Force Q (kN/m) - Stage 2: Apply wind building load case 14 +Typical Wedge Load (Load Case 6.2)



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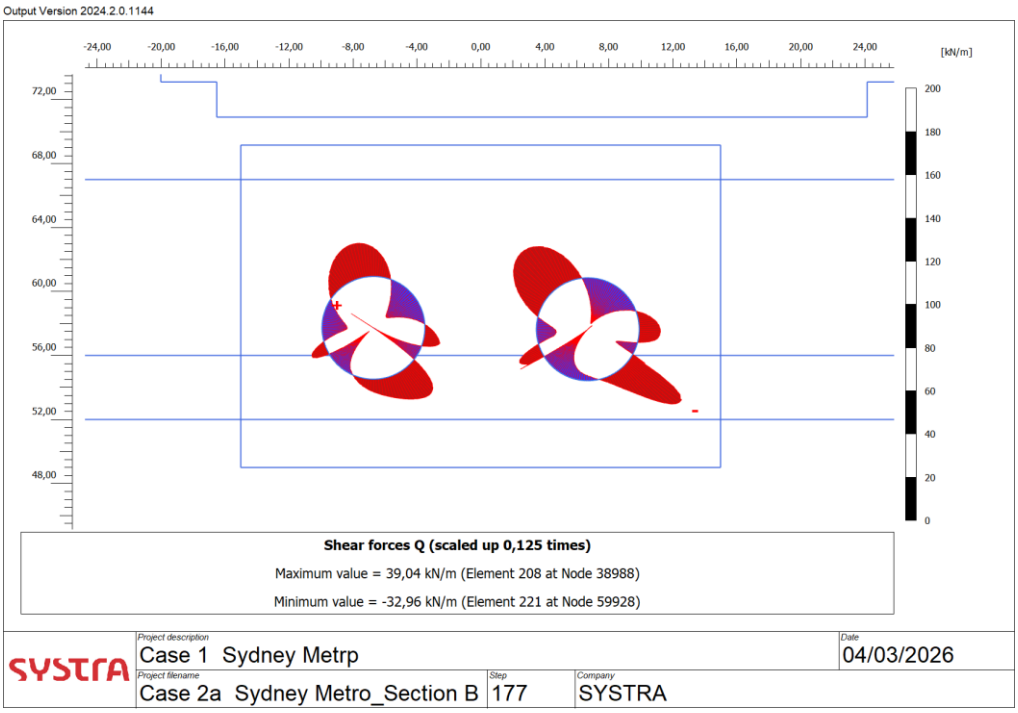
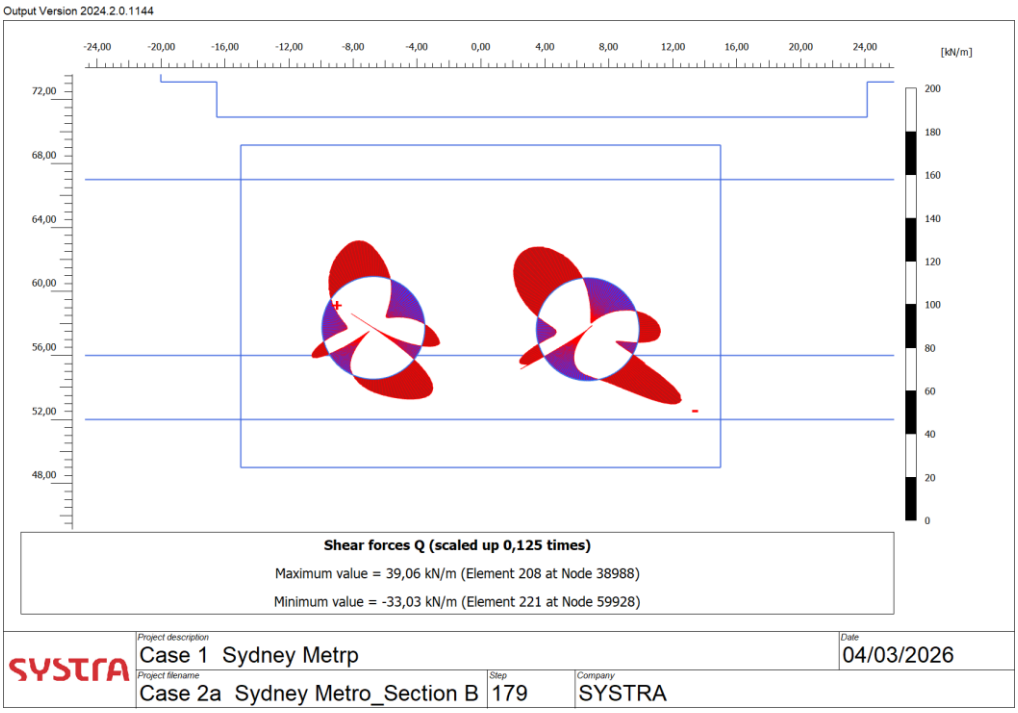
Characteristic Shear Force Q (kN/m) - Stage 2: Apply wind building load case 15 (Load Case 7)



Characteristic Shear Force Q (kN/m) - Stage 2: Apply wind building load case 15 +Exceptional Wedge Load (Load Case 7.1)



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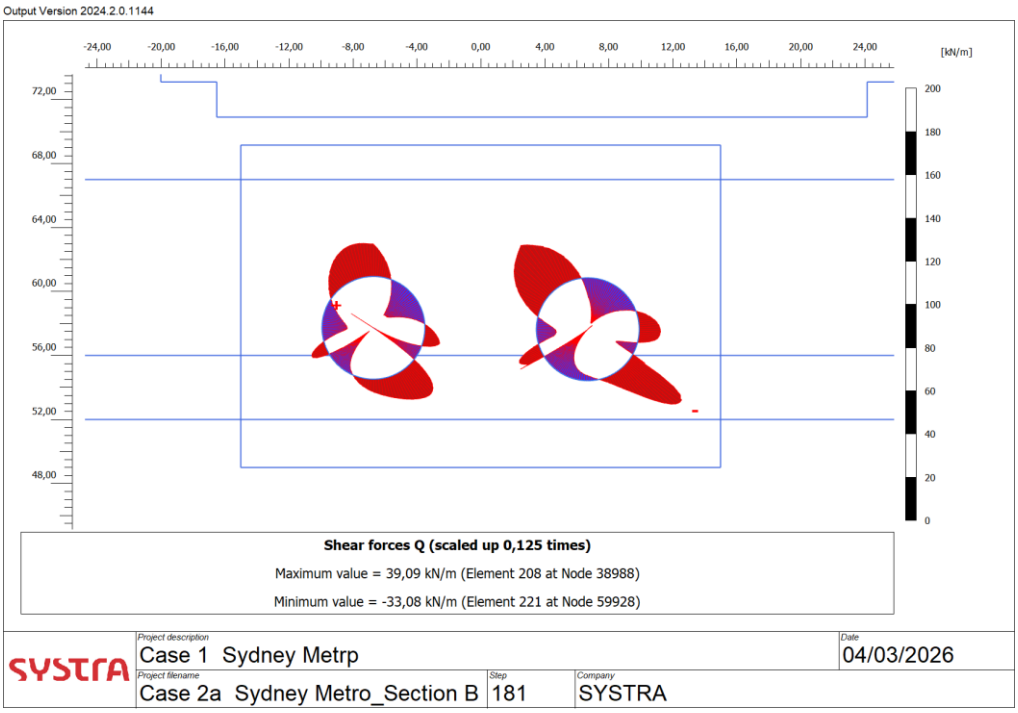

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ANNEX 3: LONGITUDINAL JOINT CHECKS FROM 2D GEOTECHNICAL FEM MODEL

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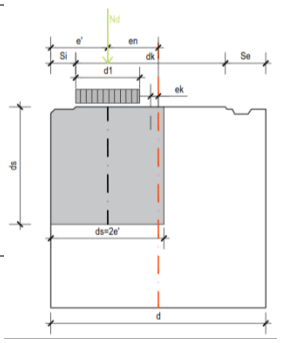
LONGITUDINAL JOINT

CASE 1 – EXCAVATION PHASE

Joint and load configuration

Joint geometry

d	[mm]	260	*Total segment thickness*
L	[mm]	1700	*Joint width (longitudinal direction)*
s_i	[mm]	57	*Recess length at the intrados*
s_e	[mm]	55	*Recess length at the extrados*
s_l	[mm]	52	*Recess length at the angle in longitudinal direction*
d_k	[mm]	148	*Joint height*
ε	[mm]	5	*Eccentricity due to ovalizations or misalignments*
e_G	[mm]	131	*Distance from joint axis to intrados*
e_k	[mm]	-1	*Eccentricity axis segment-joint (positive toward the intr.)*
L_k	[mm]	1596	*Average joint length (longitudinal direction)*



Materials characteristics and partial safety factors

f_{R1k}	[MPa]	60	*Characteristic yield strength of reinforcement*
f_{R3k}	[MPa]	50	*Characteristic compressive cylinder strength of concrete*
α_{ct}	[MPa]	1.00	*Concrete long term coefficient*
$\gamma_{m,c}$	[-]	1.50	*Partial factor for concrete*
$\gamma_{m,s}$	[-]	1.15	*Partial factor for reinforcement*
f_{R1k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD1*
f_{R3k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD4*
f_{ct}	[MPa]	5.00	*Minimum tensile splitting strength*

Design stresses and contact zone geometry

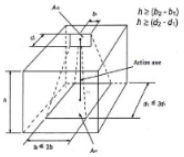
		Inv 1	*Inv 2*	
N_d	[kN]	96	73	*Design axial force*
M_d	[kNm]	-7	-5	*Design bending moment (positive if bending the extrados)*
e_n	[mm]	-70	-70	*Load eccentricity (positive at the intrados)*
e_{tot}	[mm]	-75	-75	*Total load eccentricity (positive at the intrados)*
e'	[mm]	55	55	*Distance from load axis to intrados*
d_1	[mm]	0	-1	*Equivalent width of the loaded zone*
d_s	[mm]	110	109	*Compressed zone height*
A	[m^2]	0.00	0.00	*Equivalent loaded surface*
b_2	[m]	0.11	0.11	*Load distribution width*
d_2	[m]	1.70	1.70	*Load distribution length*
A'	[m^2]	0.19	0.19	*Load distribution surface*
m	[-]	0.51	0.51	*Eccentricity ratio*

Inv 1 : *Load case 1- most critical safety factor for bursting verification*

Inv 2 : *Load case 2 - most critical safety factor for concrete compression verification*

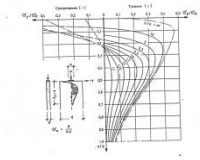
Concrete compression stresses verification (Inv 2)

h	[-]	3.00	*according to Leonhardt (A/A')* [1/2]
f'_{ad}	[MPa]	100.0	*Design compressive strength of concrete*
s_R	[MPa]	52.7	*Design compressive stress*
s_R / f'_{ad}	[-]	0.53	VERIFICATED



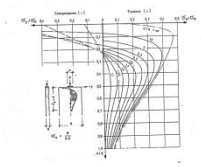
Radial bursting stresses verification SLS (Inv 1)

T	[kN]	24	*Design tensile stress*
s_0	[MPa]	0.4	*Design tensile stress*
$s_{y,max}$	[MPa]	0.2	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	5.0	*Resistance tensile stress SLS*
$s_{y,max} / f_{ct}$	[-]	0.03	VERIFICATED



Radial bursting stresses verification ULS (Inv 1)

T	[kN]	24	*Design tensile stress*
s_0	[MPa]	0.5	*Design tensile stress*
$s_{y,max}$	[MPa]	0.2	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	3.3	*Resistance tensile stress ULS*
$s_{y,max} / f_{ct}$	[-]	0.07	VERIFICATED



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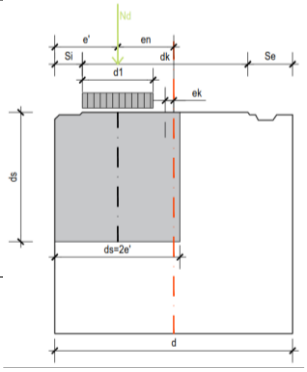
CASE 1 – G+0.7Q+TW PHASE

Joint and load configuration

Joint geometry

d	[mm]	260	*Total segment thickness*
L	[mm]	1700	*Joint width (longitudinal direction)*
s_i	[mm]	57	*Recess length at the intrados*
s_e	[mm]	55	*Recess length at the extrados*
s_l	[mm]	52	*Recess length at the angle in longitudinal direction*
d_k	[mm]	148	*Joint height*
ε	[mm]	5	*Eccentricity due to ovalizations or misalignments*
e_G	[mm]	131	*Distance from joint axis to intrados*
e_k	[mm]	-1	*Eccentricity axis segment-joint (positive toward the intr.)*
L_k	[mm]	1596	*Average joint length (longitudinal direction)*



Materials characteristics and partial safety factors

f_{R1k}	[MPa]	60	*Characteristic yield strength of reinforcement*
f_{R3k}	[MPa]	50	*Characteristic compressive cylinder strength of concrete*
f_{ct}	[MPa]	0.85	*Concrete long term coefficient*
$\gamma_{m,c}$	[-]	1.50	*Partial factor for concrete*
$\gamma_{m,s}$	[-]	1.15	*Partial factor for reinforcement*
f_{R1k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD1*
f_{R3k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD4*
f_{ct}	[MPa]	5.00	*Minimum tensile splitting strength*

Design stresses and contact zone geometry

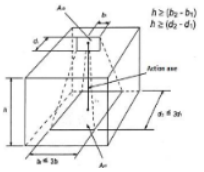
		Inv 1	*Inv 2*	
N_d	[kN]	4858	4858	*Design axial force*
M_d	[kNm]	68	68	*Design bending moment (positive if bending the extrados)*
e_n	[mm]	14	14	*Load eccentricity (positive at the intrados)*
e_{tot}	[mm]	19	19	*Total load eccentricity (positive at the intrados)*
e'	[mm]	111	111	*Distance from load axis to intrados*
d_1	[mm]	108	108	*Equivalent width of the loaded zone*
d_s	[mm]	222	222	*Compressed zone height*
A	[m^2]	0.17	0.17	*Equivalent loaded surface*
b_2	[m]	0.22	0.22	*Load distribution width*
d_2	[m]	1.70	1.70	*Load distribution length*
A'	[m^2]	0.38	0.38	*Load distribution surface*
m	[-]	0.13	0.13	*Eccentricity ratio*

Inv 1 : *Load case 1- most critical safety factor for bursting verification*

Inv 2 : *Load case 2 - most critical safety factor for concrete compression verification*

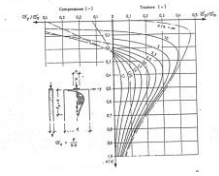
Concrete compression stresses verification (Inv 2)

h	[-]	1.48	*according to Leonhardt (A/A')* (1/2)
f'_{ad}	[MPa]	41.9	*Design compressive strength of concrete*
s_R	[MPa]	28.2	*Design compressive stress*
s_R / f'_{ad}	[-]	0.67	VERIFICATED



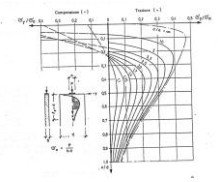
Radial bursting stresses verification SLS (Inv 1)

T	[kN]	416	*Design tensile stress*
s_0	[MPa]	9.5	*Design tensile stress*
$s_{y,max}$	[MPa]	2.2	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	5.0	*Resistance tensile stress SLS*
$s_{y,max} / f_{ct}$	[-]	0.43	VERIFICATED



Radial bursting stresses verification ULS (Inv 1)

T	[kN]	624	*Design tensile stress*
s_0	[MPa]	12.9	*Design tensile stress*
$s_{y,max}$	[MPa]	2.9	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	3.3	*Resistance tensile stress ULS*
$s_{y,max} / f_{ct}$	[-]	0.87	VERIFICATED



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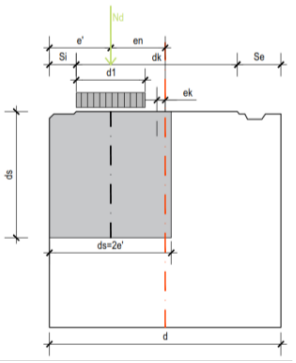
CASE 1 – LOAD CASE 15 + TW PHASE

Joint and load configuration

Joint geometry

d	[mm]	260	*Total segment thickness*
L	[mm]	1700	*Joint width (longitudinal direction)*
s_i	[mm]	57	*Recess length at the intrados*
s_e	[mm]	55	*Recess length at the extrados*
s_l	[mm]	52	*Recess length at the angle in longitudinal direction*
d_k	[mm]	148	*Joint height*
ε	[mm]	5	*Eccentricity due to ovalizations or misalignments*
e_G	[mm]	131	*Distance from joint axis to intrados*
e_k	[mm]	-1	*Eccentricity axis segment-joint (positive toward the intr.)*
L_k	[mm]	1596	*Average joint length (longitudinal direction)*



Materials characteristics and partial safety factors

f_{R1k}	[MPa]	60	*Characteristic yield strength of reinforcement*
f_{R3k}	[MPa]	50	*Characteristic compressive cylinder strength of concrete*
f_{ct}	[MPa]	0.85	*Concrete long term coefficient*
$\gamma_{m,c}$	[-]	1.50	*Partial factor for concrete*
$\gamma_{m,s}$	[-]	1.15	*Partial factor for reinforcement*
f_{R1k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD1*
f_{R3k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD4*
f_{ct}	[MPa]	5.00	*Minimum tensile splitting strength*

Design stresses and contact zone geometry

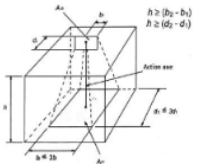
		Inv 1	*Inv 2*	
N_d	[kN]	5195	5164	*Design axial force*
M_d	[kNm]	72	74	*Design bending moment (positive if bending the extrados)*
e_n	[mm]	14	14	*Load eccentricity (positive at the intrados)*
e_{tot}	[mm]	19	19	*Total load eccentricity (positive at the intrados)*
e'	[mm]	111	111	*Distance from load axis to intrados*
d_1	[mm]	108	107	*Equivalent width of the loaded zone*
d_s	[mm]	222	221	*Compressed zone height*
A	[m^2]	0.17	0.17	*Equivalent loaded surface*
b_2	[m]	0.22	0.22	*Load distribution width*
d_2	[m]	1.70	1.70	*Load distribution length*
A'	[m^2]	0.38	0.38	*Load distribution surface*
m	[-]	0.13	0.13	*Eccentricity ratio*

Inv 1 : *Load case 1- most critical safety factor for bursting verification*

Inv 2 : *Load case 2 - most critical safety factor for concrete compression verification*

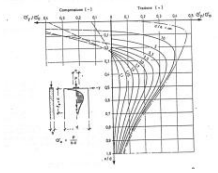
Concrete compression stresses verification (Inv 2)

h	[-]	1.48	*according to Leonhardt (A/A')* [1/2]
f'_{ad}	[MPa]	42.0	*Design compressive strength of concrete*
s_R	[MPa]	30.2	*Design compressive stress*
s_R / f'_{ad}	[-]	0.72	VERIFICATED



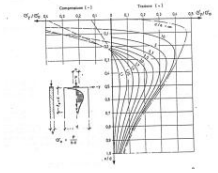
Radial bursting stresses verification SLS (Inv 1)

T	[kN]	444	*Design tensile stress*
s_0	[MPa]	10.2	*Design tensile stress*
$s_{y,max}$	[MPa]	2.3	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	5.0	*Resistance tensile stress SLS*
$s_{y,max} / f_{ct}$	[-]	0.46	VERIFICATED



Radial bursting stresses verification ULS (Inv 1)

T	[kN]	666	*Design tensile stress*
s_0	[MPa]	13.8	*Design tensile stress*
$s_{y,max}$	[MPa]	3.1	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	3.3	*Resistance tensile stress ULS*
$s_{y,max} / f_{ct}$	[-]	0.93	VERIFICATED



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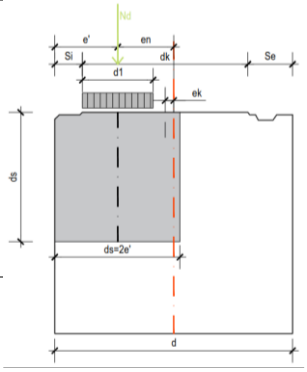
CASE 2 - EXCAVATION PHASE

Joint and load configuration

Joint geometry

d	[mm]	260	*Total segment thickness*
L	[mm]	1700	*Joint width (longitudinal direction)*
s_i	[mm]	57	*Recess length at the intrados*
s_e	[mm]	55	*Recess length at the extrados*
s_l	[mm]	52	*Recess length at the angle in longitudinal direction*
d_k	[mm]	148	*Joint height*
ε	[mm]	5	*Eccentricity due to ovalizations or misalignments*
e_G	[mm]	131	*Distance from joint axis to intrados*
e_k	[mm]	-1	*Eccentricity axis segment-joint (positive toward the intr.)*
L_k	[mm]	1596	*Average joint length (longitudinal direction)*



Materials characteristics and partial safety factors

f_{R1k}	[MPa]	60	*Characteristic yield strength of reinforcement*
f_{R3k}	[MPa]	50	*Characteristic compressive cylinder strength of concrete*
α_{ct}	[MPa]	1.00	*Concrete long term coefficient*
$\gamma_{m,c}$	[-]	1.50	*Partial factor for concrete*
$\gamma_{m,s}$	[-]	1.15	*Partial factor for reinforcement*
f_{R1k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD1*
f_{R3k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD4*
f_{ct}	[MPa]	5.00	*Minimum tensile splitting strength*

Design stresses and contact zone geometry

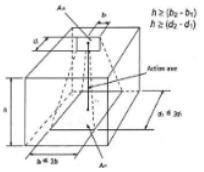
		Inv 1	*Inv 2*	
N_d	[kN]	93	82	*Design axial force*
M_d	[kNm]	-7	6	*Design bending moment (positive if bending the extrados)*
e_n	[mm]	-72	75	*Load eccentricity (positive at the intrados)*
e_{tot}	[mm]	-77	80	*Total load eccentricity (positive at the intrados)*
e'	[mm]	53	50	*Distance from load axis to intrados*
d_1	[mm]	-4	-13	*Equivalent width of the loaded zone*
d_s	[mm]	106	101	*Compressed zone height*
A	[m^2]	0.01	0.02	*Equivalent loaded surface*
b_2	[m]	0.11	0.10	*Load distribution width*
d_2	[m]	1.70	1.70	*Load distribution length*
A'	[m^2]	0.18	0.17	*Load distribution surface*
m	[-]	0.52	0.54	*Eccentricity ratio*

Inv 1 : *Load case 1- most critical safety factor for bursting verification*

Inv 2 : *Load case 2 - most critical safety factor for concrete compression verification*

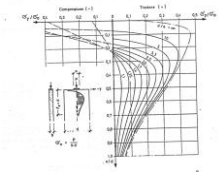
Concrete compression stresses verification (Inv 2)

h	[-]	2.83	*according to Leonhardt (A/A')* (1/2)
f'_{ad}	[MPa]	94.3	*Design compressive strength of concrete*
s_R	[MPa]	3.8	*Design compressive stress*
s_R / f'_{ad}	[-]	0.04	VERIFICATED



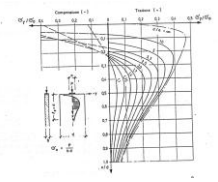
Radial bursting stresses verification SLS (Inv 1)

T	[kN]	16	*Design tensile stress*
s_0	[MPa]	0.4	*Design tensile stress*
$s_{y,max}$	[MPa]	0.2	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	5.0	*Resistance tensile stress SLS*
$s_{y,max} / f_{ct}$	[-]	0.03	VERIFICATED



Radial bursting stresses verification ULS (Inv 1)

T	[kN]	24	*Design tensile stress*
s_0	[MPa]	0.5	*Design tensile stress*
$s_{y,max}$	[MPa]	0.2	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	3.3	*Resistance tensile stress ULS*
$s_{y,max} / f_{ct}$	[-]	0.07	VERIFICATED



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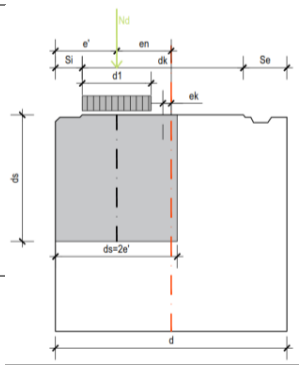
CASE 2 - G+0.7Q +TW PHASE

Section A

Joint and load configuration

Joint geometry

d	[mm]	260	*Total segment thickness*
L	[mm]	1700	*Joint width (longitudinal direction)*
s_i	[mm]	55	*Recess length at the intrados*
s_e	[mm]	57	*Recess length at the extrados*
s_l	[mm]	52	*Recess length at the angle in longitudinal direction*
d_k	[mm]	148	*Joint height*
ε	[mm]	5	*Eccentricity due to ovalizations or misalignments*
e_G	[mm]	129	*Distance from joint axis to intrados*
e_k	[mm]	1	*Eccentricity axis segment-joint (positive toward the intr.)*
L_k	[mm]	1596	*Average joint length (longitudinal direction)*



Materials characteristics and partial safety factors

f_{R1k}	[MPa]	60	*Characteristic yield strength of reinforcement*
f_{R3k}	[MPa]	50	*Characteristic compressive cylinder strength of concrete*
f_{ct}	[MPa]	0.85	*Concrete long term coefficient*
$\gamma_{m,c}$	[-]	1.50	*Partial factor for concrete*
$\gamma_{m,s}$	[-]	1.15	*Partial factor for reinforcement*
f_{R1k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD1*
f_{R3k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD4*
f_{ct}	[MPa]	5.00	*Minimum tensile splitting strength*

Design stresses and contact zone geometry

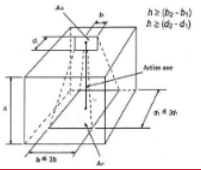
		Inv 1	*Inv 2*	
N_d	[kN]	5214	5190	*Design axial force*
M_d	[kNm]	42	44	*Design bending moment (positive if bending the extrados)*
e_n	[mm]	8	8	*Load eccentricity (positive at the intrados)*
e_{tot}	[mm]	13	13	*Total load eccentricity (positive at the intrados)*
e'	[mm]	117	117	*Distance from load axis to intrados*
d_1	[mm]	124	123	*Equivalent width of the loaded zone*
d_s	[mm]	234	233	*Compressed zone height*
A	[m^2]	0.20	0.20	*Equivalent loaded surface*
b_2	[m]	0.23	0.23	*Load distribution width*
d_2	[m]	1.70	1.70	*Load distribution length*
A'	[m^2]	0.40	0.40	*Load distribution surface*
m	[-]	0.09	0.09	*Eccentricity ratio*

Inv 1 : *Load case 1- most critical safety factor for bursting verification*

Inv 2 : *Load case 2 - most critical safety factor for concrete compression verification*

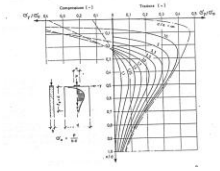
Concrete compression stresses verification (Inv 2)

h	[-]	1.42	*according to Leonhardt (A/A')* $^{(1/2)}$
f'_{ad}	[MPa]	40.2	*Design compressive strength of concrete*
s_R	[MPa]	26.4	*Design compressive stress*
s_R / f'_{ad}	[-]	0.66	VERIFICATED



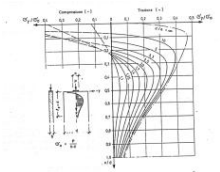
Radial bursting stresses verification SLS (Inv 1)

T	[kN]	409	*Design tensile stress*
s_0	[MPa]	9.7	*Design tensile stress*
$s_{y,max}$	[MPa]	2.0	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	5.0	*Resistance tensile stress SLS*
$s_{y,max} / f_{ct}$	[-]	0.40	VERIFICATED



Radial bursting stresses verification ULS (Inv 1)

T	[kN]	613	*Design tensile stress*
s_0	[MPa]	13.1	*Design tensile stress*
$s_{y,max}$	[MPa]	2.7	*Design tensile stress*
$f_{ct,SLU}$	[MPa]	2.8	*Resistance tensile stress ULS*
$s_{y,max} / f_{ct}$	[-]	0.96	VERIFICATED



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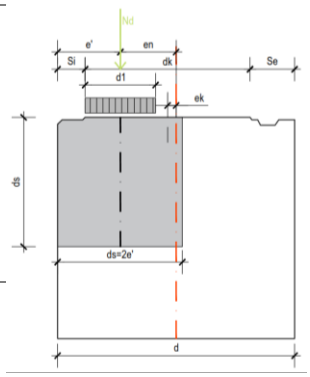
CASE 2 - LOAD CASE 15 TW PAHSE

Joint and load configuration

Joint geometry

d	[mm]	260	*Total segment thickness*
L	[mm]	1700	*Joint width (longitudinal direction)*
s_i	[mm]	55	*Recess length at the intrados*
s_e	[mm]	57	*Recess length at the extrados*
s_l	[mm]	52	*Recess length at the angle in longitudinal direction*
d_k	[mm]	148	*Joint height*
ε	[mm]	5	*Eccentricity due to ovalizations or misalignments*
e_G	[mm]	129	*Distance from joint axis to intrados*
e_k	[mm]	1	*Eccentricity axis segment-joint (positive toward the intr.)*
L_k	[mm]	1596	*Average joint length (longitudinal direction)*



Materials characteristics and partial safety factors

f_{R1k}	[MPa]	60	*Characteristic yield strength of reinforcement*
f_{R3k}	[MPa]	50	*Characteristic compressive cylinder strength of concrete*
f_{ct}	[MPa]	0.85	*Concrete long term coefficient*
$\gamma_{m,c}$	[-]	1.50	*Partial factor for concrete*
$\gamma_{m,s}$	[-]	1.15	*Partial factor for reinforcement*
f_{R1k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD1*
f_{R3k}	[MPa]	3.00	*Characteristic residual flexural tensile strength at CMOD4*
f_{ct}	[MPa]	5.00	*Minimum tensile splitting strength*

Design stresses and contact zone geometry

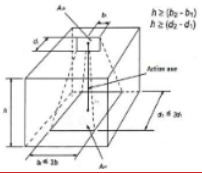
		Inv 1	Inv 2	
N_d	[kN]	6461	6439	*Design axial force*
M_d	[kNm]	65	67	*Design bending moment (positive if bending the extrados)*
e_n	[mm]	10	10	*Load eccentricity (positive at the intrados)*
e_{tot}	[mm]	15	15	*Total load eccentricity (positive at the intrados)*
e'	[mm]	115	115	*Distance from load axis to intrados*
d_1	[mm]	120	119	*Equivalent width of the loaded zone*
d_s	[mm]	230	229	*Compressed zone height*
A	[m^2]	0.19	0.19	*Equivalent loaded surface*
b_2	[m]	0.23	0.23	*Load distribution width*
d_2	[m]	1.70	1.70	*Load distribution length*
A'	[m^2]	0.39	0.39	*Load distribution surface*
m	[-]	0.10	0.10	*Eccentricity ratio*

Inv 1 : *Load case 1- most critical safety factor for bursting verification*

Inv 2 : *Load case 2 - most critical safety factor for concrete compression verification*

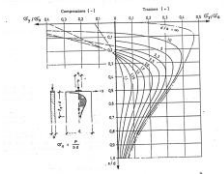
Concrete compression stresses verification (Inv 2)

h	[-]	1.43	*according to Leonhardt (A/A')* [1/2]
f'_{ad}	[MPa]	40.6	*Design compressive strength of concrete*
s_R	[MPa]	33.9	*Design compressive stress*
s_R / f'_{ad}	[-]	0.84	VERIFICATED



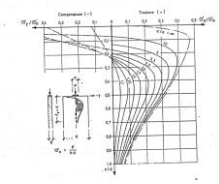
Radial bursting stresses verification SLS (Inv 1)

T	[kN]	515	*Design tensile stress*
s_0	[MPa]	12.2	*Design tensile stress*
$s_{y,max}$	[MPa]	2.6	*Design tensile stress*
$f_{ct,SLE}$	[MPa]	5.0	*Resistance tensile stress SLS*
$s_{y,max} / f_{ct}$	[-]	0.52	VERIFICATED



Radial bursting stresses verification ULS (Inv 1)

T	[kN]	773	*Design tensile stress*
s_0	[MPa]	16.5	*Design tensile stress*
$s_{y,max}$	[MPa]	3.5	*Design tensile stress*
$f_{ct,SLU}$	[MPa]	2.8	*Resistance tensile stress ULS*
$s_{y,max} / f_{ct}$	[-]	1.23	NOT VERIFICATED



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Theoretical ULS check is not satisfied, as a result nonlinear analysis is carried out for the ULS bursting check.

The stress-strain laws used were defined according to fib MC2010 considering a characteristic element size, l_{cs}, of 30mm based on the mesh. More details on stress-strain laws are presented below.

The nonlinear stress-strain of concrete has been defined according to fib MC2010.

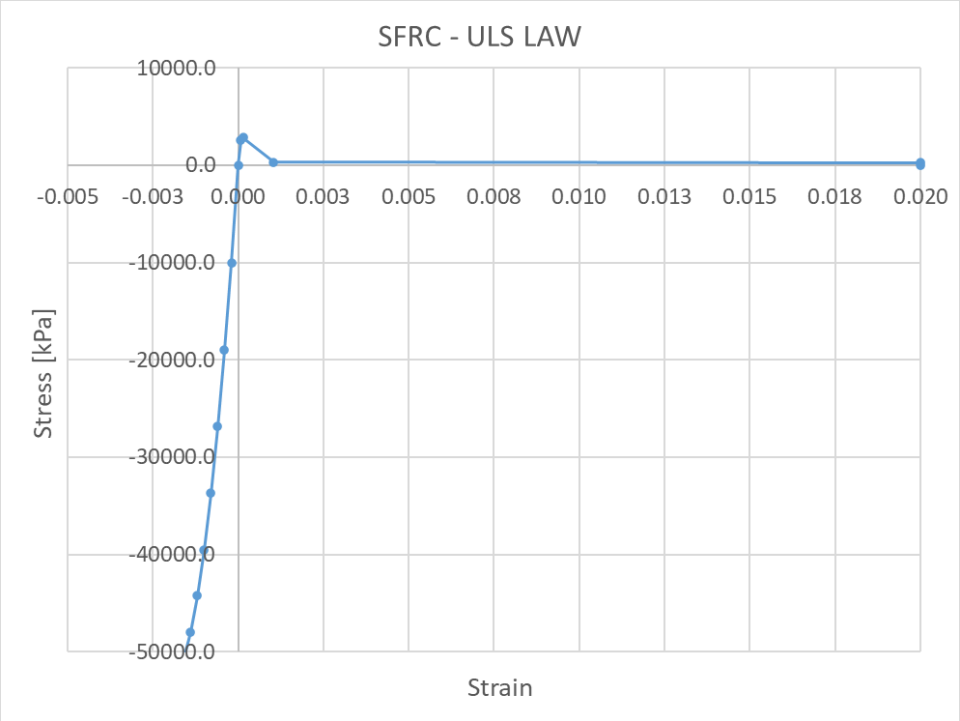

Figure 6-4 - SFRC stress-strain relationship for ULS

At ULS conditions, the constitutive law is limited to the tensile strain ε_{Fu} = 0.02. The FEM analysis will not converge if this limit is exceeded. The ULS limit of crack width is set w_{ULS} =2.5mm. The model geometry including the load applied is illustrated below.

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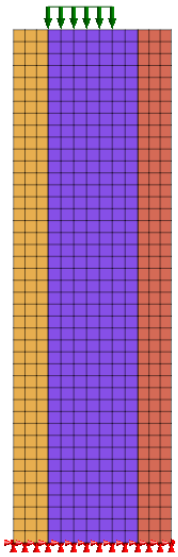
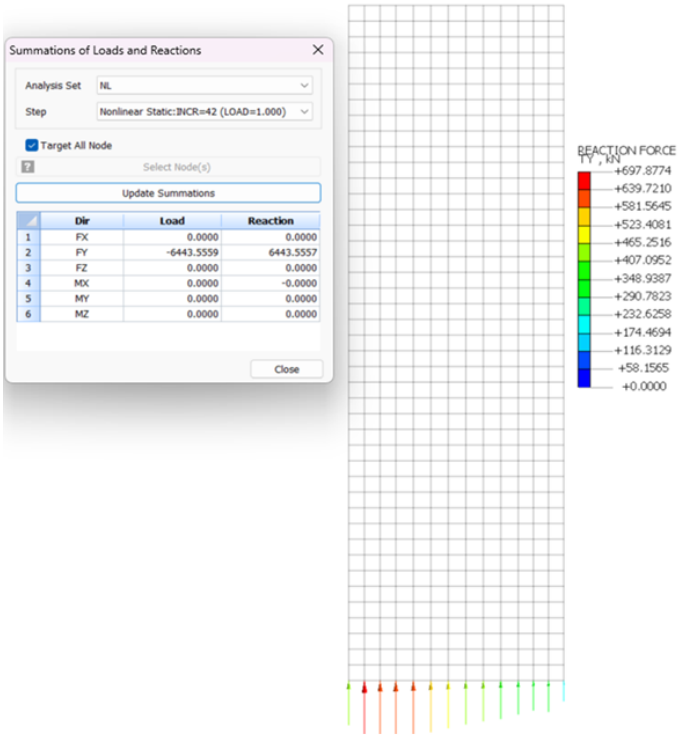


Figure 6-5 - FEM Model geometry including load configuration

At ULS, the constitutive law is limited to the tensile strain ε_{Fu} = 0.02. The FEM analysis will not converge if this limit is exceeded.

The first crack opening in the concrete begins when the critical strain ε_{ct} = 0.00015 is exceeded, in accordance with fib MC2010.



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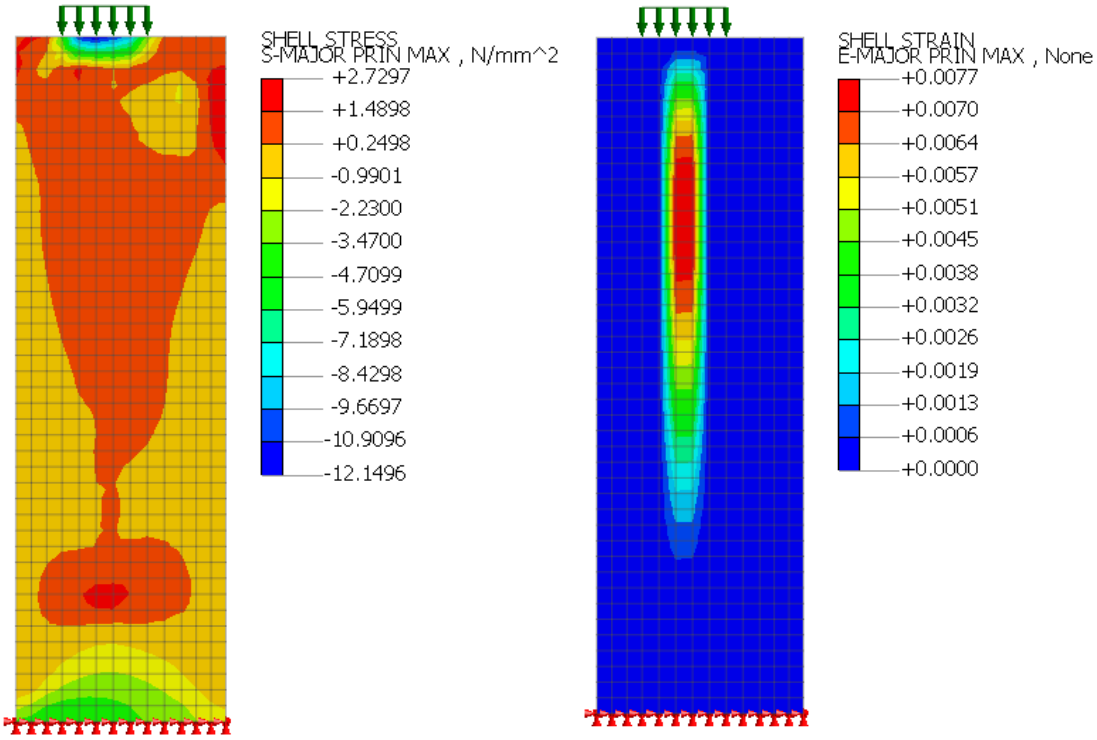

Figure 6-6 – Max principal stress and strain - ULS

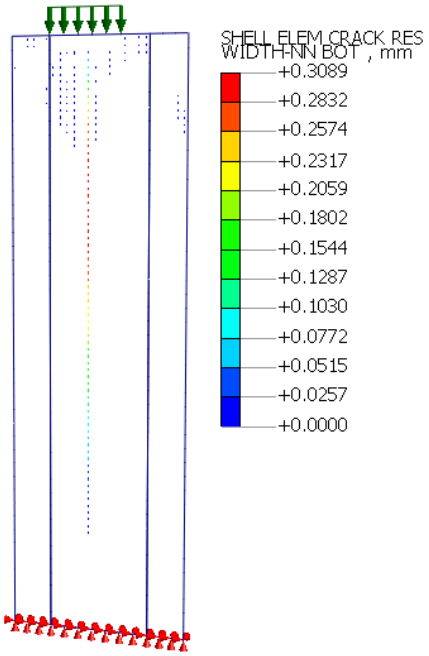

Figure 6-7 – Crack width – ULS

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$$w_{uls} = \sum w_i = 0.31\ mm\ \leq 2.5\ mm$$

The ULS check is satisfied.

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Appendix F – Monitoring Plan

Stockland Development Pty Limited
Level 25/133 Castlereagh Street
Sydney, NSW 2000

Attention: Diego Eguiguren
Email: Diego.Eguiguren@stockland.com.au

Project 86230.02
24 March 2026
R.002.Rev2
CAS

Sydney Metro Tunnel Geotechnical Monitoring Plan
Proposed Mixed-use Residential Building
601 Pacific Highway, St Leonards, NSW

This Tunnel Geotechnical Monitoring Plan (TGMP) provides a sequence for Sydney Metro (SM) tunnel geotechnical monitoring activities expected during demolition, excavation and construction, showing the responsible parties, as well as hold points to manage the processes involved.

The two SM Tunnels, RT01 and RT02, run parallel directly beneath the site. The tunnels are understood to be 7.05 m in diameter with a 260 mm thick segmented concrete lining. The tunnel crown for both tunnels ranges from about RL 61 m in the west to RL 59 m in the east, relative to the Australian Height Datum (AHD).

It is understood that the proposed development of the site will include the demolition of the existing 14-storey building and construction of a new 52-storey mixed-use residential building with 6 basement levels. The proposed bulk excavation requires additional excavation of up to 10 m below the existing three level basement. The detailed excavation level includes a 2 m deep raft slab to RL 71.2 m which covers the central area of the site directly above the tunnels. The deepest part of the excavation will be approximately 10 m above the tunnel crown.

The type of monitoring instruments, locations and trigger levels recommended in this report have been based the findings of the numerical modelling undertaken by Douglas Partners Pty Ltd (DP, ref: DP Report 86230.02.R.001.Rev1). The proposed locations for monitoring equipment/instruments are shown in DP Plots 1 and 2 (refer attached). Note that pre-construction phase and construction phase documents may be provided in stages to suit contractor engagement and timing.

Tables 1 to 4 provide the sequence of activities, action/documentation, trigger levels and parties responsible for the respective activities. Note that parties have been abbreviated, as shown at the bottom of each page. Tables 10.1 and 10.2 from the Sydney Metro Underground Corridor Protection Technical Guidelines have been annotated to provide additional information for the selection of monitoring equipment (refer attached).

All Hold Points in this register should be released in writing by the responsible party prior to proceeding with the next activity.

Where exceedance trigger levels are exceeded, works should be stopped. The nature of the exceedance should be investigated, work method reevaluated and reported to Sydney Metro. Depending on the type of exceedance, contingency measures should be implemented. Contingency measures may be as simple as changing the type of plant used when vibration reaches the trigger levels, or stop work and re-evaluate/reassess the impact with possible design changes where the tunnel displacement trigger is exceeded.

The TGMP is based on previous experience, expected SM requirements and the numerical analysis. The TGMP will be reviewed and updated if any changes are made to the proposed development or SM requirements.

This document also provides a Geotechnical Risk Assessment for the tunnels as part of the engineering assessment criteria set out in the SM Guidelines. Major geotechnical risks associated with the SM tunnel assets below to the development are identified and assessed in the risk assessment. The TfNSW Standard, TS 04982:1.0, was used to determine the risks, probability and consequences for common geotechnical activities during the proposed development.

We trust this meets your current requirements. Please contact the undersigned if you have any queries.

Yours faithfully
Douglas Partners Pty Ltd

Craig Stemp
Associate

Reviewed by

Hugh Burbidge
Principal

Attachments:
About this Report
Table 1: Design Phase
Table 2: Pre-Construction Phase
Table 3: Construction Phase
Table 4: Monitoring Limits
Tables 5 & 6: Comments Regarding Guideline Tables
DP Plot 1 Plan View of Proposed Tunnel Instrument Locations
DP Plot 2 Section View of Proposed Tunnel Instrument Arrangement
Geotechnical Risk Assessment for Rail Tunnels
Risk Criteria from TS 04982:1.0

About this Report

October 2024

Introduction

These notes have been provided to amplify Douglas' report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

Douglas' reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Engagement Terms for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, Douglas will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, Douglas cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, Douglas will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, Douglas requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. Douglas would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Table 1: Design Phase

Activity		Action / Documentation Required	Parties Responsible						
			SM	DP	Con/ Build	SV	TSE	BSE	VM
D1	DP to carry out geotechnical investigation.	Report to be provided to SM.		✓					
D2	Registered SV to complete drawings.	Registered SV to provide drawings showing the proposed development in relation to the tunnel assets and reserves/easements.				✓			
D3	Geotechnical impact assessment on tunnels to be carried out.	Report to be provided to TfNSW for approval (refer DP Report 86230.02.R.001.Rev1).		✓					
D4	TSE to carry out structural assessment on tunnel liner.	TSE to review the geotechnical numerical analysis and carry out a structural tunnel liner assessment. Structural liner assessment report to be provided.					✓		
D5	BSE to complete structural design.	BSE to provide final development structural design (following the geotechnical and structural impact assessments) .		✓				✓	
D6	DP to prepare TGMP and risk assessment.	TGMP (this plan) and Risk Assessment to be provided .		✓					
D7	Developer to submit design phase documents and impact assessment report to SM.	SM to approve ALL design phase documents and release **Hold Point D7.**	✓		✓				

SM – Sydney Metro, DP – Douglas Partners, CON/BUILD – Contractor/Builder, SV – Registered Surveyor, BSE – Structural Engineer,
VM – Vibration Monitoring Contractor, TSE – Tunnel Structural Engineer

Table 2: Pre-Construction Phase

Activity		Action / Documentation Required	Parties Responsible						
			SM	DP	Con/ Build	SV	TSE	BSE	VM
Pre-Construction activity can only proceed if the Design Phase Hold Point D7 has been released									
P1	CON/BUILD to provide detailed procedures and risk assessments for construction works.	Prior to the construction phase, CON/BUILD shall provide SM with a detailed method statement / sequence for the construction works, including demolition, shoring, excavation and detailed foundation works. The method statement shall include procedures put in place to ensure that any anchors/excavation shall maintain the required clearances to the SM infrastructure. The method statement should also include a risk assessment. The method statement shall clearly nominate the name and position of the person who will be on site at all times during the works and who will be directly responsible for all communication and activities on site. This method statement shall be reviewed by DP, BSE and TSE (**Hold Point P1**).		✓	✓		✓	✓	
P2	Baseline Dilapidation Survey.	TSE are to carry out a baseline dilapidation survey of the RT01 and RT02 tunnels adjacent to the site to 10 m beyond the site boundaries, as marked out by a registered surveyor. The surveyor to survey cross-sections and accurately survey the tunnel alignment relative to the site boundaries. The baseline dilapidation survey (and follow up surveys) shall be limited to mapping visible cracks and seepage/leakage evident at the surface of the tunnel lining. TSE to provide a separate method statement to SM outlining how the dilapidation survey will be conducted and the details to be recorded.				✓	✓		
P3	Install Tunnel Instrumentation.	**Track detail survey:** survey targets to be installed on the RT01 and RT02 tunnel tracks in accordance with SPC207 (Refer DP Plot 1).				✓			
		Tunnel liner survey: it is proposed to install 5x full cross-section survey arrays per tunnel (refer DP Plot 1). 4x array shall include 3 targets and 1x array shall be positioned below the core with 5 targets.				✓			
		Crack meters: TSE to install crack meters with a 0.1 mm accuracy shall be installed on selected cracks recorded in the tunnel/cross passage (if significant defects are identified).					✓		
		Vibration monitoring: VM shall install automated and remote vibration monitors in the tunnels and monitor until excavation completed (as show in DP Plot 1).							✓

SM – Sydney Metro, DP – Douglas Partners, CON/BUILD – Contractor/Builder, SV – Registered Surveyor, BSE – Structural Engineer,
VM – Vibration Monitoring Contractor, TSE – Tunnel Structural Engineer

Table 2: Pre-Construction Phase

Activity		Action / Documentation Required	Parties Responsible						
			SM	DP	Con/ Build	SV	TSE	BSE	VM
Pre-Construction activity can only proceed if the Design Phase Hold Point D7 has been released									
P4	Install Site Survey Markers	**Building/Site Survey:** Prior to demolition of the ground level slab, survey points at the top of the existing shoring/ basement walls shall be installed as shown on DP Plot 2 and to SE requirements prior to commencing excavation. Baseline readings (minimum three readings) shall be established before major works commence.			✓	✓			
P5	Submit Pre-Construction phase documents.	Instrumentation installation and baseline readings to be provided to SM for approval and release of **Hold Point P5.**	✓						

SM – Sydney Metro, DP – Douglas Partners, CON/BUILD – Contractor/Builder, SV – Registered Surveyor, BSE – Structural Engineer,
VM – Vibration Monitoring Contractor, TSE – Tunnel Structural Engineer

Table 3: Construction Phase

	Activity	Action / Documentation Required	Parties Responsible						
			SM	DP	Con/ Build	SV	TSE	BSE	VM
Construction activity can only proceed if the Pre-Construction Hold Point P5 has been released									
C1	Excavation Stage.	**Vibration Monitoring** At the commencement of excavation, VM shall carry out a number of vibration trials on site to determine the site vibration attenuation of the rock and report on the buffer distances of selected plant. Vibration monitors shall be in place in the tunnels, located as close to the crown as practically possible (indicative location shown in DP Plots 1 and 2). Continuous unattended tunnel vibration monitoring shall be carried out during the vibration trials and commence at the start of demolition/ excavation in rock (reported weekly). Vibration monitoring can cease, and equipment can be removed on completion of the detailed excavation stage.			✓				✓
		Building/Site Survey Monitoring Survey targets shall be read every 1.5 m drop in excavation level or as directed by DP. Additional survey targets shall be installed on the rock face as the excavation progresses, as shown on DP Plot 2 (minimum 2 baseline readings required) and read every 1.5 m drop in excavation level or as directed by DP. DP/TSE/BSE to review site survey monitoring against the trigger levels. The results are to be included in a monitoring report. Report to be provided to SM. Note: At each drop in excavation, DP to compare measured displacements with the predicted displacements (Table 4), carrying out additional analysis and recommend remedial support measures, should they be required.		✓	✓	✓	✓	✓	
		Geotechnical Inspections The following geotechnical inspections are required throughout this stage (subject to change as directed by DP): • Geotechnical inspection of excavated faces every 1.5 m drop in excavation level; and • Geotechnical inspection of detailed excavations (footings, lift cores and service trenches). CON is to notify DP when inspections are required.		✓	✓				

SM – Sydney Metro, DP – Douglas Partners, CON/BUILD – Contractor/Builder, SV – Registered Surveyor, BSE – Structural Engineer,
VM – Vibration Monitoring Contractor, TSE – Tunnel Structural Engineer

Table 3: Construction Phase

Activity		Action / Documentation Required	Parties Responsible						
			SM	DP	Con/ Build	SV	TSE	BSE	VM
Construction activity can only proceed if the Pre-Construction Hold Point P5 has been released									
C1	Excavation stage continued	**Follow-up Tunnel Dilapidation Survey** TSE are to carry out a follow-up dilapidation survey of Metro tunnels when excavation reaches the end of the excavation stage (100% excavation stage). Surveyors to take tunnel readings at 50% excavation and 100% excavation stage. DP/TSE to compare measured displacements with the predicted displacements (Table 4), and if required, carry out additional analysis and recommend remedial support measures. **Hold-Point C1** Each instrument reading/dilapidation/survey stage constitutes a **Hold Point C1** which requires release from TSE/DP (to be submitted to SM for information).		✓		✓	✓		
C2	Construction Stage	**Follow-up Tunnel Dilapidation Survey** TSE are to carry out a follow-up dilapidation survey of the Metro tunnels when the building reaches approximately 50% completion and at the end of the construction stage (100% building completion). Surveyors to take tunnel readings at 50% and 75% and install continuous survey monitoring of the RT01 tunnel from 75% construction stage and cease at 100% construction stage. Each dilapidation/survey stage constitutes a **Hold Point C2** which requires release from TSE/DP (to be submitted to SM for information). **Extensometer** One extensometer is proposed to be installed between the two tunnels and terminate at tunnel crown level. It will be installed through the core. Surveying the extensometer head will be required at each reading. Establish a baseline from 3 consecutive readings. Approval will be required from Sydney Metro for installation in the first reserve. Readings to be taken at 25%, 50%, 75% and 100% construction stage. **Building/Site Survey Monitoring** Additional survey targets shall be installed on foundations/columns as specified by the structural engineer (minimum 2 baseline readings required). Reading taken as directed by BSE. Readings to be taken at 25%, 50%, 75% and 100% construction stage. **Hold-Point C2** Each instrument reading/dilapidation/survey stage constitutes a Hold Point C2 which requires release from TSE/DP (to be submitted to SM for information).		✓	✓	✓	✓	✓	
C3	Submit Construction Phase Documents**.**	SM to approve construction phase documents.	✓		✓				

SM – Sydney Metro, DP – Douglas Partners, CON/BUILD – Contractor/Builder, SV – Registered Surveyor, BSE – Structural Engineer,
VM – Vibration Monitoring Contractor, TSE – Tunnel Structural Engineer

Table 4: Monitoring Limits

Exceedance Category	Site Vibration Event[1]	Rock Face Survey Markers[2]	Extensometer Readings[3]	Tunnel Crack Width Criteria	Tunnel Crack Length Criteria	Tunnel Displacement[2]	Site Actions	Notification to SM by CON	Report / Review	SM HOLD POINT
Monitoring Level	Sustained Peak Particle Velocity (PPV) approaching 15 mm/s	< 15 mm	Extensometer reading < 7 mm	Signs of change such as seepage.	Signs of crack lengthening < approx 240 mm	Movement < 7.5 mm and/or angular distortion < 0.4 mm/m Track movement < 4 mm and/or angular distortion <0.3 mm/m	Work to continue as normal. No Action required	Notification not required.	Results presented in weekly monitoring report.	Not required
Action Level	Sustained Peak Particle Velocity (PPV) > 15 mm/s	> 15 mm	Extensometer reading > 7 mm	Existing crack opens > 0.15 mm.	Crack length > 240 mm	Movement > 7.5 mm and/or angular distortion > 0.4 mm/m Track movement > 4 mm and/or angular distortion >0.3 mm/m	Notify DP/TSE and continue with caution.	Notify SM within 24 hrs.	DP/TSE to review increase in instrument readings. DP/SE to advise whether further action is required.	Not required. SM to be copied into advice.
Exceedance	Sustained Peak Particle Velocity (PPV) of > 20 mm/s	>20 mm	Extensometer reading > 11 mm	Existing crack opens > 0.2 mm. New cracks form.	Crack length > 300 mm	Movement > 11 mm and/or angular distortion > 0.5 mm/m Track movement > 8 mm and/or angular distortion >0.4 mm/m	Stop Works in the area affected by the exceedance. Notify DP/TSE.	Notify SM immediately.	DP/TSE and CON to assess what caused the exceedance. Compare against other monitoring measurements, re-analyse using actual measurements and assess how much additional deformation can be accommodated and implement remedial or contingency measures. Contractor to implement recommendations. Further tunnel inspection may be required.	DP/TSE & SM to confirm release of HOLD POINT in writing to re-commence once work method modified.

Notes:

1: To be confirmed by vibration consultant.

2: Tunnel displacement Action levels estimated from numerical modelling Case 1. Tunnel displacement exceedance level based on Sensitivity Case and structrual liner assessment carried out by TSE. Crack and angular distortion exceednace levels based on SM limits.

3: Extensometer readings taken at base of raft slab (RL 70.9m) and top of tunnel crown (RL 60m). Instrument reading only, does not reflect direct movement at tunnel crown level.

Comments Regarding Sydney Metro Technical Guideline

Table 5*: Minimum monitoring requirement for development activities near rail tunnels – In-ground

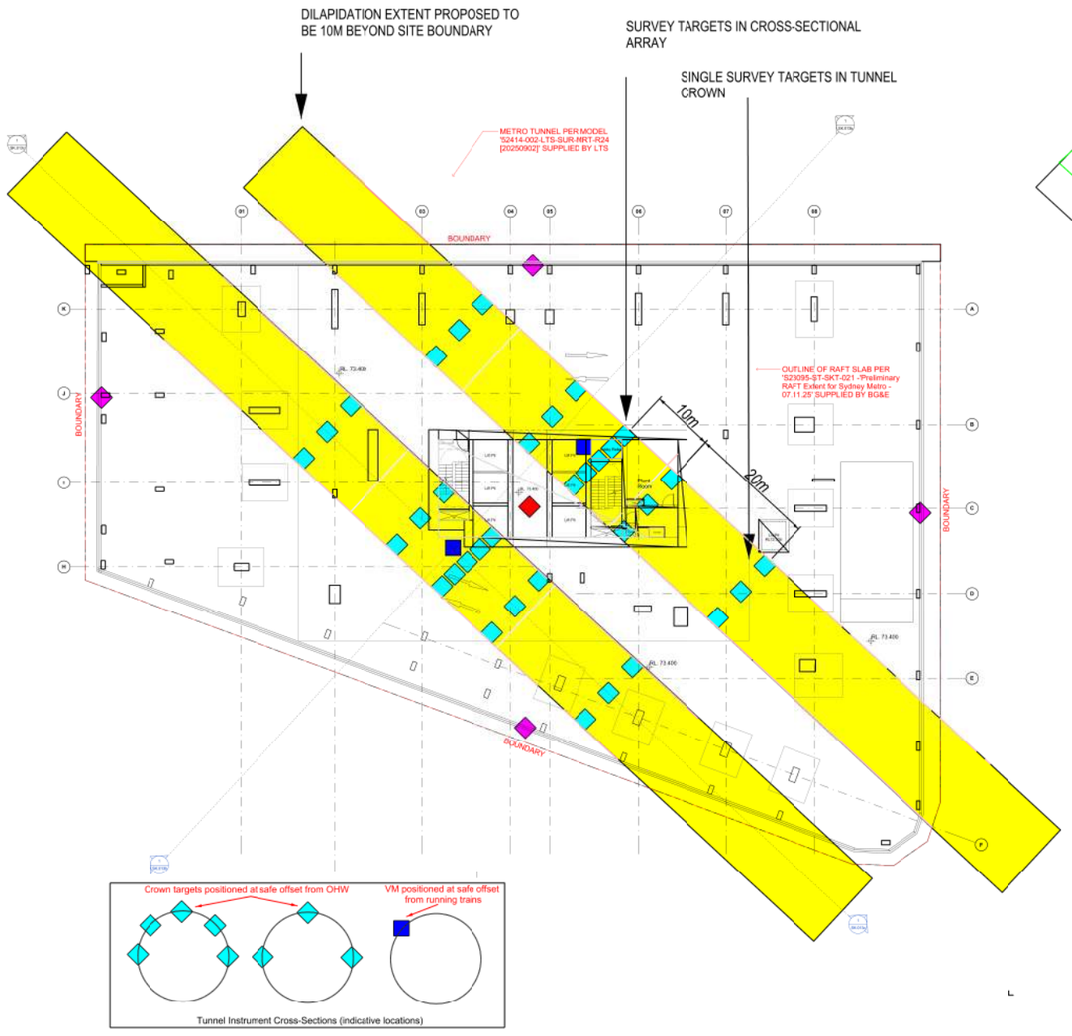
Type of instrument	Deep open excavations SM requirement	DP Comments
Inclinometer	Yes	Not proposed. Shoring and rockface survey markers shall be installed.
Water standpipe	If required by SM	Not proposed.
Piezometer	Yes	Not proposed.
Extensometer	Yes	Yes, installed post completion of the raft foundation.
Ground settlement markers	Yes	Shoring and rock face surveys can be used to measure settlement.
Building settlement markers	Yes	Survey markers shall be installed in accordance with structural engineer's specification on selected footings.

*extract of Table 10.1 from the Guidelines

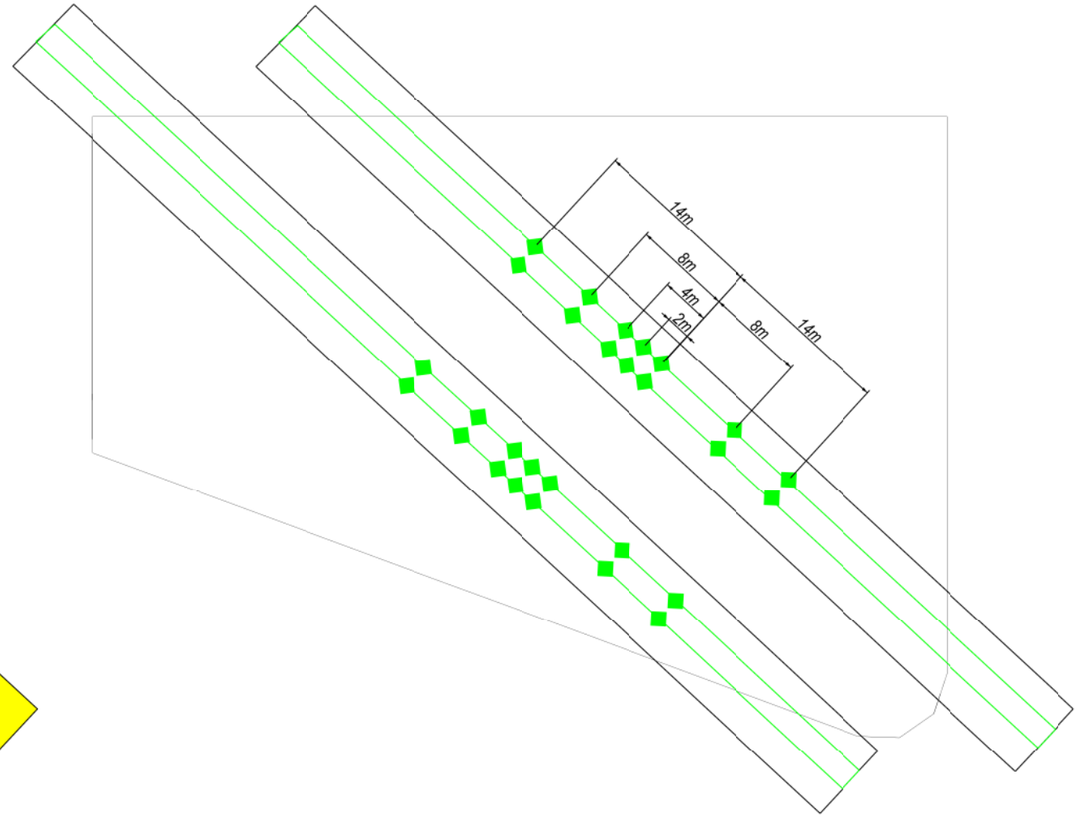
Table 6*: Minimum monitoring requirement for development activities near rail tunnels – Within existing rail tunnels

Type of instrument	Deep open excavations SM requirement	DP Comments
Tunnel Convergence	Yes	Tunnel survey markers shall be installed in 5 arrays as per DP Plot 1.
Tiltmeter	Yes	Not proposed. Defer to structural engineer for comment.
Crack Meter	Yes	Yes, where/if required.
Vibration Sensor	Yes	Yes.
Rail track monitoring (distortion)	Yes	Yes.
Strain gauges in lining	If required by SM	Not proposed.
Pressure cells in lining	If required by SM	Not proposed.
Real time monitoring such as EL beams, optical prism laser scanning	If required by SM	Proposed for between 75% and 100% Construction stage.

*extract of Table 10.2 from the Guidelines



Plan View Showing Proposed Tunnel Crown/Sidewall Instrumentation



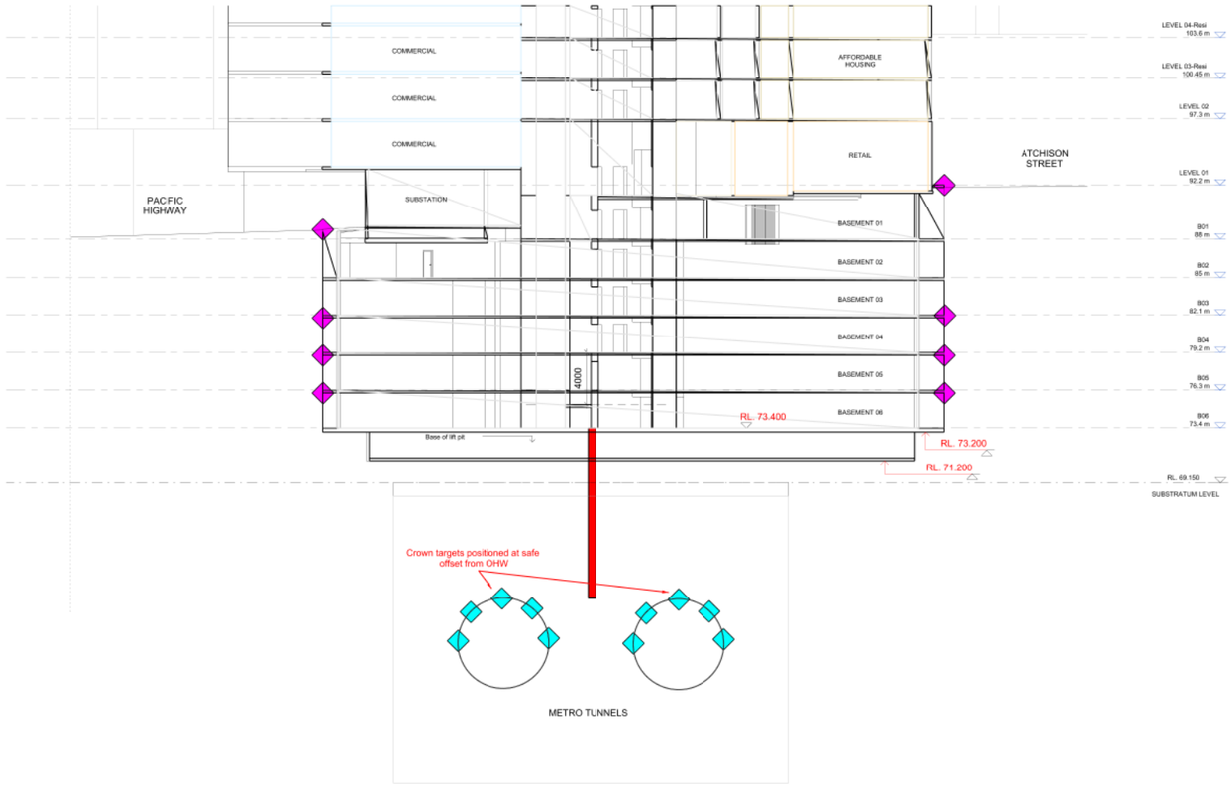
Plan View Showing Track Proposed Instrumentation

NOTES:
1. Base Drawing taken from Batessmart Drawing SK.013a
2. Drawing not to scale
3. Monitoring locations are indicative. An instrumentation installation method statement should be submitted to SM prior to installation and detail safe offset of instrument locations to OHW and running trains.

- PROPOSED TUNNEL CROWN/SIDEWALL SURVEY TARGET INDICATIVE LOCATION
- PROPOSED TRACK SURVEY TARGET LOCATION
- PROPOSED DILAPIDATION EXTENT.
- PROPOSED VIBRATION MONITOR INDICATIVE LOCATION
- PROPOSED EXTENSOMETER
- PROPOSED SITE SURVEY TARGET LOCATION

Douglas PARTNERS

CLIENT: Stockland		TITLE: **Plan View of Proposed Instrument Locations**	PROJECT No: 86230.02
OFFICE: Sydney	DRAWN BY: CAS	**Tunnel Geotechnical Monitoring Plan and Risk Assessment**	DRAWING No: Plot 1
SCALE: NTS	DATE: 19.03.2026	**601 Pacific Hwy, St Leonards**	REVISION: 1



1 SECTION -TUNNEL CROSS SECTION

NOTES:
1. Base Drawing taken from Batessmart Drawing SK.013b
2. Drawing not to scale
3. Monitoring locations are indicative. An instrumentation installation method statement should be submitted to SM prior to installation and detail safe offset of instrument locations to OHW and running trains.

PROPOSED TUNNEL CROWN/SIDEWALL SURVEY TARGET INDICATIVE LOCATION
PROPOSED SITE SURVEY TARGET LOCATION
PROPOSED EXTENSOMETER

Douglas PARTNERS

CLIENT: Stockland		TITLE: **Section View of Proposed Instrument Locations**	PROJECT No: 86230.02
OFFICE: Sydney	DRAWN BY: CAS	**Tunnel Geotechnical Monitoring Plan and Risk Assessment**	DRAWING No: Plot 2
SCALE: NTS	DATE: 19.03.2026	**601 Pacific Hwy, St Leonards**	REVISION: 1

Project: Proposed Mixed-use Residential Building	**Project No: 86230.02**
Client: Stockland Development Pty Limited	**24-Mar-26**
Location: 601 Pacific Highway, St Leonards	

				Before Control Measures				After Control Measures			
Activity / Event	**Date Raised**	**Risk Owner**	**Risk Description**	**Likelihood Rating**	**Consequence Rating**	**Risk Evaluation**	**Control Measures**	**Likelihood Rating**	**Consequence Rating**	**Risk Evaluation**	**Comment**
Temporary Construction Machine Loading	24/03/26	Contractor	Cracking of tunnel lining from excessive construction plant loading.	L6	C6	D	- Nill. Construction plant is negligible compared to the building loads already loading the tunnel	L6	C6	D	
Excavation into Tunnel	24/03/26	Contractor	Damage to tunnel.	L6	C4	D	- Construction methodology preventing excavation into the easement to be in place prior to proceeding with work. - Up to date and accurate surveys required.	L6	C4	D	
Drilling into Tunnel	24/03/26	Contractor	Damage to tunnel.	L5	C3	D	- Construction methodology preventing drilling into the easement to be in place prior to proceeding with work. - Up to date and accurate surveys required. - Any extensometer or other SM approved drilling locations to be verified with surveyor.	L6	C3	D	
Vibration Exceedance	24/03/26	Contractor	Cracking of tunnel lining from excessive vibration during demolition and/or excavation.	L4	C5	D	- Vibration assessment and trials to be undertaken to determine appropriate plant and buffer levels. - Continous vibration monitoring to be installed and implemented in the tunnel.	L5	C5	D	
Groundwater	24/03/26	Contractor	Damage to tunnel lining from increase in groundwater level.	L6	C6	D	- A drained basement excavation would reduce the current hydrostatic head on the tunnel. - Any water services damaged should be immediately rectified with excess water immediately be pumped out. - No water to be pooled on site in excavations.	L6	C6	D	
Excavation / Building Loading	24/03/26	Contractor	Cracking of tunnel lining from excess deformation due to stress relief and building loading.	L4	C4	C	- Predict ground behaviour using Numerical Analysis. - Structural engineer to assess tunnel liner based on predicted movement / stresses. - Excavation and foundations to be designed to limit affect on tunnels. - Monitoring plan to be prepared and carried out. - Full time displacement/survey monitoting during final stage of construction.	L5	C4	D	- Refer DP Report on Numerical Analysis (ref 86230.02.R.001.Rev1) and DP's Tunnel Geotechnical Monitoring Plan (ref 86230.02.R.002.Rev0).

6 Risk criteria

The tables in this section include the criteria organisations shall use while conducting risk assessment for TfNSW in line with the requirements in this document.

Table 1 includes the risk consequence criteria.

Table 1 – Risk consequence criteria

Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
Safety (Worker/ Contractor)	An injury/illness requiring no treatment or first aid No absence from the workplace, worker/ contractor was able to return to substantive position	An injury/illness requiring medical treatment by a qualified medical practitioner Minimal absence from workplace during shift to receive treatment but was able to return to substantive position that day or the following day 0 to less than 5 shifts lost (minor claim)	An injury/illness requiring treatment by a qualified medical practitioner resulting in worker not able to work/ substantive position on the next rostered shift after the injury (LTI) Greater than 5 shifts lost (standard claim)	Serious injury/illness* resulting in permanent disability Greater than 250 days absent from the workplace	A single fatality of a worker/contractor 10–20 workers/contractors serious injuries*/illnesses*	Multiple worker/contractor fatalities > 20 workers/ contractors serious injuries*/illnesses* (single event or over a period)

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Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
Safety (Customer & Community Member)	An injury/illness where first aid treatment is administered to a customer/community member at the incident scene/location	An injury/illness treated by a qualified medical practitioner resulting in a customer/community member not requiring hospitalisation	An injury/illness treated by a qualified medical practitioner resulting in a customer/community member requiring local area hospitalisation	An injury/illness resulting in a customer/ community member requiring high degree of care in hospital (e.g. ICU) or resulting in a permanent disability	A single fatality of a customer/community member 10–20 customer injuries/ illnesses requiring high degree of care in hospital (e.g. ICU) or resulting in a permanent disability	Multiple customer/ community member fatalities in a single event > 20 customer injuries/illnesses (single incident or over a period)
Customer Service & Experience	Isolated written complaints No impact to overall customer satisfaction ratings	Continuous written complaints > 3 months Minor (< 2%) reduction in core drivers for customer satisfaction ratings for any transport modes Potential Ministerial or Ombudsman complaints	A stream of continuous complaints at an increased volume and severity for > 1 year Moderate (2%–5%) reduction in core drivers for overall customer satisfaction ratings for any major transport modes Limited number of Ministerial and/or Ombudsman complaints with limited local media coverage	A substantial and sustained increase in the rate of customer complaints (per 100,000 boardings) Repeated complaints associated with a failure to respond in a timely manner Major (5%–7%) reduction in core drivers for overall customer satisfaction ratings for any major transport modes Multiple Ministerial and/or Ombudsman complaints with ongoing local media coverage	Increased customer complaints for up to 6 months, with normal background rates for the mode or service increasing by a factor of 3 or more, and a persistent backlog in responses Significant (7%–10%) reduction in core drivers for overall customer satisfaction ratings for any transport modes Significant increase in number of Ministerial and Ombudsman complaints, accompanied by	A prolonged increase in customer complaints for greater than 6 months, with normal background rates for the mode or service increasing by a factor of 10 or more, and a persistent backlog in responses – allowing for typical seasonal variations in complaints volume throughout the year A prolonged material reduction (10% or more) in core drivers for overall customer satisfaction ratings for any transport modes

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Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
					persistently state and national media coverage	Substantial backlog of Ministerial and Ombudsman complaints accompanied by national and international media coverage
Everyday Service Delivery	No infrastructure or asset damage. Insignificant change to services	No permanent infrastructure or asset damage. Some minor restoration work required Localised and short service disruption Minor need for new/ modified ancillary equipment	Limited infrastructure/asset damage with damage recoverable by maintenance and minor repair Frequent and major service disruption at one or a few locations	Major infrastructure or asset damage at multiple locations. Damage recoverable by uplift in maintenance and major repairs at multiple locations Major service disruption at multiple locations	Extensive network-wide infrastructure damage requiring major repairs and recovery activities Network-wide service disruption	Significant permanent damage and/or complete loss of the infrastructure and the service Loss of infrastructure support and translocation of service to other sites
Financial Management	Capital Expenditure over project budget by less than 1% Operating Expenditure (including accounting adjustments) over project/initiative budget by less than 1% Revenue (including fines, penalties, compensation etc.)	Capital Expenditure over project budget by 1%–2%. Operating Expenditure (including accounting adjustments) over project/initiative budget by 1%–2% Revenue (including fines, penalties, compensation etc) under	Capital Expenditure over project budget by 2%–3% Operating Expenditure (including accounting adjustments) over project/initiative budget by 2%–3% Revenue (including fines, penalties, compensation etc) under	Capital Expenditure over project budget by 3%–5% Operating Expenditure (including accounting adjustments) over project/initiative budget by 3%–5% Revenue (including fines, penalties, compensation etc) under	Capital Expenditure over project budget by 5%–8% Operating Expenditure (including accounting adjustments) over project/initiative budget by 5%–8% Revenue (including fines, penalties, compensation etc.)	Capital Expenditure over project budget by more than 8% Operating Expenditure (including accounting adjustments) over project/initiative budget by more than 8% Revenue (including fines, penalties, compensation etc.)

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Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
	under project/initiative budget by less than 1%	project/initiative budget by 1%–2%	project/initiative budget by 2%–3%	project/initiative budget by 3%–5%	under project/initiative budget by 5%–8%	under project/initiative budget by more than 8%
People	No impact to employee health or safety Engagement and morale not impacted Employee performance and delivery not impacted No industrial impact	Employee health and safety impacted in a small work group. Minimal impact to the delivery of services Engagement and morale in state of decline in a small work group. Some employees becoming disengaged Employee performance and delivery impacted in a small work group. Minimal impact to delivery of services Industrial impacts for a small work group with	Employee health and safety in state of decline across larger business units or across a number of workgroups with some impacts to services Engagement and morale in state of decline affecting larger business units or a number of workgroups. Some employees disengaged and looking to leave, degree of absenteeism. Employee performance and delivery impacted in a larger business units or number of	Employee health and safety in state of decline in over half the organisation with impacts to the delivery of services and access to work sites Engagement and morale in state of decline affecting over half of the organisation. Many staff disengaged and looking to leave, increasing rates of absenteeism Employee performance and delivery impacted across half of the organisation with	Employee health and safety impacted across most of the organisation with high rates of leave, stress and turnover affecting delivery of many services and access to work sites Engagement and morale affected in most sections of the organisation. Widespread turnover and high volumes of frustrated employees. High rates of absenteeism Employee performance and delivery impacted across most sections of	Employee health and safety impacts over a prolonged period of time with high rates of burn-out, illness, stress and fatigue, loss of life/lives. Affecting delivery of all services and access to work sites Engagement and morale low across the entire organisation resulting in work impacts, prolonged absenteeism, stoppages and high turnover Employee performance and delivery impacted across the entire

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Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
		minimal impact to services	workgroups. Delivery of some services affected. Industrial impacts for a larger business units or a number of workgroups with some impact to services.	delivery of many services affected Industrial impacts for multiple sections of the business occurring with impacts to service delivery	the organisation with services not delivered Industrial impacts for most sections of the organisation, impairing customer services and safety	organisation for a prolonged period of time stopping services and impacting safety Industrial impacts across the entire organisation for a prolonged period stopping services and impacting safety
Reputation and Integrity	Single negative article in local media Limited social media commentary Stakeholder/ community confidence and trust retained Incident contained within Branch	Series of negative articles in local media Series of negative social media commentary Stakeholder/community confidence remains with minor loss of trust recoverable with little effort or cost. Some continuing scrutiny / attention Incident confined to Branch but requiring notification to Division	Extended local media coverage and some broader regional media coverage Extended negative social media coverage Confidence and trust of stakeholder/community is dented but recoverable at modest cost within existing budget and resources TfNSW and/or Minister's department requires update	State media coverage, short-term negative national media coverage Widespread negative social media coverage Stakeholder/community confidence and trust impaired Project/activity credibility under question Regular talk-back programs questioning credibility and capability	Sustained negative state and national media coverage Sustained widespread negative social media coverage Stakeholder and community confidence and trust severely damaged Support withdrawn but recoverable at considerable cost, time and staff effort	Sustained, high profile national and international media coverage Prolonged negative social media coverage Stakeholder/community confidence is non-existent, including active campaigning against TfNSW Material changes in the public perception of the Agency with the potential for government to reverse decision

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Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
					Regular updates requested by the Minister	
Project Delivery	Insignificant project delay (< 1 day) Capex over project budget by less than 1% No reduction in functionality/scope	Minor project delay (1 day – < 1 week) with no public impacts Capex over project budget by 1%–2% Scope or functionality partially impaired with no impacts on delivery or quality	Moderate project delay (< 1% to maximum of 1 month) with no public impacts Capex over project budget by 2%–3% < 1% reduction in functionality/scope Benefit realisation partially impaired but still adds value and is economically sound	Major delay (< 10% to maximum of 5 months) Capex over project budget by 3%–5% < than 10% reduction in functionality/scope Cost/benefit analysis may not have supported the program to go ahead Publicly announced portion, milestone or completion date missed	Severe delay (< 15% to maximum of 9 months) project delay Capex over project budget by 5%–8% <15% reduction in functionality/scope	Total blow out in time, (> 9 months or > 15%) Capex over project budget by more than 8%. > 15% reduction in functionality/scope. Failure to realise benefits Future funding likely needed to rectify or deliver outcomes

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Rating/Description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
Governance, Legal & Assurance	Some non-compliance with legal, regulatory or government policy requirement or duty. Little or no consequence.	Minor non-compliance with legal, regulatory or government policy requirement or duty. Internal reporting of non-compliance. Small fine.	Moderate non-compliance with legal, regulatory or government policy requirement or duty. Internal reporting and investigation. Moderate fine.	Systemic non-compliance with legal, regulatory or government policy requirement or duty. Notifiable to external regulatory or government authority. Significant fine.	Substantial non-compliance with legal, regulatory or government policy requirement or duty. Notifiable to external regulatory or government authority, with investigation, enforcement, or prosecution action by authority. Substantial fine. Disruption to ability to operate e.g. external authority places conditions on licence or accreditation.	Catastrophic non-compliance with legal, regulatory or government policy requirement or duty. Notifiable to external regulatory or government authority, with investigation, enforcement action, or criminal prosecution by authority. Unprecedented fine. Loss of ability to operate e.g. operating licence or accreditation revoked by external authority.
Environment	No appreciable negative changes to environment	Negative change from existing environment conditions that can be rectified immediately (< 1 day) with available resources	Short-term (< 1 year) and/or well-contained environmental impact Minor remedial actions probably required	Short to medium term (between 1 and < 5 years) environmental impact Considerable remedial actions probably required	Medium term (> 5 years) environmental impact Extensive remedial actions probably required	Long-term (> 10 years) large scale environmental impact Extensive and ongoing remedial actions probably required

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Notes:

* Under the WHS Act a serious injury or illness requires a person to have:

a) immediate treatment as an in-patient in a hospital, or

b) immediate treatment for: amputation; a serious head injury; a serious eye injury; a serious burn; separation of skin from an underlying tissue (such as de-gloving or scalping); a spinal injury; the loss of a bodily function; serious lacerations, or

c) medical treatment within 48 hours of exposure to a substance.

Table 2 provides the risk likelihood criteria

Table 2 – Risk likelihood criteria

Rating/Description	L6 Almost unprecedented	L5 Very unlikely	L4 Unlikely	L3 Likely	L2 Very likely	L1 Almost certain
Frequency	• Consequence will occur once every 50 years	• Consequence will occur at least once every 25 years	• Consequence will occur at least once every 10 years	• Consequence will occur once a year	• Consequence will occur between 2 and 10 times per year	• Consequence will occur more than 10 times per year
Probability	• < 10% chance of occurring • Not expected to ever occur	• 10% to 25% chance of occurring • Not expected to occur	• > 25% to 50% chance of occurring • More likely not to occur than occur	• > 50% to 75% chance of occurring • More likely to occur than not occur	• > 75% to 90% chance of occurring • Expected to occur occasionally	• > 90% chance of occurring • Expected to occur frequently

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Table 3 represents the risk matrix to estimate the level of risk

Table 3 – Risk matrix – Likelihood and consequence

Likelihood/ Consequence	Insignificant C6	Minor C5	Moderate C4	Major C3	Severe C2	Catastrophic C1
Almost certain L1	D	C	B	A	A	A
Very likely L2	D	C	B	B	A	A
Likely L3	D	C	C	B	B	A
Unlikely L4	D	D	C	C	B	B
Very unlikely L5	D	D	D	C	C	B
Almost unprecedented L6	D	D	D	D	C	C

Table 4 provides guidance on risk levels and the associated tolerance levels and responses

Table 4 – Risk tolerance and responses

Current risk rating	Response
Very high 'A'	• Generally intolerable • Avoid except in extraordinary circumstances • Find an alternative solution • Reduce level of risk as a priority
High 'B'	• Almost unacceptable • Undesirable • Reduce level of risk as a priority • Tolerate only if not reasonably practicable to reduce risk level
Medium 'C'	• Generally tolerable if not reasonably practicable to reduce risk level • Seek additional treatment measures unless cost exceeds benefit and/or measure is not recognised as good practice
Low 'D'	• Broadly acceptable • Consider reducing risk level if options exists and costs are proportionate to the benefits

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Appendix G – Contamination Reports

Douglas PARTNERS

GROUNDED EXPERTISE

Specialist Advice

Report on Geotechnical Investigation

Proposed Residential Building

601 Pacific Highway, St Leonards NSW

Prepared for Stockland

Project 86230.01

18 March 2026

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Document History

Details

Project No.	86230.01
Document Title	Report on Geotechnical Investigation
Site Address	601 Pacific Highway, St Leonards NSW
Report Prepared For	Stockland
Filename	86230.01.R.001.Rev3

Status and Review

Status	Prepared by	Reviewed by	Date issued
Revision 0	James Connaughton	Scott Easton / Bruce McPherson	22/05/2025
Revision 1	James Connaughton	Scott Easton	21/11/2025
Revision 2	James Connaughton	Scott Easton	24/11/2025
Revision 3	James Connaughton (Associate – Engineering Geologist)	Scott Easton (Principal – Geotechnical Engineer)	18/03/2026

Distribution of Copies

Status	Issued to
Revision 0	Guy Bell, Stockland
Revision 1	Hee-Jung Yoon, Stockland
Revision 2	Hee-Jung Yoon, Stockland
Revision 3	Diego Eguiguren, Stockland

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature	Date
Author	18 March 2026
Reviewer	18 March 2026

FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

Executive Summary

Stockland Development (Stockland) submitted an EOI for an SSDA and concurrent rezoning proposal on 17 January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19 February 2025, the HDA recommended to the Minister that the applicant's project be declared SSD, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).

A request for SEARs was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This geotechnical report has been prepared by Douglas and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.
- Demolition of the existing 14 storey commercial office building that is currently on the site.
- Site excavation, remediation and other preparatory works.
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m^2), comprising:
  - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
  - A contribution of 5% of the residential GFA toward Affordable Housing.
  - Retail and commercial land uses at the ground and podium levels.
  - Internal and external residential amenities provided throughout the building.
  - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
- Vehicular access to the basement via Atchison Street.
- Landscaping and Public Domain works.
- Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

This geotechnical report has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out in the Table 1 below.

Table 1: Secretary's Environmental Assessment Requirements relevant to this report

SEARs	Report Reference
12. Ground and Groundwater Conditions • Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion.	Sections 2, 3, 4, 6, 9, 10
9. Transport • A Geotechnical report detailing the excavation of the site and support structures and consider proximity to the Sydney Metro corridor. The geotechnical report shall be prepared in accordance with Technical Direction GTD2020/001.	Section 2.1, 10.1, 10.2 and 10.6

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Appendix A: About This Report

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Report on Geotechnical Investigation
Proposed Residential Building
601 Pacific Highway, St Leonards NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a geotechnical investigation undertaken for a proposed residential building at 601 Pacific Highway, St Leonards NSW (the site). The investigation was commissioned by email instructing to proceed dated 04 November 2024 from Diego Eguiguren of Stockland and was undertaken in accordance with Douglas' proposal 86230.01.P.001.Rev2 dated 17/09/2024.

Based on the supplied architectural drawings prepared by Bates Smart, it is understood that the proposed development comprises the demolition of the existing 14-storey commercial building and construction of a new 52-storey mixed-used residential building with six basement levels. The existing basement has 4 partial basement levels in a gradually spiralling arrangement with the lowest basement level understood to be at about RL 81.3 m relative to Australian Height Datum (AHD). It is proposed to deepen the existing basement by about 8.3 m to RL 73 m AHD.

The current investigation was undertaken to provide information on the subsurface profile and groundwater levels to inform the design and planning of the proposed structure. The investigation included the drilling of six cored boreholes, groundwater well installation for permeability test and groundwater level monitoring, and laboratory testing of selected soil and rock samples. The details of the field work are presented in this report, together with comments and recommendations on the items listed above.

Douglas have also prepared the following reports for the project:

- Due Diligence Contamination Assessment (Ref.: 86230.01.R.002.Rev4, dated March 2026);
- Detailed Site Investigation (DSI) for contamination) (Ref.: 86230.03.R.002.Rev1, dated March 2026);
- Remediation Action Plan (RAP) (Ref.: 86230.03.R.001.Rev2, dated March 2026); and
- Groundwater Inflow Assessment (Ref: 86230.01.R.004.Rev2, dated March 2026).

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Site Description

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400m (walking distance) from the Crows Nest Metro station.

A site aerial and location plan is provided at Figure 1 below.

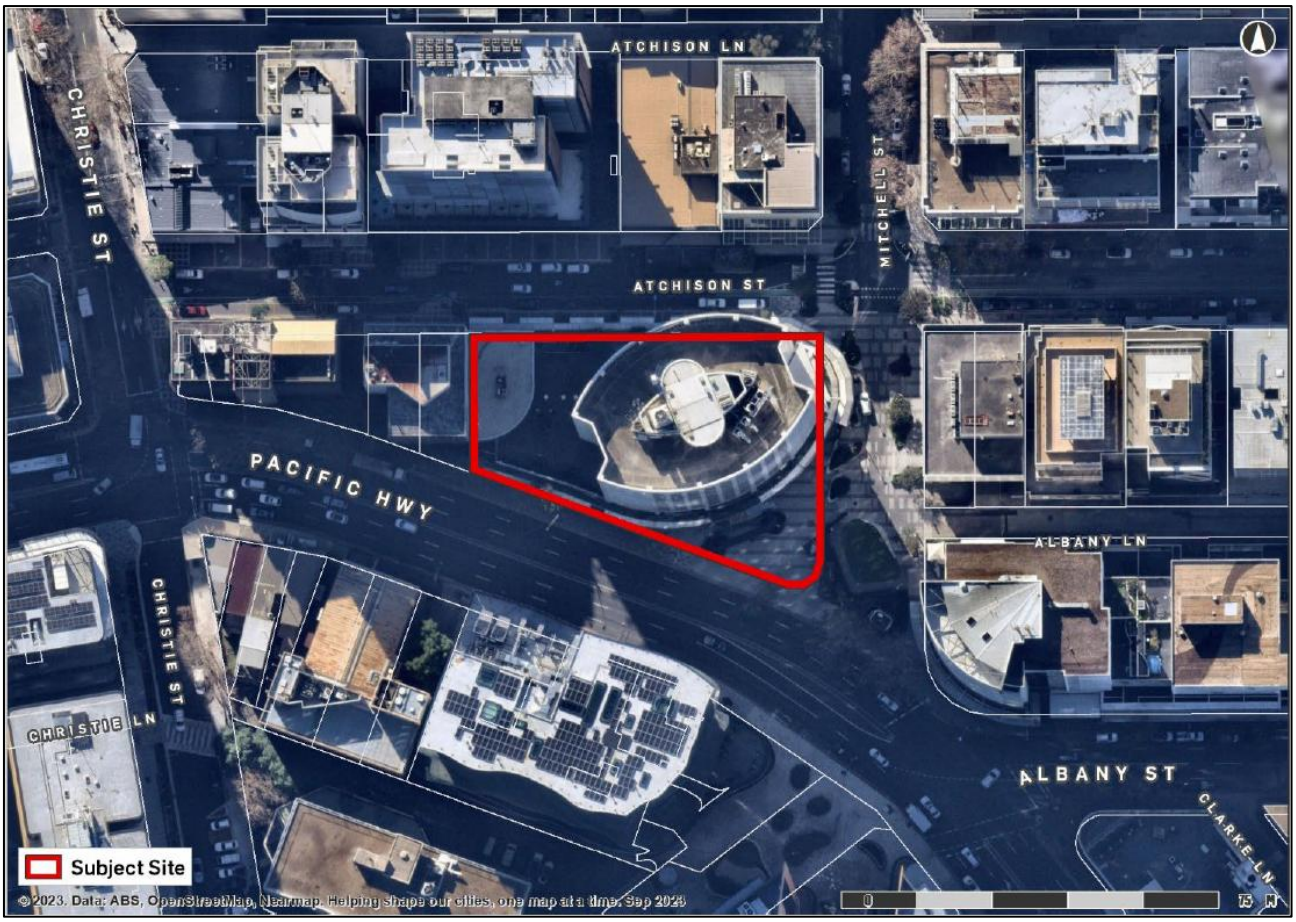

Figure 1: Site Location (provided by Urbis)

The site is bounded by a 7-storey commercial building with one level of basement carpark to the west, located at 619 Pacific Highway, and Mitchell Street to the east. Beyond Aitchson Street to the north is a 27-storey residential building understood to have a single level basement. Beyond Mitchell Street to the east is a five-storey commercial building with a basement car park.

Based on the available 'NSW 2 m Elevation Contours'; the site topography generally slopes down towards the west, with surface levels of approximately RL 93 m in the east, falling to RL 88 m in the west, relative to Australian Height Datum.

At the time of writing this report, the site is occupied by a 14-storey commercial building in the eastern portion of the site, and single level mixed-use retail in the western portion of the site, over the basement entrance. The basement levels comprise 4 partial basement levels in a gradually spiralling arrangement with the lowest basement level understood to grade from RL 82.4 m at its highest point, down to about RL 81.3 m at its lowest, measured during the initial surveying of the site. Based on the supplied existing basement drawings, it is understood that the basement retention system comprises a soldier pile wall. Shotcrete panels in the basement car park were observed and signs of minor cracking with seepage and iron staining noted.

The closest body of water to the site is Berrys Creek located approximately 750 m to the southwest, at a significantly lower elevation.

The site location is shown in Drawing 1, Appendix B.

2.1 **Sydney Metro Tunnels**

The *Sydney Metro Underground Corridor Protection Technical Guidelines* prepared by TfNSW (dated August 2025) provides comments and assessment criteria on Sydney Metro assets. The Technical Guidelines specify the "first reserve" boundary generally extends 5 m from the outer edge of the tunnel (or extent of Sydney Metro substratum above) and the "second reserve" boundary generally extends a further 25 m from the "first reserve" boundary .

It is understood from the supplied detailed survey plans provided by Sydney Metro, that the Sydney Metro corridor runs in a northwest-southeast direction below the site, with the entire of the site situated within the second protection reserve, and the first protection reserve running below the centre of the site. The protection reserves and tunnel alignments beneath the site are shown in Figure 1. The detailed survey plans prepared by LTS Lockley (Drwg. 52414 001BH) indicate that the first protection reserve is limited to RL 69.15 m AHD.

Based on the supplied architectural drawings, it is understood that the proposed six level basement finished floor level (FFL) will be at approximately RL 73.4 m, which is 4.25 m above the first protection reserve.

Liaison with Sydney Metro was undertaken to confirm the scope of the current geotechnical investigation and approvals were obtained via email dated 22 January 2025 on the locations and the target depths of the boreholes.

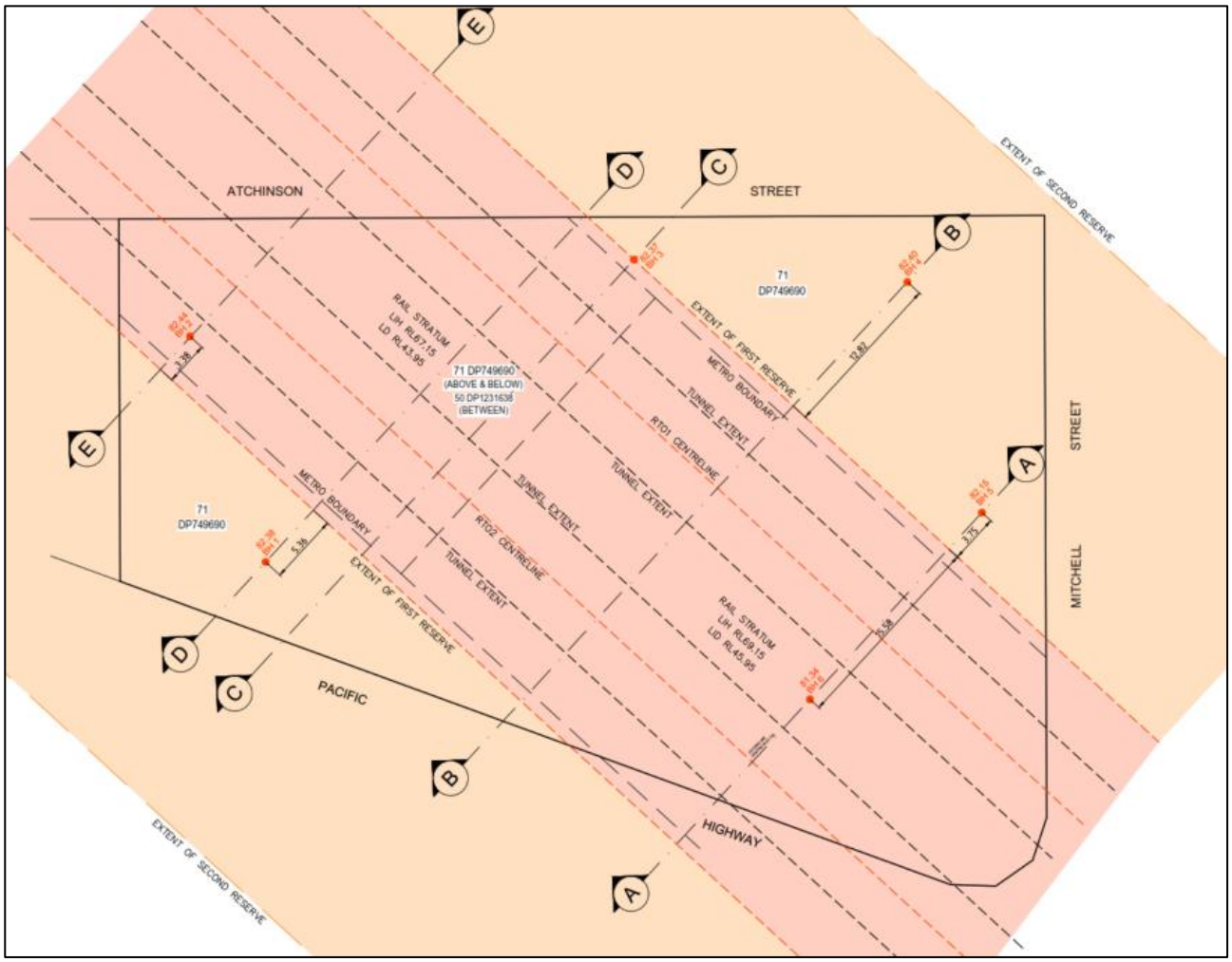

Figure 2 - Sydney Metro Tunnels and Protection Reserves beneath the site (LTS Lockley 52414 001BH)

3. Published data

3.1 Geology

Reference to the Sydney 1:100 000 Seamless Geology Sheet indicates that the site is underlain by the Ashfield Shale of the Wianamatta Group, described as black to dark-grey shale and laminite. Below the Ashfield Shale is the Hawkesbury Sandstone which typically comprises medium to coarse grained quartz sandstone with some shale and laminite bands or lenses. The Mittagong Formation is a transitional unit often found between the Ashfield Shale and Hawkesbury Sandstone and typically includes laminite and fine-grained sandstone of variable strength, ranging in thickness from about 2 m to 10 m.

Ashfield Shale is typically closely bedded and contains an orthogonal pair of steeply dipping (70° to 90°) joint sets striking NNE and ESE, spaced 0.5 m to 5 m. Random orientated, 30° to 45° dipping ubiquitous joints are also present. These joint sets persist through the Hawkesbury Sandstone, which is typically light to mid grey in colour and has massive and cross-bedded facies.

The Hawkesbury Sandstone normally has near-horizontal bedding partings spaced from less than 1 m to well over 3 m in places.

An extract from the geological map overlain by 2 m (AHD) contours is shown in Figure 2.

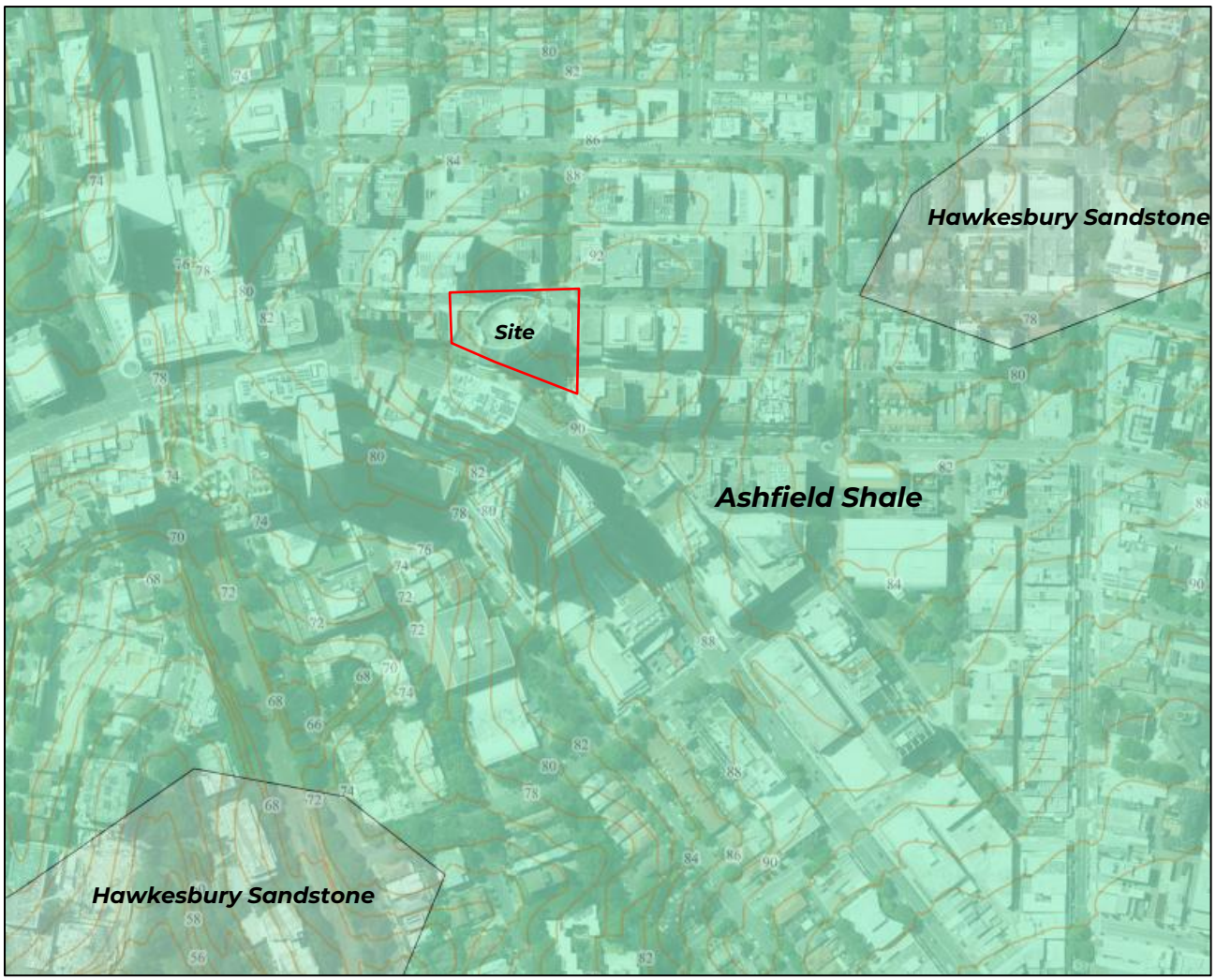

Figure 2 - Geological Map Extract

3.2 Acid Sulphate Soils and Salinity

Based on available mapping (NSW Acid Sulfate Soil Risk Mapping, 1998, by NSW Department of Environment and Climate Change and Mapping of Salinity Potential in Western Sydney, 2002, by NSW Department of Infrastructure, Planning and Natural Resources) the site is not within an area that is considered at risk of the occurrence of acid sulphate soils or soil salinity.

Furthermore, given the elevation, topography and geology of the site acid sulphate and highly saline soils are considered unlikely to be present at the site and further assessment is not required.

3.3 Hydrogeology

Based on the local topography, groundwater is anticipated to flow to the west.

One Water NSW registered groundwater bore with a current license is located approximately 420 m north of the site with a recorded standing groundwater level of 35 m depth or RL 37 m, referring to the available 'NSW 2 m Elevation Contours'. Shallower perched seepage may occur along the clay and rock surface and at strata boundaries and in defects in the rock mass.

It should be noted that groundwater levels may vary over time due to climatic and human influences and will temporarily rise following periods of prolonged rainfall.

3.4 Previous Geotechnical Investigations on Nearby Sites

Douglas has previously undertaken a number of geotechnical investigations for developments near the site between 2008 and 2023 as summarised below:

- September 2008 (Douglas reference no. 45742) – Geotechnical investigation at 9 - 11 Atchison Street, St Leonards which including drilling of one cored borehole to 18 m depth below ground level (BGL) for a 12-storey development with four basement levels.
- December 2012 (Douglas reference no. 73262.00) - Geotechnical Investigation at 18 - 22 Atchison Street, St Leonards, which involved the drilling of one cored borehole to 19 m depth for a multi storey development with five levels of basement. A groundwater well was installed for monitoring of groundwater levels during a limited period.
- January 2010 and August 2013 (Douglas reference no. 71470.00 and .02) - Geotechnical Investigation at 6 - 16 Atchison Street, comprising four cored boreholes to a maximum depth of 22 m BGL for a 25-storey building with six basement levels.
- September 2023 (Douglas reference no. 205925.01) – Geotechnical Investigation at 617-621 Pacific Highway, St Leonards, which involved the drilling of four cored boreholes to 27 m depth for a 50-storey development with up to six basement levels.

Douglas was also extensively involved with geotechnical consultancy services during a deep basement construction at 500 - 520 Pacific Highway. Douglas' services included installation of three 15 m deep groundwater wells and *in-situ* permeability assessment using Packer and slug testing. Two boreholes were also drilled and were logged to depths of about 30 m to install inclinometers along the site's boundary with Pacific Highway. The rock face and seepage flows were inspected progressively during excavation.

The geotechnical investigations undertaken on nearby sites have been used to assist in developing a geotechnical model for the subject site.

4. Results of Previous Nearby Works

A review of some of Douglas' previous investigations near the site, indicate that the general stratum underlying the area comprises Ashfield Shale (Siltstone / Shale and Laminite) to depths of about 5.7 m to 20 m (RL 78 m to RL 68 m), followed by Mittagong Formation then Hawkesbury Sandstone, which typically included medium to high strength, slightly fractured sandstone.

Previous groundwater monitoring has encountered groundwater at depths between 13 m (RL 75 m AHD) and 19.7 m (RL 64.0 m AHD) within the Ashfield Shale and Hawkesbury Sandstone.

Some observations from construction phase works on nearby projects included:

- Considerable water seepage noted during piling within the deeper shale profile at some locations;
- The results of packer tests were in a range of 6.9 x 10^{-8} and 1.2 x 10^{-6} m/s within the bedrock. The Packer tests indicated that the lower rock strata of the tested sections (high strength sandstone) were more permeable than typically expected for Hawkesbury Sandstone / Mittagong Formation;
- The results of the falling head permeability tests indicated that the fresh Hawkesbury Sandstone had a permeability between 1.2 x 10^{-5} and 1.2 x 10^{-6} m/s, whilst the highly weathered sandstone had a permeability of 2.4 x 10^{-8} m/s;
- Slug test results were in a range of 7.1 x 10^{-8} to 2.3 x 10^{-7} m/s for the weathered rock profile; and
- Zones of fractured / sheared rock and possible fault zones within high strength rock were observed at various depths of between 12 m to 22 m, which corresponded to the increase in the permeability of the rock mass at some locations.

5. Current Field Work Methods

The current field work involved the drilling of six cored boreholes within the lowest basement level at the locations shown on Drawing 1 in Appendix B. A summary of the field work is presented as follows:

- Borehole locations set out and surveying using an accredited surveyor of each location to determine the locations and surface levels within the basement relative to the Sydney Metro tunnel alignment;
- Scanning for underground services at each location using an accredited services locator with supervision by a geotechnical engineer from Douglas;
- Drilling of six boreholes using a tight access, low headroom, track-mounted drilling rig between 24 March and 10 April 2025. Boreholes were commenced with a diacore barrel to penetrate through the existing basement concrete slab, and then extended into the soil profile using solid flight augers to reached top of bedrock. The boreholes were then advanced to their target depths using NMLC diamond coring to obtain continuous core samples of the bedrock. Boreholes BH01 – BH03, BH05 and BH06 were drilled to depths of between 11.0 m and 15.0 m, approximately 5 m below the proposed lowest basement FFL and at least 1.0 m above the first protection reserve. BH04 was drilled to a depth of 31.5 m or RL 50.9 m AHD, to obtain data below the Sydney Metro Tunnel invert level;
- Point Load Index strength tests were undertaken at regular intervals along the rock core. Selected rock core samples were also tested at Douglas' NATA accredited laboratory for Unconfined Compressive Strength (UCS) testing;
- Groundwater monitoring wells were installed in boreholes BH01, BH03, and BH06 to 14.8 m, 12.1 m, and 11.1 m, respectively. The wells were purged on 9 and 10 April 2025;
- Supervision of the drilling, sampling and logging of the boreholes by an experienced engineering geologist;

- Falling head permeability tests involving introducing water to raise the water level and measuring the rate of discharge were carried out in the groundwater wells on 10 and 17 April 2025. Data loggers were installed in all wells on the same day to monitor the ground water level variations for a minimum period of three months and is currently on-going.

6. Field work Results

6.1 Subsurface Profile

The detailed subsurface conditions encountered are presented in the borehole logs in Appendix C along with notes defining descriptive terms and classification methods. Photographs of the recovered rock cores are also included.

The general subsurface profile encountered at the borehole locations may be summarised as follows:

CONCRETE	-	Concrete slab at all borehole locations, measured to be between 130 mm and 180 mm thick. At BH01, the concrete slab comprised two slabs of 90 mm and 130 mm, with bedding sand separating the two. Reinforcement of 8 mm diameter was noted within the concrete slabs.
FILL	-	Typically sandy clay and clayey sand with various proportions of igneous gravel within the shallow depths of the boreholes, with variable thickness in a range of 0.4 m to 2.4 m. The fill layer was observed to reduce in thickness in boreholes which were located in the deeper basement levels, with the thickest layer observed in BH01, and the thinnest in BH06.
SHALE BEDROCK	-	Generally low to medium strength, fresh, dark grey shale (Ashfield Shale) encountered in all boreholes below the fill to depths between 4.1 m and 4.8 m. The shale was typically slightly fractured. Frequent joints dipping 30° to 70° were observed within the shale bedrock. Sub-horizontal crushed zones with clay infill were also noted within BH02 between 3.9 m and 4.7 m depth. Very low strength bands accompanied with crushed zones and joints dipping 35° to 60° were noted in BH05 between 2.7 m and 5.3 m depth in BH05.
SANDSTONE and LAMINITE BEDROCK	-	Typically medium and medium to high strength, fresh to slightly weathered, pale grey and grey fine to medium grained sandstone and laminite (Mittagong Formation), and pale grey medium to coarse grained sandstone (Hawkesbury Sandstone) to depths of about 10.4 m and 17.0 m. Zones of very low and low strength rock were noted within the laminite bedrock at BH01 at depths of 5.0 m, 7.5 m, and 8.5 m. The rock was typically slightly fractured to

unbroken. Sub-vertical joints dipping 70° to 90° were observed within BH03 between 7.2 m and 9.5 m depth.

HIGH STRENGTH SANDSTONE ROCK - Medium to high strength and high strength, fresh, pale grey to grey, fine to medium grained sandstone and laminite (Mittagong Formation), grading to fresh, high strength, medium to coarse grained sandstone (Hawkesbury Sandstone) to the termination depth of boreholes. A very high strength band was noted within BH01 between 14.3 m and 14.8 m depth. The high strength rock was typically unbroken. A low to medium strength, fractured zone was noted in BH04 between 26.2 m and 30.5 m depth.

POSSIBLE THRUST FAULTS - The low to medium strength rock and crushed zones with joints dipping 15° to 25°, observed in BH04 between 26.2 m and 30.5 m depth, were accompanied with significant loss of drilling fluid, indicating a possible presence of a thrust fault.

6.2 Groundwater

No groundwater was observed during augering of the boreholes. The use of water as a drilling fluid during diamond coring precluded measurement of the groundwater level during the drilling of the boreholes. The results of the ground water level monitoring from the installed wells are summarised in Table 2 below.

Table 2: Summary of Groundwater Level Measurements

Borehole	Measured Groundwater Depth (m) and RL [*m AHD*]		
	9 April *	17 April *	7 July
BH01	11.0 *[71.4]*	10.83 *[71.6]*	11.12 *[71.3]*
BH03	9.0 *[73.4]*	6.73 *[75.7]*	8.17 *[74.2]*
BH06	*N.D*	3.40 *[77.9]*	6.13 *[75.2]*

Note: * Measurement may be influenced by purging and permeability testing completed 09/04/25 and 17/04/25
N.D – No data

After installation, the groundwater monitoring wells were purged of drilling fluid using a submersible pump on 9 and 10 April 2025.

Data loggers were installed in all wells between 9 April and 7 July 2025 to monitor the ground water level variations for a minimum period of three months.

A summary of the datalogger records during this reporting period is provided in Table 3.

Table 3: Summary of Datalogger Results during the Reporting Period

Borehole	Groundwater Readings (m) [*RL m AHD*]			
	Minimum	Maximum	Mean	Median
BH01	10.71 *[70.78]*	11.62 *[71.69]*	11.08 *[71.32]*	11.05 *[71.35]*
BH03	7.30 *[73.88]*	8.52 *[75.10]*	8.03 *[74.37]*	8.09 *[74.31]*
BH06	5.84 *[75.08]*	6.22 *[75.46]*	6.08 *[75.22]*	6.12 *[75.18]*

Notes: Data influenced by the permeability testing have been removed from this data set.

The results of permeability tests carried out by Douglas are given in Appendix E and are summarised in Table 4.

Table 4: Summary of Hydraulic Conductivity Test Results

Test Location	Screened Depth (m)	Test Method	Material	Hydraulic Conductivity (m/sec)
BH01	3.0 – 14.8	Falling Head	Shale & Sandstone/ Laminite	2.3×10^{-7}
BH03	0.5 – 12.1	Falling Head	Shale & Sandstone / Laminite	4.3×10^{-9}
BH03	0.5 – 12.1	Falling Head	Shale & Sandstone / Laminite	5.6×10^{-9}
BH06	1.5 – 11.1	Falling Head	Shale & Sandstone / Laminite	2.8×10^{-7}

The results of the permeability testing undertaken during the current investigation for BH03 are up to approximately two orders of magnitude lower than some of the results from nearby previous investigations for the "weathered sandstone". However, these values are consistent with the typical expected values for permeability in high strength, unfractured rock (Pells 2019).

7. Laboratory Testing

Selected samples of the rock core were tested in the laboratory to determine the Point Load Strength Index (Is_{50}) values to assist with the rock strength classification. The results of the testing are shown on the borehole logs at the appropriate depth. The Is_{50} values for the rock ranged from 0.12 MPa to 3.18 MPa, indicating that the rock samples tested were of very low to very high strength, with an average Is_{50} value of 1.0 MPa, corresponding to medium to high strength.

Six rock core samples were tested for Uniaxial Compression Strength (UCS) with modulus measurement. A summary of the results is presented in Table 5 below.

Table 5: Summary of UCS on rock core samples

Sample Source	Uniaxial Compressive Strength (MPa)	Young's Modulus (GPa)		Poisson's Ratio	
		Tangent	Secant	Tangent	Secant
BH01, (7.1 – 7.3m)	35.0	2.7	2.6	0.23	0.39*
BH02, (13.4 – 13.7m)	25.0	7.8	5.3	0.42*	0.21
BH03, (8.1 – 8.4m)	21.7	2.7	3.1	0.32	0.17
BH04, (25.0 – 25.4m)	27.8	9.0	8.0	0.39*	0.26
BH05, (7.6 – 7.9m)	43.0	5.9	5.7	0.34	0.19
BH06, (6.4 – 6.6m)	17.7	2.9	3.0	0.15	0.10

Notes: *These values are not within the normally expected range values for this material and should be disregarded.

8. Proposed Development

It is understood that the proposed development comprises the demolition of the existing 14-storey commercial building and construction of a new 52-storey mixed-use residential building with six basement levels. The sixth level basement FFL is understood to be RL 73 m AHD, with a bulk excavation level of RL 72.6. m, requiring additional excavation of up to about 8.3 m depth. Deeper detailed excavations are expected to be required for lift pits/cores and footings to about RL 70.8 m. Based on the supplied architectural drawings, it is understood that part of the existing soldier pile shoring wall will remain in some areas, and a secondary shoring system will be installed to support the existing wall and to provide retention of the additional basement levels.

The proposed basement set out in relation to the first and second protection reserves of the Sydney Metro necessitate a detailed engineering impact assessment, which will be undertaken by Douglas in a separate stage and will require review by TfNSW / Sydney Metro,

9. Geotechnical Model

The field work results (i.e. borehole logs) from the current and nearby previous investigations, where relevant, are summarised on interpreted geotechnical cross-sections in Appendix B (Drawings 2 - 4). These cross-sections show the interpreted layers of soil and rock units between the borehole locations. The interpreted boundaries shown on the sections are accurate only at the test locations and layers shown diagrammatically on the drawings are inferred, only. As noted on these cross-section drawings, subsurface conditions may vary away from the borehole locations. Also, it should be noted that bands of lower or higher strength rock may be present within the generalised rock layers.

9.1 Soil Profile

The shallow soil profile encountered in the boreholes below the existing basement generally included clayey sand and gravel fill to depths between 0.5 m and 2.6 m. This fill layer was observed to reduce in thickness in boreholes which were located deeper in the existing basement, with the thickest layer observed in BH01, and the thinnest in BH06. It is assumed that

the fill layer has been placed as fill beneath the basement slab and is therefore not expected to continue laterally beyond the existing basement walls and retaining structure.

The results of the previous nearby 205925.01 investigation indicate that the soil profile below street level, surrounding the site is likely to comprise sandy gravel and clayey sand fill to depths of up to 2.5 m, followed by very stiff to hard consistency, medium to high plasticity clay residual soil to depths in a range of 0.9 m to 1.5 m, or RL 81.2 m to RL 85.0 m. If the upper soil profile becomes important for the design of shoring / retention or other structures, additional investigation should be conducted at street level.

9.2 Rock Strata

The rock encountered in the cored boreholes has been classified in accordance with Pells et al (2019) "Classification of Sandstone and Shale in the Sydney Region: A Forty Year Review" Aust. Geomechanics Journal, June 2019. There are five classes of rock (I to V) based on strength, fracturing and the amount of defects such as sheared zones and clay seams. Class I rock is the best quality (high strength with very few defects) while Class V represents the lowest quality rock (very low strength and / or numerous defects) in the classification system.

The rock classes encountered in the boreholes have been generalised and are defined in Table 6. It is noted that in some cases, zones of higher or lower 'class' rock may be present at varying depths in the defined rock units.

Table 6: Summary of Defined Rock Units

Rock Unit / Classification	Description
Unit 1 – Generally low to medium strength shale (Class III)	Ashfield Shale – generally low to medium with some high strength zones, fresh shale, typically slightly fractured to unbroken(1)
Unit 2 – Medium strength laminite and sandstone (Class III)	Mittagong Formation – medium strength, fresh, fine to medium grained laminite and sandstone, typically slightly fractured with some fractured zones. Some low strength bands.
Unit 3 – Medium to high strength sandstone and laminite (Class II)	Mittagong Formation – medium to high strength, fresh, grey and pale grey, fine to medium grained sandstone and laminite
Unit 4 – High strength sandstone (Class II/I)	Hawkesbury Sandstone – High strength, fresh, pale grey, unbroken, medium to coarse grained sandstone(2)

Notes: (1) Very low strength bands were encountered within Unit 1 in BH05 and high strength in BH04
(2) Fractured, medium strength sandstone (Class III) was noted between 26.5 m and 30.0 m in BH04

The interpreted depth and Reduced Level (RL) at the top of the various defined rock units is shown in and Table 7.

Table 7: Summary of Depths (and Reduced Levels) to Top of Various Rock Units

Borehole	Surface RL (AHD)	Depth [RL] to top of rock units (m)			
		Unit 1	Unit 2	Unit 3	Unit 4
BH01	82.4	2.6 [79.8]	4.5 [77.9]	8.7 [73.8]	12.0 [70.4]
BH02	82.4	1.1 [81.3]	4.7 [77.7]	6.0 [76.4]	13.4 [69.0]
BH03	82.4	0.7 [81.7]	4.8 [77.6]	7.9 [74.5]	N.E
BH04	82.4	0.6 [81.8]	4.2 [78.2]	9.4 [73.0]	17.0(1) [65.4]
BH05	82.2	1.3 [81.0]	4.8 [77.5]	6.9 [75.3]	N.E
BH06	81.3	0.5 [80.8]	4.0 [77.3]	4.5 [76.8]	N.E

Notes: (1) Fractured, medium strength sandstone (Class III) was noted between 26.5 m and 30.0 m in BH04
N.E – Not Encountered

Groundwater was measured at variable depths of between 3.4 m and 11.1 m (RL 71.3 m to RL 77.9 m). The variable water levels may be attributed to nearby drained basements and / or the Sydney Metro rail tunnels and suggest it may also be associated with perched seepage and not the permanent/regional groundwater table. It should be noted that the groundwater levels are affected by climatic conditions, rock mass permeability and available defects and will vary with time.

10. Comments

10.1 Earthworks

10.1.1 Excavation

Excavations to deepen the existing basement is expected to require the removal of fill, low to high strength shale then medium and high strength slightly fractured and unbroken laminite and sandstone.

Excavation of fill and low strength rock should be achievable using conventional earthmoving equipment, however, the assistance of rock hammering or ripping will generally be required for effective removal of any medium to high strength rock in the upper shale rock profile. Excavation of medium and high strength rock may require heavy ripping with a large bulldozer together with the use of large hydraulic rock breakers for effective removal of this material and rock saws, where necessary, to reduce the vibration impacts to the neighbouring structures.

Some of the unbroken, high strength rock may be effectively unrippable with very low productivity expected. Pre-splitting (consecutive drilled holes along the proposed excavation line)

or rock sawing may be required to break up this rock, prior to the use of rock hammering and bulldozers with ripping tynes.

The excavation rate that can be achieved, particularly within high strength rock, varies considerably and is dependent upon the degree of jointing in the rock, the rock strength, the type of machinery being used and the skill of the operator. It is suggested that bulk excavation tenderers be required to make their own assessment of the equipment required to carry out the work. Contractors may inspect the rock core samples at the Douglas' office in West Ryde prior to submitting final tenders (rock cores are generally kept for 6 months after drilling unless longer holding times are requested).

10.1.2 **Vibration**

During excavation, it will be necessary to use appropriate methods and equipment to keep ground vibrations at adjacent buildings and structures within acceptable limits. Excavations within soil and low strength rock are not expected to generate excessive vibrations. The use of heavy ripping and rock hammers in the deeper parts of the excavation and for demolition and removing the concrete slab may generate vibrations, which should be monitored.

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s peak particle velocity (PPVi). This is generally much lower than the vibration levels required to cause structural damage to buildings. The Australian Standard AS2670.2-1990 "Evaluation of human exposure to whole-body vibrations - continuous and shock induced vibrations in buildings (1-80 Hz)" indicates an acceptable day time limit of 8 mm/s PPVi for human comfort.

Based on Douglas' experience and with reference to AS2670, it is suggested that a maximum PPVi of 8 mm/s (applicable at the foundation level of existing buildings / structures) be provisionally employed at this site for both architectural and human comfort considerations, although this vibration limit may need to be reduced if there are sensitive buildings, structures or equipment in the area.

In relation to rail tunnels, further advice on the vibration criteria will need to be sought from Sydney Metro/TfNSW. Based on our experience, it is anticipated that TfNSW may nominate a vibration limit of 12.5 mm/s for the rail tunnels, although this will need to be confirmed. Rock sawing, pre-splitting and the use of smaller equipment may be required as excavations approach the anticipated bulk excavation level.

As the magnitude of vibration transmission is site specific, it is recommended that a vibration trial be undertaken at the commencement of rock excavation or initial use of different excavation plant. The trial may indicate that smaller or different types of excavation equipment should be used for bulk (or detailed) excavation purposes.

10.1.3 **Dilapidation Surveys**

Dilapidation surveys should be carried out on adjacent buildings, pavements and infrastructure that may be affected by the excavation works. The dilapidation surveys should be undertaken before the commencement of any excavation work in order to document any existing defects so that claims for damage due to construction related activities can be accurately assessed.

10.1.4 Disposal of Excavated Material

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the *Waste Classification Guidelines* (EPA, 2014). This includes fill and natural materials that may be removed from the site. Reference to Douglas' contamination report should be made for further information.

10.2 Excavation Support

10.2.1 Excavation Support and Vertical Rock Faces

Both temporary and permanent lateral support will be required during deepening of the existing basement for all vertical excavation faces within soil and the shale and laminite rock (Units 1 to 3). Details of the existing shoring wall and adjacent buildings and footings will need to be confirmed prior to detailed design of the shoring system for the new development scheme.

Based on the supplied architectural drawings, it is understood that the existing shoring will remain in place, and a new soldier pile wall will be constructed in front to support the additional two levels of basement. Prior to removal of the existing structure and basement floor slabs, it will be necessary to provide lateral support to the existing retaining structure with bracing or temporary anchors as these slabs are presumably supporting the existing basement walls.

Soldier piles for the deepened basement excavation could be installed spaced at approximately 2 m to 2.5 m centres and preferably founded at least 1 m or two pile diameters below the lowest bulk excavation level, or adjacent excavation for drainage trenches, pits or other utilities. More closely spaced piles may be required to reduce wall movements or prevent the collapse of materials in between the solider piles.

At the completion of each 1.5 m to 2 m drop in excavation level, reinforced shotcrete infill panels should be constructed. It is suggested that shotcrete protection should be provided for Ashfield Shale and Mittagong Formation as it can be prone to deterioration with time. This requirement in Class II rock (where encountered) can be reassessed when the rock is exposed. At no stage should progressive vertical excavation proceed beyond 2 m without infill panel support being constructed. Regular inspections by a geotechnical professional should be carried out following each progressive drop in excavation level to confirm that the conditions encountered are consistent with the design assumptions.

It may be possible to terminate the shoring piles within unsupported medium to high strength sandstone/laminite (Units 3 and 4) above the bulk excavation level. In this case it will be important for a geotechnical engineer to assess the stability of the rock directly beneath each pile, and excavation may need to be completed in "hit and miss" panels. Consideration should also be given to the loads applied above any vertical rock cut (i.e. by shoring or footings) to ensure these loads are within the reduced capacity of the rock following excavation. The toe of the piles which terminate above bulk excavation level will also need to be restrained with rock bolts or anchors.

It is assumed that the existing shoring wall terminates below the existing lowest basement floor level and this aspect will require confirmation prior to bulk excavation. As excavation and piling progresses, the toe of the existing shoring wall piles will need to be restrained with rock bolts or anchors to provide additional passive support.

Suitably powered piling rigs will be required to penetrate the medium and high strength sandstone/laminite and this should be considered by the piling contractor. Consideration should also be given to the potential for groundwater inflow into the piles which may be heavy where fractured zones and faults are encountered and at strata boundaries. This may require the use of cleaning buckets and possibly tremmie pouring methods.

Medium strength or better sandstone (Unit 3 and 4 rock) will generally be stable when cut vertically provided there are no adversely oriented joints or other defects present. All vertical faces in rock should be inspected by an experienced geotechnical engineer at 1.5 m depth intervals to check for adversely inclined joints and to assess whether additional stabilisation measures (such as rock bolts or shotcrete) are required. A number of steeply dipping joints and clay infilled defects were encountered within the rock, which may affect the stability of the excavation faces if adversely orientated. The joints can form unstable rock slivers, blocks and wedges which may require additional support. Bedding planes and soft seams are also common in the Hawkesbury Sandstone, including high strength rock. Thick seams and fractured zones may require shotcrete and rockbolt support to protect these areas over the long term. These defects can also affect the stability and footing performance of adjacent buildings. Excavated faces in medium strength or stronger sandstone can therefore only be considered self-supporting once mapping has confirmed that they are not adversely affected by discontinuities or soft seams.

10.2.2 Earth Pressures for Shoring Design

Preliminary design of shoring systems may be based on the earth pressure coefficients provided in Table 8. 'Active' earth pressure coefficient (K_a) values may be used where some wall movement is acceptable. 'At Rest' earth pressure coefficient (K_o) values should be used where the wall movement needs to be limited. These parameters do not take into account stress relief which must also be considered.

Table 8: Recommended Design Parameters for Shoring Systems

Unit/Material	Unit Weight (kN/m^3)	Earth Pressure Coefficient		Ultimate Passive Earth Pressure (kPa)
		Active (K_a)	At Rest (K_o)	
Fill	19	0.4	0.6	Kp = 2.5
Residual Clay	20	0.35	0.5	Kp = 2.0
Class III Shale (Unit 1)	22	0.25	0.4	2000
Class III Laminite and Sandstone (Unit 2)	23	0*	0.1	3000
Class II / I Laminite and Sandstone (Units 3 and 4)	24	0*	0*	4000

Notes: The values above assume a level surface behind the wall
*It is assumed that the rock mass is free of adversely dipping joints and seams
It should also be noted that the K_a and K_o designs will not prevent stress relief movement

For braced walls or where two or more rows of anchors are used, the shoring can be designed using a rectangular or trapezoidal earth pressure distribution. For preliminary design purposes, a trapezoidal earth pressure distribution with a maximum pressure calculated based on 4H kPa where H is equal to the retained height of soil and Ashfield Shale (Unit 1) may be assumed. The maximum pressure should be increased to 6H to 8H, depending on the sensitivity of any structures behind the shoring wall, where wall movement needs to be reduced. In each case the maximum pressure generally acts over the central 60% of the wall height, reducing to zero at the top and base.

The design of temporary (and possibly permanent) support will also need to consider the possibility that moderately to steeply dipping joints in the weathered rock and Ashfield Shale will 'daylight' near the base of the excavation or top of Class III or better sandstone leading to wedges of rock requiring support by the temporary (and permanent) shoring/ retaining structures. For the temporary case, the required forces are generally provided by temporary 'tie-back' ground anchors and prudent, conservative design of deep excavations in shale generally involves shoring piles extending below the bulk excavation level to provide passive restraint to the shoring/retaining walls. As a guide, an anchor force equal to $4.2H^2$ kN per metre length of wall would be required for a continuous 45 degree joint daylighting at the base of the Ashfield Shale, and this often governs the shoring/anchor design for deep excavations in jointed shale. This assumes anchors at 10 degrees and the anchor load increases with increased inclination.

Additional surcharge loads such as new and existing footings, existing shoring walls, construction loads, etc., must be allowed for in the design.

The earth pressure loading described above does not include either earthquake loads or hydrostatic pressures. Unless positive drainage measures are incorporated to prevent water pressure build-up behind the walls, allowance for the hydrostatic head associated with a groundwater level rising to at least a metre above the highest measured groundwater level should be allowed for in the design, noting that groundwater monitoring in the installed wells is still ongoing and will be reported progressive.

Consideration should also be given to the assessment of a 'burst water main' sensitivity case, in which the full hydrostatic pressure is applied to the shoring wall. Such an event is considered of low probability but could potentially be of high consequence, should it occur. Therefore, assessment of the proposed shoring system and lateral restraint for such a case may be prudent as a precaution against such events.

Passive resistance for piles founded below the base of the bulk excavation may be based on the ultimate passive pressures given in Table 8. A factor of safety of at least 2 should be applied to limit wall movements. The passive restraint of the first 0.5 m of rock socket below the bulk excavation level (or base level of any adjacent excavations along the excavation/wall line) should be ignored. The minimum socket depth should be equal to the greater of two pile diameters or 1.0 m below the lowest level of any nearby excavation (including any detailed excavations), but subject to analysis.

Detailed design of the shoring should be carried out using software such as Plaxis or similar that is capable of modelling soil structure interaction and ground movements on adjacent areas.

10.2.3 Ground Movement and Stress Relief

Horizontal movements due to stress relief of the Hawkesbury Sandstone and Mittagong Formation and to a lesser extent the Ashfield Shale will occur during the excavation works. Based on published literature and Douglas' experience, the lateral deflections associated with stress relief in rock may be in the order of 0.05% to 0.2% of the excavation height, depending on the various factors such as rock strength, orientation of the face, a degree of fracturing. The predicted deflections would generally be greatest at the centre of the excavated faces and would reduce with distance from the excavation face/boundary.

It is unlikely to be practicable to provide restraint (i.e., anchoring) for the relatively high in-situ horizontal stresses associated with stress relief movements. Therefore, it is recommended that appropriate allowance be made for movements of this order in construction and planning

10.2.4 Anchor Design

Post-stressed ground anchors, rock bolts and dowels (support elements) can be used to laterally support existing walls, new shoring, underpinning works or unstable rock blocks and wedges. Anchors will also be required to retrain the toe of any existing shoring piles (proposed or existing) not suitably socketed below the bulk excavation level.

Encroaching the Sydney Metro First Protection Reserve is not generally permitted. As such, all support elements must be designed to be limited within the Second Protection Reserve and this will still require assessment and approval from Sydney Metro.

Anchors could also be used vertically as hold down anchors although the proximity of the Sydney Metro First Protection Reserve may limit this option. Support elements used for lateral support should be bonded in the stronger rock, inclined as required, but preferably not steeper than 30° below horizontal. Table 9 provides ultimate bond stresses for anchors design.

Table 9: Recommended Bond Stresses for Rock Anchor Design

Material	Ultimate Bond Stress (kPa)
Class III Shale (Unit 1)	300
Class III Laminite and Sandstone (Unit 2)	1000
Class II Laminite and Sandstone (Unit 3)	1500
Class II / I Sandstone (Unit 4)	2000

These values should be confirmed by pull-out tests prior to installation of support elements. Ultimately, it is the contractor's responsibility to ensure that the correct design values (specific to the support system and method of installation) are used and that the support element holes are carefully cleaned prior to grouting.

After temporary support elements have been installed, it is recommended that they are tested to 125% of their nominal Working load. Where stress relief or further unavoidable movement of the shoring is expected, it is recommended that the support elements are locked-off between 60% and 80% of their Working loads to accommodate the additional movement and subsequent

increase in stress in the support elements. Consideration should, however, be given to the immediate design requirements. The capacity of the anchor may have to be increased if a lower initial lock-off is not feasible. Checks should be carried out to confirm that the load in the support elements has been maintained and that losses due to creep effects or other causes have not occurred.

Shorter support elements (i.e., rockbolts, dowels and pins) may be required to support any unstable rock wedges, slivers or blocks. Short dowels and pins may be required to support feather edges where sub-parallel joints intersect the face. Shotcrete with mesh (or fibrecrete) may be required where beds/seams of extremely weathered and very low strength rock are encountered within higher strength sandstone, secured with anchors, rockbolts, dowels or pins, as required. Care should be exercised to ensure that anchors are installed progressively during excavation and stressed prior to excavation of the next drop to ensure that stability is maintained at all times

It is anticipated that the new structure will support the existing and newly constructed shoring walls over the long term and therefore the support elements are expected to be temporary only. The use of permanent rockbolts and ground anchors, if required, will need careful attention to corrosion protection. It should be noted that permission will be required from adjacent property owner prior to installing rockbolts / ground anchors below their land. Due consideration should also be given to below-ground excavations, services, etc.

10.3 **Foundations**

Based on available information it is likely that medium to high strength sandstone and laminite (Class III or better) will be exposed at the base of the excavation. Typical parameters for the design of foundations on laminate and sandstone, based on the classification methods of Pells et al. (2019) are provided in Table 10, and are subject to spoon testing/proof coring, where required. Shaft adhesion values for uplift (tension) in piles may be taken as being equal to 70% of the values for compression, provided that adequate socket roughness is achieved.

Consideration should be given to downgrading of the bearing pressure if weak seams are likely to be present within the zone of influence of the footings (e.g., 30 mm clay seam encountered at RL 70.5 m AHD in BH03). Some allowance for downgraded bearing pressures following spoon testing should also be made, which may include deepening footings or redesigning larger (i.e. broader) footings.

Table 10: Recommended Parameters for Foundation Design

Foundation Stratum	Allowable Bearing Pressure (Serviceability)		Ultimate Bearing Pressure		Young's Modulus (MPa)
	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	
Unit 2 – Class III Laminite and Sandstone	3.5	350	20	800	800

Foundation Stratum	Allowable Bearing Pressure (Serviceability)		Ultimate Bearing Pressure		Young's Modulus (MPa)
	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (MPa)	Shaft Adhesion (Compression) (kPa)	
Unit 3 – Class II Sandstone and Laminite	6.0	600	60	100	1500
Unit 4 – Class II/I Sandstone	8.0	1000	120	2000	2000

Note: Shaft adhesion applicable to the design of bored piles, uncased over the rock socket length, where adequate sidewall cleanliness and roughness are achieved

Foundations proportioned on the basis of the allowable bearing pressures in Table 10 would be expected to experience total settlements of less than 1% of the pile diameter or footing width under the applied working load, with differential settlements between adjacent columns expected to be less than half of this value. Footings designed using the ultimate values in Table 10 will also need to consider serviceability criteria which will probably govern the design.

To use an allowable bearing pressure value for design of greater than 3.5 MPa, spoon testing in 33% of footings will be required. If bearing pressures greater than 6 MPa are used in design, then spoon testing in all footings will be required. For spoon testing, a 50 mm diameter hole is drilled below the base of the footing to a depth of 1.5 times the footing width, followed by testing to check for the presence of weak layers or clay bands.

Consideration should be given to the existing footings for the neighbouring building to the west of the site, as it is likely to be within the zone of influence of the proposed excavation. The zone of influence may be taken as a 45° line drawn up from the base of the proposed bulk excavation level. An assessment of the bearing capacity beneath these neighbouring footings should be undertaken to ensure the foundation remains within their Serviceability design limits and what if any support or underpinning may be required, if any. During bulk excavation, progressive inspections of the excavated face below the neighbouring footings will be necessary in 1.0 m drops to check whether there are defects or adversely dipping joints that may affect the neighbouring foundation performance.

All foundations should be inspected by a geotechnical engineer to confirm that foundation conditions are suitable for the design parameters, and proof (core) drilled or spoon tested as appropriate. If weak seams or defects are encountered, footings may need to be deepened until suitable foundation material is reached. Alternatively, the footing can be enlarged, or redesigned for a lower bearing pressure.

10.4 **Groundwater and Dewatering**

Groundwater was measured in the wells on the site at variable depths. In BH01 and BH03, groundwater was measured at depths between 7-11 m depth (RL 75.4 to RL 71.4) which is within medium and medium to high strength Mittagong Formation, slightly above and below the proposed basement at RL 73 m. In BH06, groundwater was measured at a depth of about 3.4 m (RL 77.9 m) which was within medium strength Ashfield Shale. The shallower groundwater is

likely to be perched seepage trapped within fractures and joints in rock mass and based on experience in the area, is likely to drain and reduce in the long term. Douglas has been involved with similar and deeper basements nearby that have been excavated through Ashfield Shale and into the Hawkesbury Sandstone. Some seepage occurred at varying depths, but significant ongoing groundwater flows were not observed.

During construction and in the long term, it is anticipated that seepage into the excavation should generally be readily controlled by perimeter drains connected to a "sump-and-pump" system. A drained basement is technically feasible and will require permanent subfloor drainage below the basement floor slab to direct seepage to the stormwater drainage system. However, a drained basement and pumping to the stormwater system will be subject to approval from Council and relevant authorities. It may be necessary to carry out more detailed testing and analysis to estimate inflows and demonstrate minimal impact to surrounding groundwater systems and property (prepare a Groundwater Impact Assessment report). Given that the measured groundwater level is generally within rock, it is expected that minor seepage flows associated with a drained basement would have no significant impact to surrounding groundwater systems or property.

It is possible that iron oxides will precipitate from any seepage, possibly leading to a build-up of an iron-oxide sludge. Allowance for periodic cleaning of such sludge should be made in the long-term maintenance requirements.

Reference should be made to Douglas Groundwater Inflow Assessment report (86230.01.R.004.Rev2, dated March 2026) for further comments on the groundwater impact of the proposed development.

10.5 Earthquake Design

A Hazard Factor (*Z*) of 0.08 would be appropriate for preliminary design in accordance with Australian Standard AS 1170.4 - 2007 *Structural design actions – Part 4: Earthquake actions in Australia*.

Based on the results of the previous investigation undertaken on the site adjacent (Ref.: 205925.01 – *Geotechnical Investigation at 617-621 Pacific Highway, St Leonards*), the site sub-soil class is expected to be Class C_e due to the depth to competent rock adjacent to the site. It is recommended that further geotechnical investigation be undertaken at street level to confirm the depth to bedrock, to more accurately classify the site sub-soil class.

It is recommended that the structure is not designed to rely on any passive resistance from the excavated rock faces surrounding the site as there is the potential for the removal of this rock by future neighbouring developments.

10.6 TfNSW Considerations

10.6.1 Excavation Requirements

Based on the supplied architectural drawings, it is understood that the proposed basement excavation will be entirely within the 2nd Protection Reserve of the Sydney Metro tunnel. As such, a detailed impact assessment and review by TfNSW will be required. The detailed assessment of

the interaction between the proposed basement excavation (and building construction) and the existing Sydney Metro tunnels will need to be carried out by 3D numerical modelling.

A detailed monitoring plan will also be required during the construction including a minimum of two inclinometers along Pacific Highway, and survey monitoring to assess vertical and horizontal movements during the excavation. The survey should commence prior to excavation to provide a baseline and should continue every 1.5 m drop of the excavation. TfNSW may require dilapidation surveys for the tunnels depending on the final layout and depth of the excavation.

10.6.2 **Anchoring Requirements**

TfNSW Technical Direction GTD 2020/001 (dated 2 July 2020) and Sydney Metro Underground Corridor Protection Guildines (dated 1 August 2025) outlines the requirements for installing ground anchors as part of the excavations close to TfNSW infrastructure. The applicable requirements are as follows:

- Anchors are generally not permitted with the First Protection Reserve of Sydney Metro tunnels;
- Only temporary ground anchors will be permitted within the Second Protection Reserve of Sydney Metro tunnels (subject to assessment);
- Ground anchors are to be designed and tested in accordance with AS 5100;
- Temporary ground anchors must have a minimum design life of two years. Where ground anchors are required for more than 18 months they must be designed as permanent anchors. A safety factor of 3 should be applied to ultimate bond stress values as provided in Table 9 to obtain permanent allowable bond stress;
- No anchor forming part of the works must be stressed to greater than 75% of the tendon ultimate tensile strength under either Working load or test load;
- No part of any ground anchor must be less than two metres below the surface within the State road reserve and TfNSW easement; and
- Once the anchors are no longer required to carry load, all structural connection between the anchors and the proposed development must be removed.

10.6.3 **Foundation Requirements**

Sydney Metro guidelines generally requires that no footings be located above a 45 degrees line extended up from the invert level of the rail tunnels (i.e., Influence Zone). However, these requirements have been developed to cover all sites, including those with deep soils and can be negotiated based on the site-specific assessment. Detailed numerical modelling would be required to assess the potential impact of proposed footing on the rail infrastructure. The numerical assessment would require detailed (geotechnical) numerical modelling to be undertaken during the detailed design stage and once the proposed column / footing layout has been developed.

11. **Conclusion**

Based on the findings of the geotechnical investigation, the site is generally considered suitable for the proposed development from a geotechnical perspective, provided the comments and

advice outlined within Section 10 of this report are considered within the design of the development.

12. Limitations

This report provides specialist advice only and no part of it is considered a Regulated Design under the Design and Building Practitioner Act 2020 (NSW).

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 601 Pacific Highway, St Leonards NSW in line with Douglas' proposal dated 17/09/2024 and acceptance received from Diego Eguiguren of Stockland dated 19/11/2024. The work was carried out under contract No. CW96547 dated 15/11/2024. This report is provided for the exclusive use of Stockland for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical and groundwater components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope of work for this report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building demolition

materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

Appendix A

About this Report

Terminology, Symbols and Abbreviations

Soil Descriptions

Rock Descriptions

Sampling, Testing and Excavation Methodology

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style `XW`. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	`KL`
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	`UK`
No data	Information required to allow classification of the property was not available. For example, if drilling is commenced from the base of a hole predrilled by others	`ND`
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example, providing a description of the strength of a concrete pavement	`NA`

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

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November 2023

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index[1] $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	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, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	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 deposition of weathering products in pores.	HW
Moderately weathered	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 but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	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 weathered products in pores.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections > 100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Infilled seam	IS
Cleavage	CV
Crushed zone	CZ
Decomposed seam	DS
Fault	F
Joint	JT
Lamination	LAM
Parting	P
Shear zone	SZ
Vein	VN
Drilling/handling break	DB , HB
Fracture	FC

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN

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Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Slickensided	SL
Smooth	SM
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

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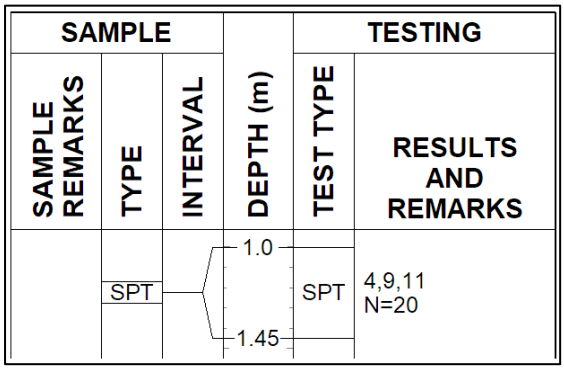
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

November 2023

Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Bulk sample	B
Core sample	C
Disturbed sample	D
Sample from SPT test	SPT
Environmental sample	ES
Gas sample	G
Undisturbed tube sample	U[1]
Water sample	W
Piston sample	P
Core sample for unconfined compressive strength testing	UCS
Material Sample	MT

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

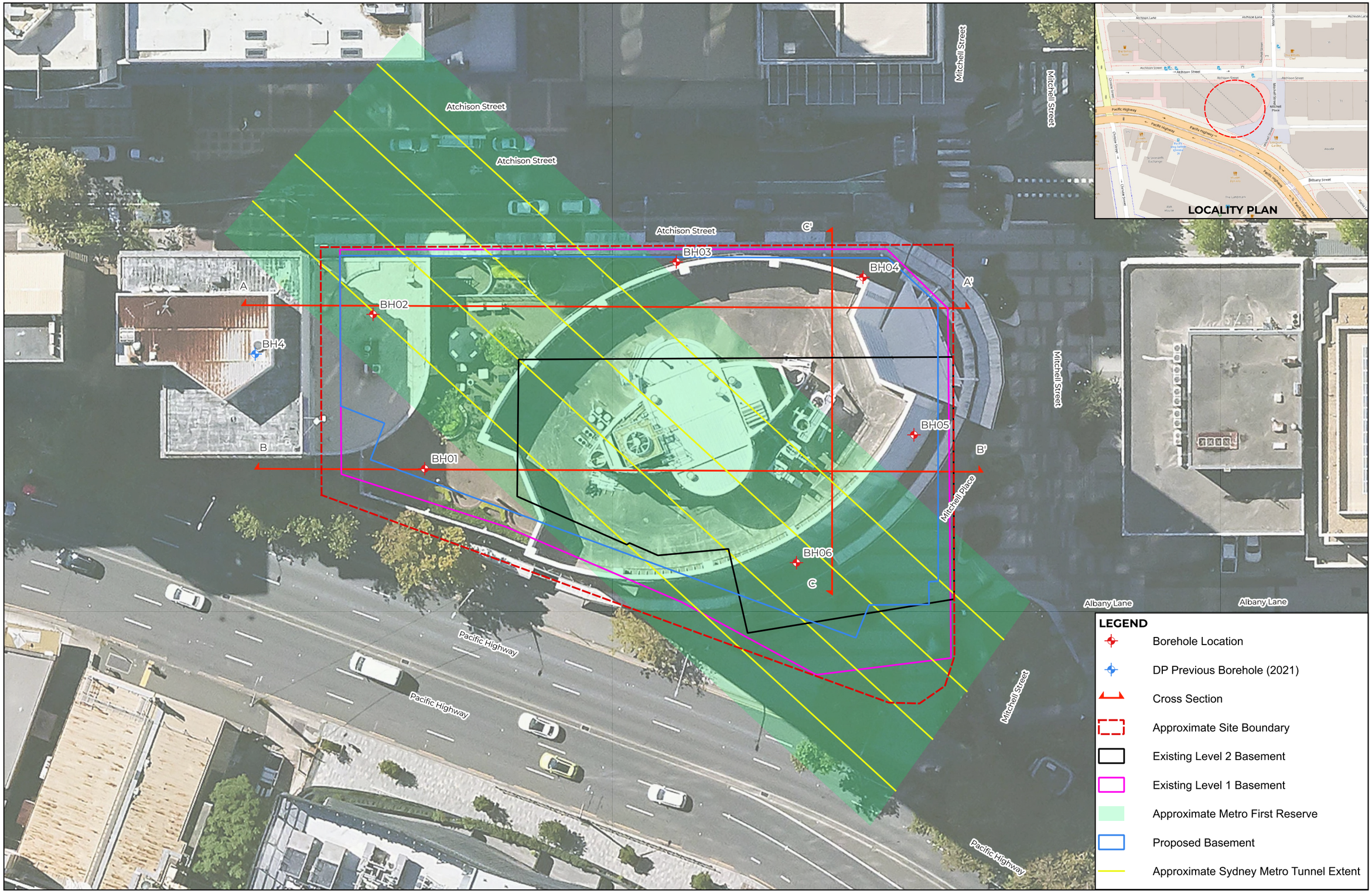
Method	Abbreviation Code
Toothed bucket	TB[1]
Mud/blade bucket	MB[1]
Ripping tyne/ripper	R
Rock breaker/hydraulic hammer	RB
Hand auger	HA[1]
NMLC series coring	NMLC
HMLC series coring	HMLC
NQ coring	NQ3
HQ coring	HQ3
PQ coring	PQ3
Push tube	PT[1]
Rock roller	RR[1]
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Sonic drilling	SON[1]
Vibrocore	VC[1]
Wash bore (unspecified bit type)	WB[1]
Existing exposure	X
Hand tools (unspecified)	HAND
Predrilled	PD
Diatube	DT[1]
Hollow flight auger	HSA[1]
Vacuum excavation	VE

[1] – numeric suffixes indicate tool diameter/width in mm

Douglas PARTNERS

Appendix B

Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	22.05.2025	EC

SCALE: 0 4 8 12 16 20 m
1:400 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT: **Stockland Commercial Property**

NOTE:
1: Basemap from Metromap (Dated 13.03.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME: **Proposed Commercial Building**

PROJECT ADDRESS: **601 Pacific Highway, St Leonards**

DRAWING TITLE: **Test Location Plan**

PROJECT NO: **86230.01**

DRAWING NO: **1**

REVISION: **0**

A

A'

BH4

BH02

BH03

BH04

FILL

UNIT 1: CLASS III SHALE

UNIT 2: CLASS III SANDSTONE/LAMINITE

PROPOSED L06 BASEMENT FFL
RL 73.0 m

UNIT 3: CLASS II SANDSTONE/LAMINITE

APPROXIMATE EXTENT OF METRO TST RESERVE

UNIT 4: CLASS II/I SANDSTONE

POSSIBLE LOW ANGLE THRUST FAULT ZONE

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

CLAY
FILL
SANDSTONE
CONCRETE
Clayey SAND
SILTSTONE
NO CORE
Gravelly SAND
Groundwater Level

TESTS / OTHER
— ? — — - Interpreted geotechnical boundary

ROCK STRENGTH
VL- Very Low
L - Low
M - Medium
H - High

COMPACTION (anthropogenically modified soil)
na - Not applicable
nd - No data
pc - Poorly compated
mc - Mostly compacted
wc - Well compacted
vc - Variably compacted

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	24.10.2025	EC

SCALE: 0 2 4 6 8 10 15 20
1:400 @ A3
Vertical Exaggeration = 2.0

Douglas PARTNERS
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CLIENT:
Stockland Commercial Property

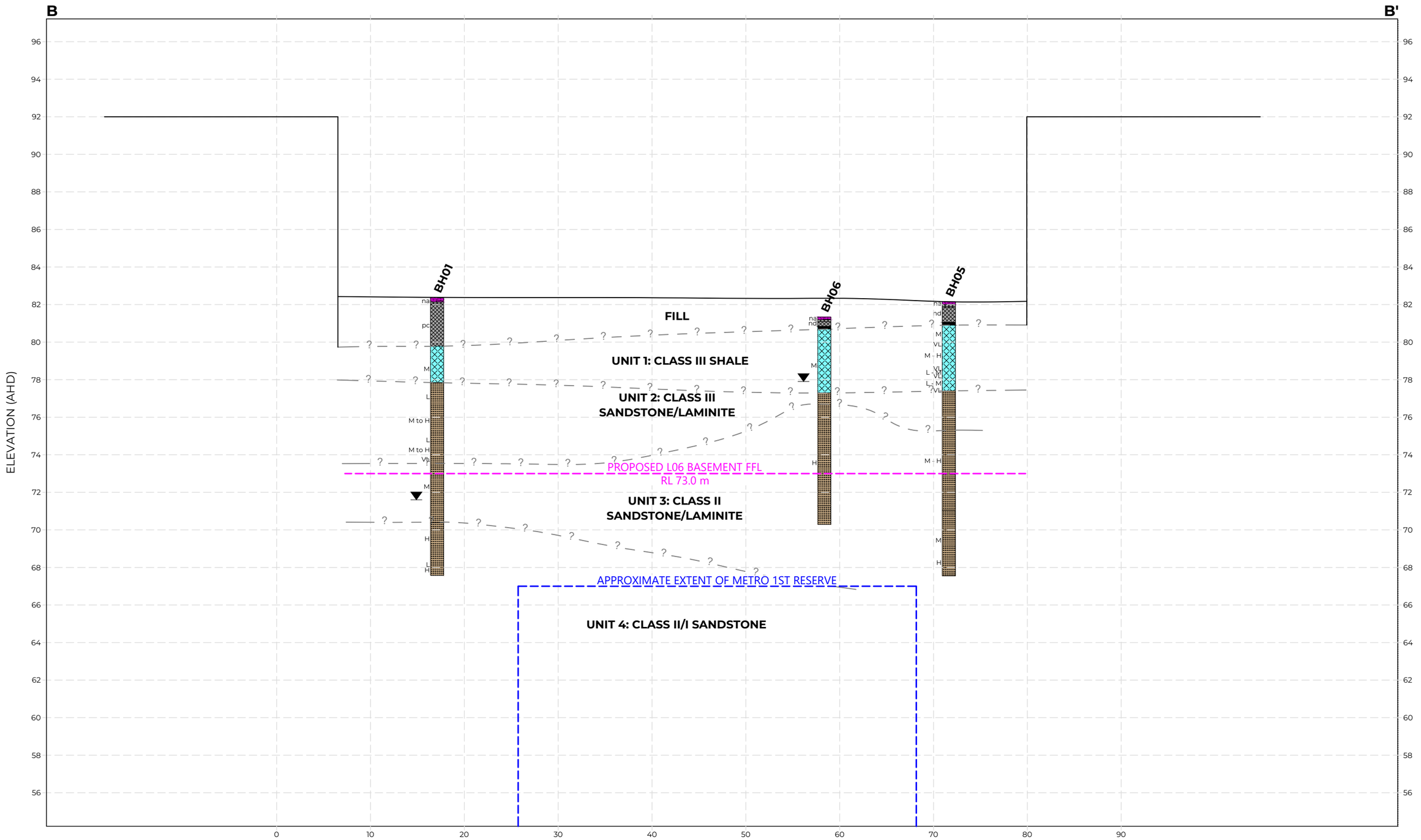
NOTES
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

PROJECT NAME:
Proposed Commercial Building
PROJECT ADDRESS:
601 Pacific Highway, St Leonards

DRAWING TITLE:
Geological Cross Section A-A'

PROJECT No: **86230.01**
DRAWING No: **2**
REVISION: **0**

\\dpsydnas02\Projects\86230.01 - ST LEONARDS, 601 Pacific Highway, geo\70 Drawings\72 Out\86230.01.D.002-004 Rev0 Cross Sections A-C.dwg



LEGEND

- CONCRETE
- SANDSTONE
- NO CORE
- SILTSTONE
- FILL
- Groundwater Level

TESTS / OTHER

— ? — — - Interpreted geotechnical boundary

ROCK STRENGTH

- VL- Very Low
- L - Low
- M - Medium
- H - High

COMPACTION (anthropogenically modified soil)

- na - Not applicable
- nd - No data
- pc - Poorly compated
- mc - Mostly compacted
- wc - Well compacted
- vc - Variably compacted

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	24.10.2025	EC

SCALE: 0 2 4 6 8 10 15 20

1:400 @ A3
Vertical Exaggeration = 2.0

Douglas PARTNERS
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CLIENT:
Stockland Commercial Property

NOTES
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2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

PROJECT NAME:
Proposed Commercial Building

PROJECT ADDRESS:
601 Pacific Highway, St Leonards

DRAWING TITLE:
Geological Cross Section B-B'

PROJECT No: **86230.01**

DRAWING No: **4**

REVISION: **0**

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C

C'

ELEVATION (AHD)

92 90 88 86 84 82 80 78 76 74 72 70 68 66 64 62 60 58 56 54 52 50

BH06 BH05 BH04

FILL

UNIT 1: CLASS III SHALE

UNIT 2: CLASS III SANDSTONE/LAMINITE

UNIT 3: CLASS II SANDSTONE/LAMINITE

UNIT 4: CLASS II/I SANDSTONE

PROPOSED L06 BASEMENT FFL
RL 73.0 m

APPROXIMATE EXTENT OF METRO 1ST RESERVE

POSSIBLE LOW ANGLE THRUST FAULT ZONE

0 10 20 30 40 50 60

DISTANCE ALONG PROFILE (m)

LEGEND

CONCRETE
SANDSTONE
NO CORE
SILTSTONE
FILL
Groundwater Level

TESTS / OTHER

— ? — — - Interpreted geotechnical boundary

ROCK STRENGTH

VL- Very Low
L - Low
M - Medium
H - High

COMPACTION (anthropogenically modified soil)

na - Not applicable
nd - No data
pc - Poorly compated
mc - Mostly compacted
wc - Well compacted
vc - Variably compacted

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	24.10.2025	EC

SCALE: 0 2 4 6 8 10 15 20
1:400 @ A3
Vertical Exaggeration = 2.0

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02) 9809 0666

CLIENT:
Stockland Commercial Property

NOTES
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

PROJECT NAME:
Proposed Commercial Building
PROJECT ADDRESS:
601 Pacific Highway, St Leonards

DRAWING TITLE:
Geological Cross Section C-C'

PROJECT No: **86230.01**
DRAWING No: **5**
REVISION: **0**

\\dpsydnas02\Projects\86230.01 - ST LEONARDS, 601 Pacific Highway, geo\7.0 Drawings\7.2 Out\86230.01.D.002-004.RevO_Cross Sections A-C.dwg

Appendix C

Borehole Logs

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0.25	CONCRETE; reinforcement 8mm, 2 slabs 130mm thick and 90mm thick (low), second slab has no reinforcement observable, 10mm blinding sand separating slabs.		FILL	NA	NA		D	0.40	0.40			Bentonite	
		0.35	FILL / GRAVEL: dark grey; fine to medium, angular, igneous.						D	0.50	0.50				
	81	1	FILL / CLAY trace sand: dark grey; low to medium plasticity; fine sand.		FILL	PC	w<PL		D	0.90 1.00	0.90 1.00				
		2	2.00m: poor compaction						D	1.40 1.50	1.40 1.50				
	80	2.60	Continued as rock log						D	1.90 2.00	1.90 2.00			Gravel	
	79	3									3				
	78	4									4				
	77	5									5				
	76	6									6				
	75	7									7				
	74	8									8				
	73	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0				
	81	1													1				
	80	2													2				
		2.60	SILTSTONE: dark grey, indistinct bedding; (horizontal). Ashfield Shale.			2.60		100	100						3	PLT	PL(A)=0.62MPa		
	79	3						100	100		2.87m: JT, 70°, PR, CN, SM 3.23m: JT, 70°, PR, CN, SM,				3	PLT	PL(A)=0.78MPa		
							M				3.00m: Very minimal water loss					PLT	PL(A)=0.65MPa		
	78	4						100	100		3.72m: JT, 70°, PR, CN, SM,				4	PLT	PL(A)=0.62MPa		
		4.54	SANDSTONE: grey, fine to medium grained, indistinct bedding; siltstone ~5 - 10%. Mittagong Formation.		FR						4.09m: JT, 30°, PR, CN, SM,					PLT	PL(A)=0.98MPa		
	77	5				5.00	L	100	100		4.70m: Water loss ~20%				5	PLT	PL(A)=0.28MPa		
						5.60					5.70m: Water loss ~30-40%					PLT	PL(A)=1.1MPa		
	76	6					H	95	100						6	PLT	PL(A)=1.2MPa		
		6.65																	
		6.70				6.70												Gravel	
	75	7					H	100	90		7.30m: Water loss 80-100% recovering to ~40%				7	PLT	PL(A)=1.1MPa		
						7.65					7.55-7.65m: B, 5°, PR, CN, RF, x3								
	74	8			FR		H	100	93		8.03m: B, 10°, PR, CN, RF 8.25m: B, 10°, PR, CN, RF 8.40m: B, 10°, PR, CN, RF				8	PLT	PL(A)=1.6MPa		
						8.60 8.65					8.62-8.70m: B, 0°, PR, RF, x4								
	73	9					M	100	100		8.90m: Water loss 60-90% 9.10m: Water loss ~10-20%				9	PLT	PL(A)=0.73MPa		
								100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11					M	100	100						11	PLT	PL(A)=0.76MPa		
	71					11.50		100	100		10.80m: Water loss ~20-30%					PLT	PL(A)=0.74MPa		
		12.00	SANDSTONE: grey, medium to coarse grained, indistinct bedding. Hawkesbury Sandstone.		FR						11.90m: JT, 90°, PR, SN Fe, RF 12.05m: JT, 90°, PR, CN, RF 12.23m: JT, 50°, PR, CN, RF				12			Gravel	
	70	12					H	100	100		12.60m: B, 5°, PR, INF M, RF					PLT	PL(A)=1.1MPa		
	69	13													13	PLT	PL(A)=1.1MPa		
	68	14				14.20 14.25	H - VH	100	100		14.26m: CS 50mm				14	PLT	PL(A)=3.1MPa		
	67	15	Borehole discontinued at 14.80m depth. Target depth reached.								14.71m: B, 10°, PR, SN Fe, RF								
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 2



2.60-7.00 m depth



7.00-12.00 m depth

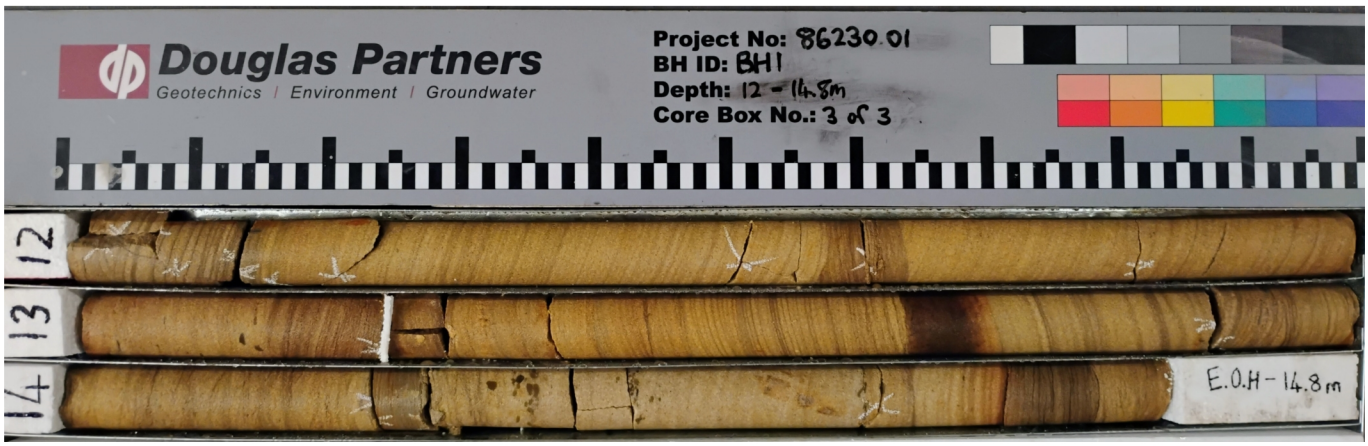
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 2



12.00-14.80 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
		0.18	CONCRETE; 2 layers reinforcement 8mm and 4mm.			NA	NA						
	82	0.40	FILL / Gravelly SAND with clay: brownish-grey; fine to medium; medium, sub-angular, igneous gravel.		FILL	ND	M						
		0.90	FILL / Clayey SAND trace gravel: dark grey; fine to medium; low to medium plasticity clay; fine to medium, angular, igneous gravel.		FILL		D						
		1.10	FILL / CLAY trace sand trace gravel: dark grey; low to medium plasticity.		FILL		w<PL						
	81		Continued as rock log								1		
	80										2		
	79										3		
	78										4		
	77										5		
	76										6		
	75										7		
	74										8		
	73										9		

28/03/25 No free groundwater observed whilst augering

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 28/03/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
82	0	Continued from soil log												0				
	1	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.		FR	1.10	L	100	100		1.33m: JT, 40°, PR, CN, SM				1	PLT	PL(A)=0.12MPa		
81					2.00		100	100							PLT	PL(A)=0.14MPa		
	2													2	PLT	PL(A)=0.32MPa		
80	2.50									2.50m - 3.60m: Water loss <10%								
	2.63				2.63					2.80m: JT, 50°, PR, CN, SM					PLT	PL(A)=0.60MPa		
	3						88	100		3.27m: JT, 45°, PR, CN, SM				3	PLT	PL(A)=0.66MPa		
79				FR		M												
	4									3.90m: CZ, 0°, PR, Clay, SM, ~5mm				4	PLT	PL(A)=0.87MPa		
78							100	100		4.25m: CZ, 0°, PR, Clay, SM, ~5mm					PLT	PL(A)=0.54MPa		
	4.72									4.62-4.67m: CZ, 5°, PR, Clay								
	5	SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.		SW	4.70									5	PLT	PL(A)=0.48MPa		
77		5.50m-5.80m: rip up clasts			5.30										PLT	PL(A)=0.37MPa		
	6				6.00		100	100						6				
76						H									PLT	PL(A)=1.2MPa		
	7			FR			100	100						7				
75					7.60	M									PLT	PL(A)=1.3MPa		
	8				8.05									8				
74										8.56m: CZ, 20mm					PLT	PL(A)=1.4MPa		
	9					H	100	100						9				
73															PLT	PL(A)=1.1MPa		
							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10	[CONT] SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.		FR	10.00	M	100	100		10.60m CZ, 20mm				10	PLT	PL(A)=0.49MPa		
	71	11				10.40					11.10m - 14.10m: Water loss <10%				11	PLT	PL(A)=1.4MPa		
	70	12					H	100	100						12	PLT	PL(A)=1.8MPa		
	69	13						87	87		13.38m B, 0°, PR, INF Clay 10mm, RF				13	PLT	PL(A)=1.1MPa		
		13.37	SANDSTONE: pale grey, medium to coarse grained; cross-bedded 0-10 degreess. Hawkesbury Sandstone.												14				
	68	13.90	Borehole discontinued at 14.10m depth. Target depth reached.																
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 2



10.00-14.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick.			NA			D		0.15			Bentonite	
		0.25	FILL / Gravelly SAND: yellow and grey; medium; fine to coarse, igneous, concrete gravel.		FILL	ND	w<PL		D		0.20				
		0.70	FILL / Sandy CLAY trace gravel: dark grey; low to medium plasticity; fine to coarse sand; fine gravel; shale.								0.40				
	81	1	Continued as rock log								0.50				
	80	2									1				
	79	3									2				
	78	4									3				
	77	5									4			Sand	
	76	6									5				
	75	7									6				
	74	8									7				
	73	9									8				
											9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0			Bentonite	
	81	1	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.		SW	0.70 1.00	VL L M H VH EH	100	100		0.75m: JT, 35°, PR, SN Fe 0.92m: JT, 85°, PR, SN Fe 0.70m - 1.80m: Water loss <10% 1.39m: JT, 70°, PR, CN, SM				1	PLT	PL(A)=1.3MPa		
	80	2						100	100						2	PLT	PL(A)=0.80MPa		
																PLT	PL(A)=0.61MPa		
	79	3						100	100		2.80m: JT, 40°, PR, CN, SM				3	PLT	PL(A)=0.91MPa		
											3.30m - 4.00m: Water loss ~10%					PLT	PL(A)=0.70MPa		
	78	4					M H	100	100		4.13-4.15m: CZ, 0°, PR, SN Clay 4.25m: JT, 80°, PR, CN, SM				4	PLT	PL(A)=0.67MPa		
		4.80														PLT	PL(A)=0.86MPa		
	77	5	SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding 0 to 10 degrees. Mittagong Formation.		FR			100	100						5	PLT	PL(A)=1.1MPa	Sand	
	76	6									6.08m: B, ~5°, PR, CN, RF 6.49m: JT, 15°, PR, CN, RF				6	PLT	PL(A)=0.77MPa		
	75	7				7.00	H	100	90		7.28m: B, 10°, PR, RF 7.30m: B, 5°, PR, HE 7.35m: B, 50°, PR Clay 6 mm 7.41m: B, ~20°, UN, RF 7.50m: JT, 70°, PR, HE 7.62m: JT, 85°, UN, HE 7.75m: JT, 20°, UN, Clay, ~5mm				7	PLT	PL(A)=2.4MPa		
	74	8						100	100		8.46m: B, 5°, ST, Clay, ~2 mm 8.79m: JT, 70°, PR, CN, RF				8	PLT	PL(A)=1.5MPa		
	73	9				9.40	M	100	84		9.45m: JT, 80-90°, CU, Clay, 1-3mm 9.60m: B, ~50°, PR, Clay, PO, 1-2mm				9	PLT	PL(A)=0.37MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding 0 to 10 degrees. Mittagong Formation.		FR		M	100	84						11	PLT	PL(A)=0.92MPa	Sand	
	71							100	100		11.55m: JT, 40°, PR, VNR Clay, RF 11.63m: CS, 30mm					PLT	PL(A)=0.84MPa		
		12									12.06m: JT, 80°, PR, CN, SM				12				
	70		Borehole discontinued at 12.10m depth. Target depth reached.																
		13																	
	69																		
		14																	
	68																		
		15																	
	67																		
		16																	
	66																		
		17																	
	65																		
		18																	
	64																		
		19																	
	63																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 2



0.70-5.00 m depth



5.00-10.00 m depth

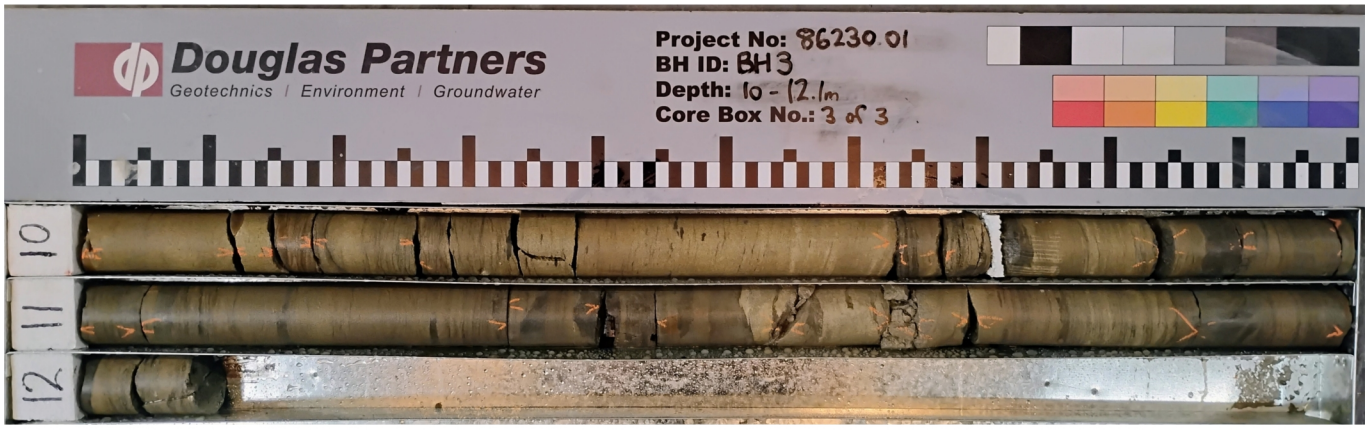
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 2



10.00-12.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 5

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
07/04/25 Water level measured at 25.2m BGL.	82	0.15	CONCRETE; 150mm thick; one layer bidirectional reinforcement (SL82).			NA	NA		D	0.15 - 0.20	0.15		
		0.23	FILL / SAND: grey; medium.		FILL	ND	M				0.20		
		0.60	FILL / Sandy GRAVEL: dark grey; fine to medium, sub-angular, igneous; fine to coarse sand.		FILL		M / W		D	0.40 - 0.50	0.40		
			Continued as rock log								0.50		
	81	1									1		
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
07/04/25 Water level measured at 25.2m BGL.	82	0	Continued from soil log												0	PLT	PL(A)=1.1MPa		
			SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.			0.60		100	100										
	81	1													1	PLT	PL(A)=1.0MPa		
											1.71m: JT, 70°, PR, CN, SM								
											1.91m: JT, 50°, PR, CN, SM					PLT	PL(A)=1.2MPa		
	80	2					H	100	100						2	PLT	PL(A)=0.68MPa		
											2.86m: JT, 60°, PR, CN, SM					PLT	PL(A)=0.75MPa		
		3													3	PLT	PL(A)=1.3MPa		
	79					3.40		100	100										
							M				3.79m: JT, 80°, PR, CN, SM					PLT	PL(A)=0.56MPa		
		4									3.70m: Water loss 10-20%				4	PLT	PL(A)=0.22MPa		
		4.15				4.10	L				4.15m: JT, ~70°, PR, CN, RF								
	78		SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.			4.20		100	100		4.20m: Water loss <10%					PLT	PL(A)=0.85MPa		
		5													5				
	77				FR											PLT	PL(A)=1.2MPa		
		6					H	100	100						6				
	76										6.70m - 8.20m: Water loss 10%					PLT	PL(A)=1.7MPa		
		7													7				
	75					7.50	L	100	99		7.60m: JT, 70°, CU, CN, RF								
						7.90	M				7.66m: B, 0°, PR, RF 7.68m: B, 0°, PR, RF					PLT	PL(A)=0.13MPa		
		8				8.10									8	PLT	PL(A)=2.2MPa		
	74						H												
											8.72-8.92m: B, 0-10°, PR, RF, 7x								
		9				9.00		100	87						9				
	73						M				9.00-9.70m: JT, 85°, CU, CN, RF								
						9.90		100	100							PLT	PL(A)=0.73MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10.00	SANDSTONE: grey, pale grey, and pale brown, fine to medium grained, distinct bedding, 0 to 10°; siltstone laminae ~5-15%. Mittagong Formation.					100	100						11	PLT	PL(A)=1.1MPa		
	71	11						100	100						12	PLT	PL(A)=0.99MPa		
	70	12						100	100						13	PLT	PL(A)=0.83MPa		
	69	13 13.05	SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.				M - H	100	100						14	PLT	PL(A)=0.89MPa		
	68	14	From 14.30m: pale grey					100	100		13.81m: B, 5-10°, PR, VNR Clay, RF				15	PLT	PL(A)=0.80MPa		
	67	15	15.00m-15.65m: 50% carbonaceous laminations		FR			100	92		15.54m: B, 0°, PR, VNR Clay, RF 15.67m: B, 10°, PR, VNR, RF				16	PLT	PL(A)=0.73MPa		
	66	16						100	100						17	PLT	PL(A)=1.1MPa		
	65	17				17.00		100	100						18	PLT	PL(A)=1.3MPa		
	64	18					H	100	100						19	PLT	PL(A)=1.0MPa		
	63	19						100	100		19.57m: B, 10°, PR, RF, iron clay 19.80m: Water loss ~20%					PLT	PL(A)=1.1MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	62	20	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		20.77m: CS, 10mm				20	PLT	PL(A)=1.0MPa		
	61	21									21.20m: B, ~5°, PR, Clay 2mm, RF				21	PLT	PL(A)=1.3MPa		
											21.40m: Water loss ~10%								
	60	22						100	100						22	PLT	PL(A)=1.1MPa		
	59	23					H	100	100						23	PLT	PL(A)=1.6MPa		
	58	24						100	100						24	PLT	PL(A)=1.5MPa		
	57	25			FR			100	100						25	PLT	PL(A)=1.7MPa		
	56	26				26.50	L	100	92		26.12m: JT, 90°, UN, CN, RF 26.20m: B, 5-10°, PR, Clay, RF, 3-4mm 26.26m: B, 0°, PR, Clay, RF, 1-2mm 26.57m: B, 15°, PR, Clay 1mm, RF 26.70m: B, 0°, PR, Clay 5mm, RF 26.75m: B, 0°, PR, Clay, RF, 1-2mm				26	PLT	PL(A)=0.34MPa		
	55	27				26.90					26.00m - 27.40m: Water loss 25%				27	PLT	PL(A)=0.59MPa		
	54	28					M	100	90		27.75m: CS, 10°, PR, Clay 40mm, RF 28.08m: CS, Clay 15mm 28.20m: JT, 20°, PR, Clay 4mm, RF 28.25m: B, 0°, PR, Clay, RF, 2-4mm				28	PLT	PL(A)=0.32MPa		
	53	29				29.50	M	100	76		28.70m: JT, 15°, PR, Clay 4mm, RF 28.94m: JT, 20°, PR, VNR Clay, RF 29.04-29.30m: B, 5°, PR, VNR, RF 29.36m: JT, 70°, PR, CN, RF 29.40m: JT, 15°, PR, VNR, RF 29.57-29.67m: CZ, 10°, PR 29.82m: JT, 5°, UN, VNR				29	PLT	PL(A)=0.43MPa		
																PLT	PL(A)=0.29MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 5 of 5

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	52	30	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.		FR	30.00	H	100	90		Clay, RF, 29.92m: JT, 25°, PR, Clay 6mm, RF 29.98m: JT, 15°, PR, Clay, RF, ~2mm 30.10m: Water loss 25% 30.29m: B, 5°, PR, Clay, RF, 2-4mm 30.34-30.39m: B, ~10°, UN, Clay, RF, 4-6mm 30.45m: B, 15°, UN, Clay, RF, ~2mm 30.48m: B, 10°, PR, Clay, RF, ~3mm				31	PLT	PL(A)=0.95MPa PL(A)=1.2MPa		
	51	31	Borehole discontinued at 31.50m depth.																	
	50	32																		
	49	33																		
	48	34																		
	47	35																		
	46	36																		
	45	37																		
	44	38																		
	43	39																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

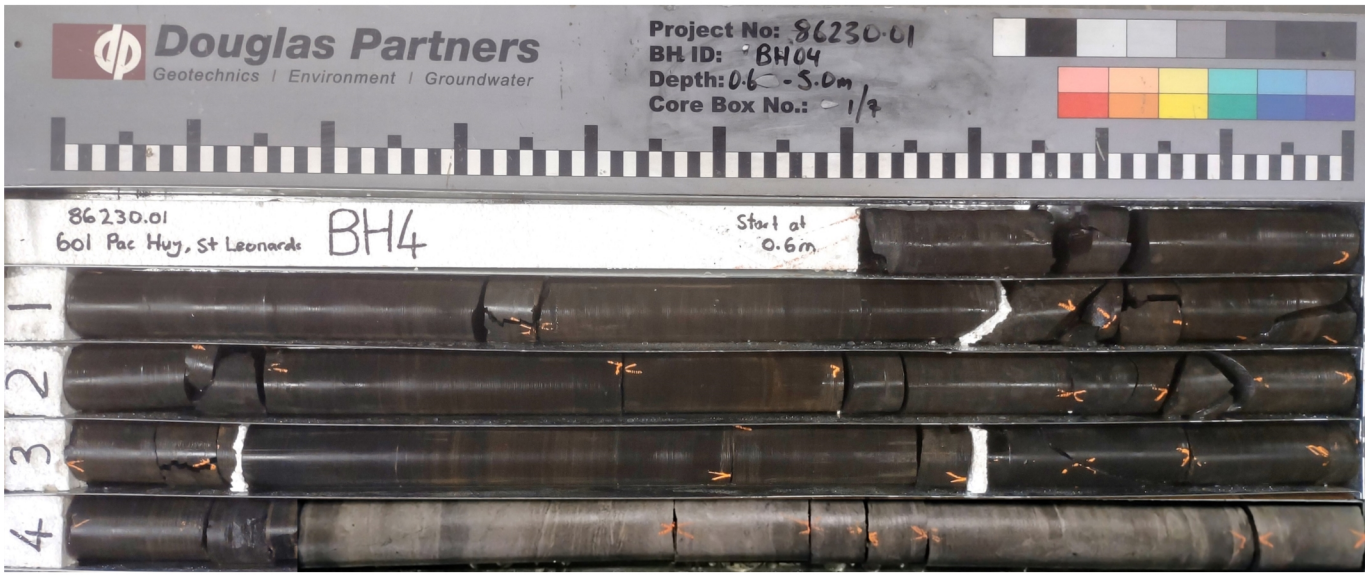
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 4



0.60-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 4



10.00-15.00 m depth



15.00-20.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 4



20.00-25.00 m depth



25.00-30.00 m depth

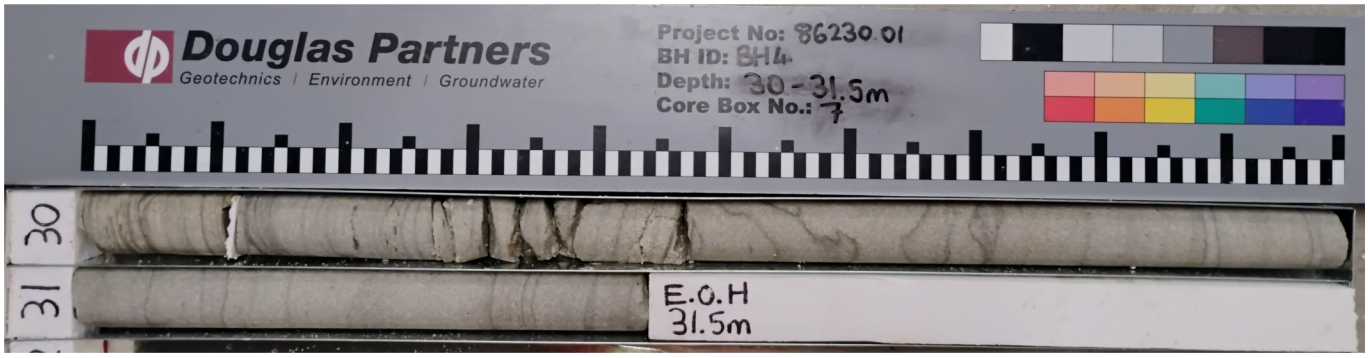
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 4



30.00-31.50 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick; one layer reinforcement 8mm (SL82).			NA	NA		D	0.15 - 0.20	0.15		
		0.25			FILL						0.20		
		0.30	FILL / SAND: yellow-grey; medium.						D	0.40 - 0.50	0.40		
			FILL / GRAVEL: grey; fine to medium, sub-angular, igneous.		FILL	ND	M				0.50		
	81	1							D	0.90 - 1.00	0.90		
		1.10	FILL / Sandy CLAY trace gravel: grey; low to medium plasticity; fine sand; fine, angular, siltstone gravel; trace PVC fragments.								1.00		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
CASING: HWT to 1m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	82	1	Continued from soil log			1.10									1				
	81	1.25	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.			1.25	M	81	81		1.50m: JT, 90°, CU, CN, RF 1.80m: JT, 70°, PR, VNR M, SM, 1.90m - 3.00m: Water loss ~10%				2	PLT	PL(A)=0.77MPa		
	80	2				2.20	VL	100	80		2.06m: JT, 70°, PR, CN, SM 2.15m: JT, 70°, PR, CN, SM 2.20-2.30m: CZ, M					PLT	PL(A)=1.5MPa		
						2.30	M - H									PLT	PL(A)=2.3MPa		
	79	3				3.43	VL	100	60		2.76m: JT, 50-60°, PR, VNR M, SM 2.83m: JT, 50-60°, PR, VNR M, SM 2.88m: JT, 50-60°, PR, VNR M, SM 3.05-3.10m: CZ, M 3.12m: JT, 70°, PR, CN, SM 3.36m: B, PR, M, SM, 3.43-3.65m: CZ, M, 3.75-3.78m: CZ, M,				3	PLT	PL(A)=0.35MPa		
						3.65	L - M									PLT	PL(A)=0.16MPa		
						3.90	VL									PLT	PL(A)=0.66MPa		
	78	4				4.00	L - M				3.90-4.00m: CZ, 6°, M 4.30m: B, 90°, PR, VNR M, SM, 4.30m - 5.90m: Water loss <10%				4	PLT	PL(A)=0.39MPa		
						4.71					4.45m: JT, 35°, PR, VNR M, SM 4.53m: B, 0°, PR, M, SM, 1-2mm 4.67m: B, PR, M, SM, ~2mm 4.71m: B, PR, M, SM, ~2mm					PLT	PL(A)=0.13MPa		
	77	4.75	SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.	FR		4.74		100	86		4.74m: B, PR, M, SM, ~2mm 4.77m: B, PR, M, SM, ~2mm 5.90m - 7.50m: Water loss ~10%				5	PLT	PL(A)=1.0MPa		
	76	6									6.30m: JT, 70°, PR, CN, RF				6				
								100	100		6.56m: JT, 70°, PR, CN, RF 6.60m: B, 0°, PR, SM 6.82m: JT, 70°, PR, CN, RF 6.94m: B, 10°, PR, SM					PLT	PL(A)=0.69MPa		
	75	7					M - H				7.40m: B, 10°, PR, SM				7	PLT	PL(A)=1.4MPa		
	74	8						100	100						8	PLT	PL(A)=1.6MPa		
	73	9						100	100		9.23m: B, 5°, PR, SM				9	PLT	PL(A)=0.90MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.		FR	12.20	M	100	100		10.30m: No drilling muds, water loss ~20%				11	PLT	PL(A)=1.9MPa		
	71							100	92		10.55-1059m: CZ, INF Clay 6mm, 10.66m: B, 15°, PR, Clay 10mm, SM					PLT	PL(A)=0.95MPa		
	70	12									11.57m: B, 10°, PR, M, SM				12				
	69	13				13.20	M	100	100						13	PLT	PL(A)=0.40MPa		
	68	14					H	100	95		13.40m: B, 5°, PR, Clay 1mm, SM 13.45m: JT, 80°, ST, CN, RF				14	PLT	PL(A)=1.0MPa		
	67	15	Borehole discontinued at 14.60m depth. Target depth reached.								14.55m: B, PR, Clay 11mm					PLT	PL(A)=1.1MPa		
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

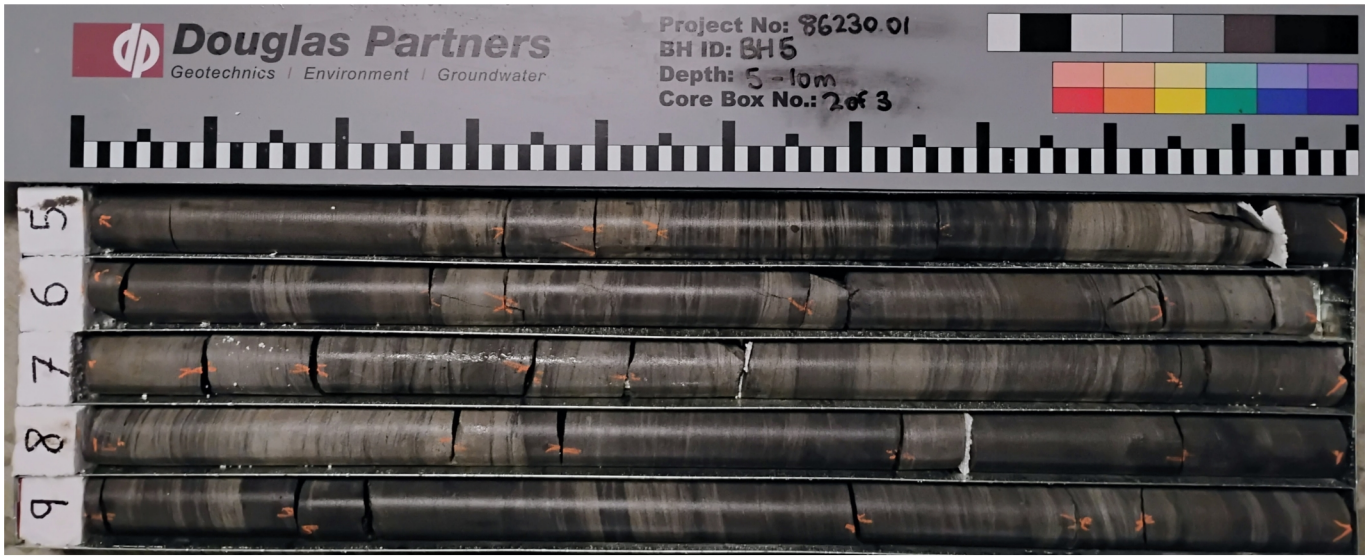
CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 2



10.00-14.60 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0.15	CONCRETE; 150m thick; one layer reinforcement (SL82).			NA	NA				0.15				
		0.25	FILL / SAND: grey-brown; medium.		FILL	ND	M		D		0.25				
		0.50	FILL / Sandy CLAY with gravel: dark grey; low to medium plasticity; fine to coarse sand; fine, siltstone gravel.		FILL		w=PL		D		0.40				
		0.65	SILTSTONE: dark grey. Ashfield Shale.								0.50				
	80	1	Continued as rock log								1			Bentonite	
	79	2									2				
	78	3									3				
	77	4									4				
	76	5									5				
	75	6									6			Sand	
	74	7									7				
	73	8									8				
	72	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0	Continued from soil log												0				
	80	1	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.			0.65		100	76		0.85m: B, 0°, PR, 1mm, SM, fines 1.15m: JT, 30°, PR, VNR, SM, fines 1.33m: JT, 30°, PR, VNR, SM, fines 1.35m: JT, 70°, PR, CN, SM 1.42m: CZ, 40mm 1.70m: Water loss <10%. no drilling mud added.				1	PLT	PL(A)=0.94MPa	Bentonite	
																PLT	PL(A)=1.8MPa		
	79	2					M	100	100						2	PLT	PL(A)=0.72MPa		
																PLT	PL(A)=0.95MPa		
	78	3						100	95		3.00m: CZ, 40mm				3	PLT	PL(A)=0.80MPa		
																PLT	PL(A)=0.75MPa		
											3.75m: CZ, 20mm 3.98m: CZ, 20mm					PLT	PL(A)=0.88MPa		
	77	4	4.05 SANDSTONE: grey and pale grey, fine to medium grained, indistinct bedding, 0 to 10°; siltstone laminations and bedding. Mittagong Formation.												4	PLT	PL(A)=0.70MPa		
						4.50		100	100							PLT	PL(A)=0.93MPa		
	76	5			FR										5	PLT	PL(A)=1.0MPa	Sand	
								100	93		6.21m: CZ, 20mm 6.31m: CZ, 20mm					PLT	PL(A)=2.0MPa		
	75	6					H								6				
																PLT	PL(A)=2.3MPa		
	74	7						100	100						7	PLT	PL(A)=1.4MPa		
	73	8													8				
								100	91							PLT	PL(A)=1.5MPa		
	72	9													9				

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	71	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, indistinct bedding, 0 to 10°; siltstone laminations and bedding. Mittagong Formation.		FR		H	100	91		9.97m: CZ, 80mm 10.10m: B, 10°, PR, Clay 10mm, RF				11	PLT	PL(A)=1.3MPa	Sand	
								100	100										
	70	12	Borehole discontinued at 11.05m depth. Target depth reached.																
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	
	62																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 1



0.50-5.00 m depth



5.00-11.05 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

Appendix D

Permeability Test Results

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	17-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	ZW

Test Location

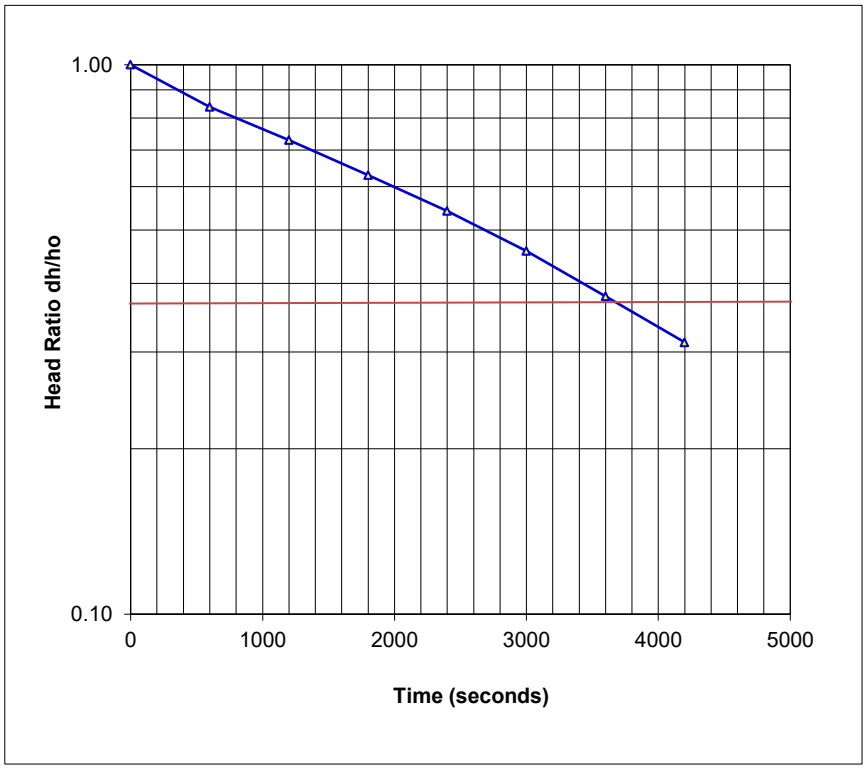
Description:	Falling Head Test (Case 2)	**Test No.**	BH01	
Material type:	Siltstone & Sandstone	Easting:	333081.1	m
		Northing	6255981.1	m
		Surface Level:	82.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	10.8	m
borehole diameter (2R)	76	mm	Depth to water at start of test	8.4	m
Effective Length of well screen (Le)	4.0	m	Depth of top of PVC standpipe	3.0	m
			Depth of base of PVC standpipe	14.8	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	8.40	2.40	1.000
600.00	8.79	2.01	0.838
1200.00	9.05	1.75	0.729
1800.00	9.29	1.51	0.629
2400.00	9.50	1.30	0.542
3000.00	9.70	1.10	0.458
3600.00	9.89	0.91	0.379
4200.00	10.05	0.75	0.313



To = 60.0 mins
3600 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity

k =	**2.3E-07**	m/sec
=	**0.020**	m/day

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	10-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	JDS

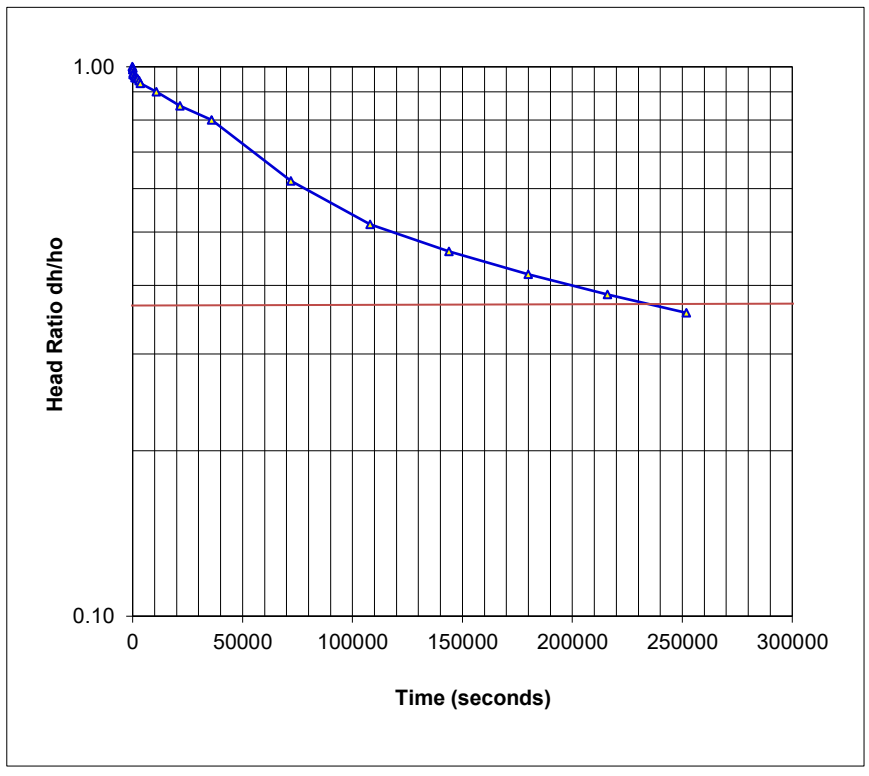
Test Location		**Test No.**	BH3	
Description:	Falling Head Test (Case 2)	Easting:	333109.1	m
Material type:	Siltstone & Sandstone	Northing	6256004.1	m
		Surface Level:	82.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	9	m
borehole diameter (2R)	76	mm	Depth to water at start of test	0.5	m
Effective Length of well screen (Le)	3.1	m	Depth of top of PVC standpipe	0.5	m
			Depth of base of PVC standpipe	12.1	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	0.50	8.50	1.000
60.00	0.53	8.47	0.996
120.00	0.54	8.46	0.995
180.00	0.61	8.39	0.987
240.00	0.72	8.28	0.974
300.00	0.77	8.23	0.968
900.00	0.82	8.18	0.962
1200.00	0.88	8.12	0.955
1800.00	0.89	8.11	0.954
2400.00	0.92	8.08	0.951
3000.00	0.98	8.02	0.944
3600.00	1.07	7.93	0.933
10800.00	1.35	7.65	0.900
21600.00	1.79	7.21	0.848
36000.00	2.20	6.80	0.800
72000.00	3.73	5.27	0.620
108000.00	4.61	4.39	0.516
144000.00	5.08	3.92	0.461
180000.00	5.44	3.56	0.419
216000.00	5.73	3.27	0.385
252000.00	5.97	3.03	0.356



To = 4000 mins
240000 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.3E-09**	m/sec
	=	**0.0004**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	17-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	ZW

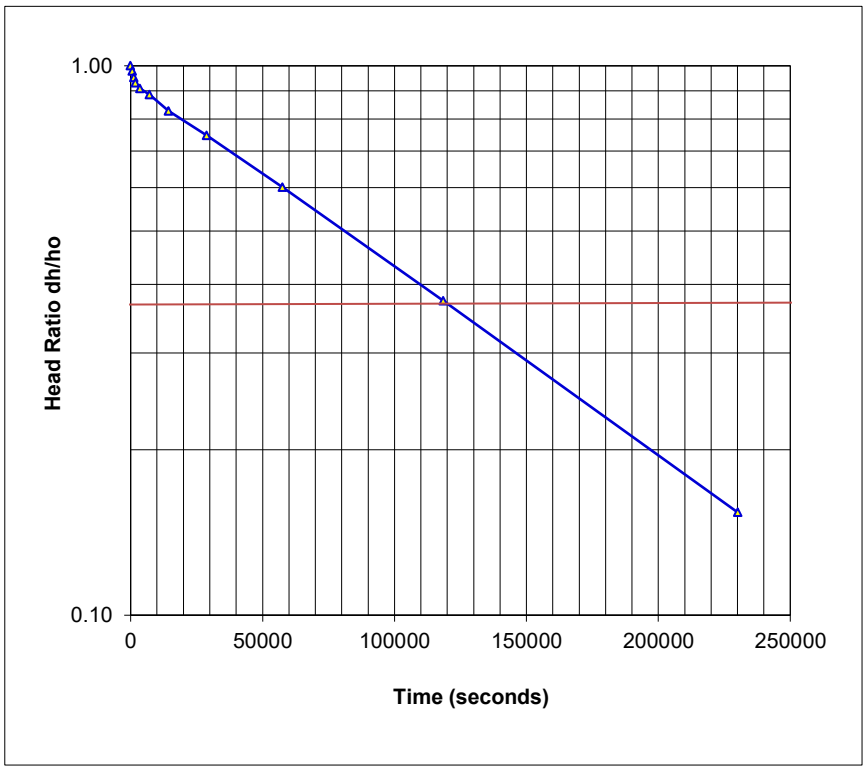
Test Location		**Test No.**	BH3	
Description:	Falling Head Test (Case 2)	Easting:	333109.1	m
Material type:	Siltstone & Sandstone	Northing	6256004.1	m
		Surface Level:	82.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	6.73	m
borehole diameter (2R)	76	mm	Depth to water at start of test	4	m
Effective Length of well screen (Le)	5.4	m	Depth of top of PVC standpipe	0.5	m
			Depth of base of PVC standpipe	12.1	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	4.00	2.73	1.000
600.00	4.06	2.67	0.978
1200.00	4.13	2.60	0.952
1800.00	4.19	2.54	0.930
3600.00	4.25	2.48	0.908
7200.00	4.31	2.42	0.886
14400.00	4.47	2.26	0.828
28800.00	4.69	2.04	0.747
57600.00	5.09	1.64	0.601
118500.00	5.71	1.02	0.374
230100.00	6.31	0.42	0.154



To = 1975 mins
118500 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**5.6E-09**	m/sec
	=	**0.0005**	m/day

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	17-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	ZW

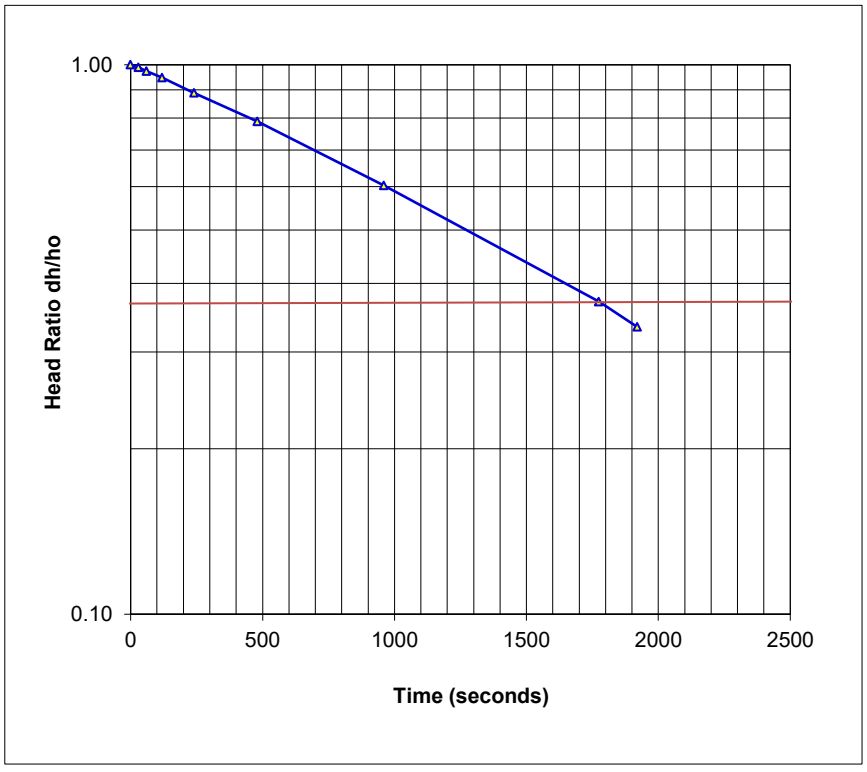
Test Location		**Test No.**	BH06	
Description:	Falling Head Test (Case 2)	Easting:	333122.5	m
Material type:	Siltstone & Sandstone	Northing	6255970.7	m
		Surface Level:	81.3	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	3.4	m
borehole diameter (2R)	76	mm	Depth to water at start of test	1.51	m
Effective Length of well screen (Le)	7.7	m	Depth of top of PVC standpipe	1.5	m
			Depth of base of PVC standpipe	11.1	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	1.51	1.89	1.000
30.00	1.53	1.87	0.989
60.00	1.56	1.84	0.974
120.00	1.61	1.79	0.947
240.00	1.72	1.68	0.889
480.00	1.91	1.49	0.788
960.00	2.26	1.14	0.603
1775.00	2.7	0.70	0.370
1920.00	2.77	0.63	0.333



To = 29.6 mins
1775 secs

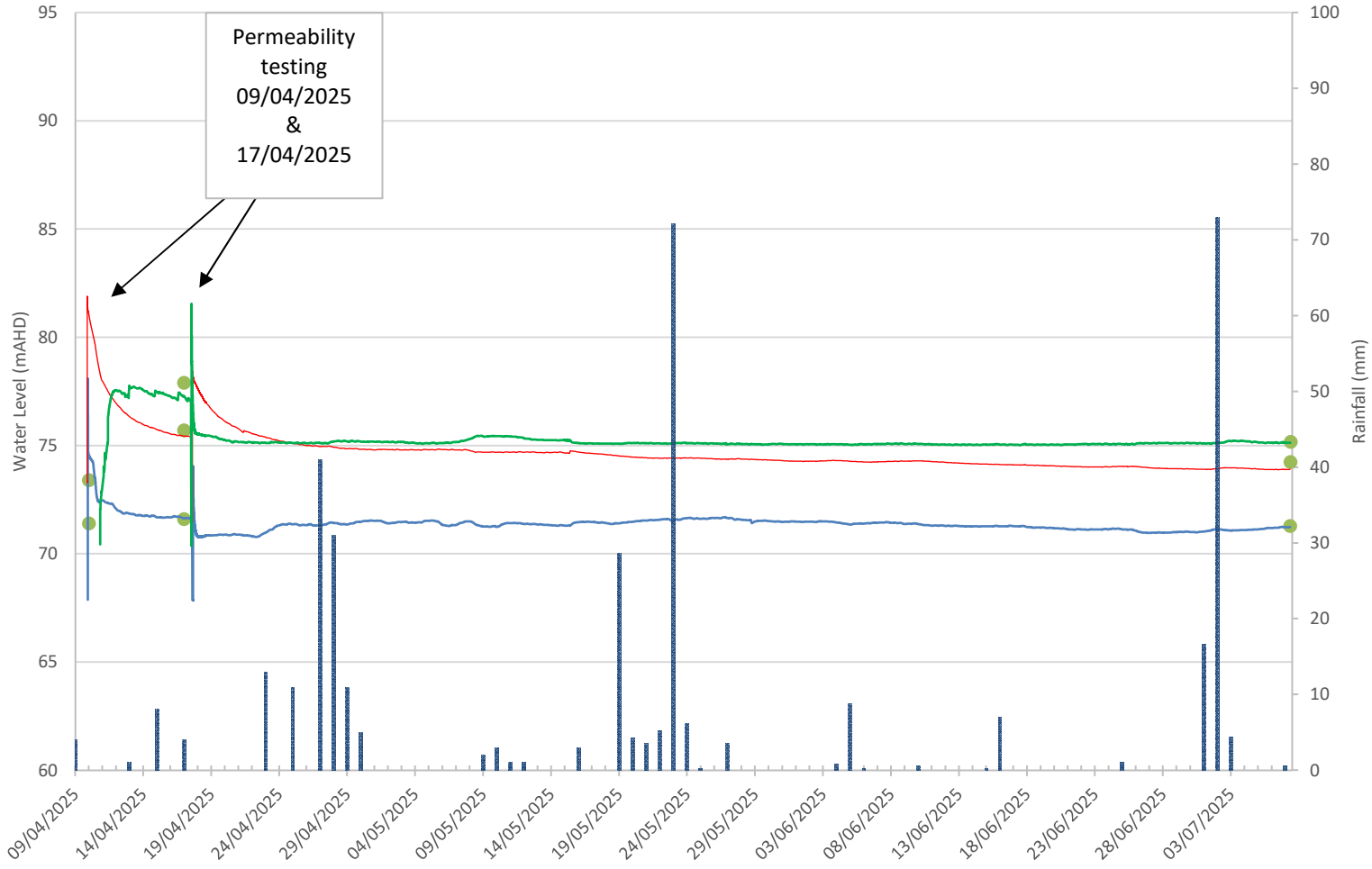
Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity **k =** **2.8E-07** m/sec
= **0.024** m/day

Groundwater Level Monitoring Summary



Note: Reading Interval = 1 hour

Douglas PARTNERS | GROUNDED EXPERTISE

- Manual Levels
- Water Level BH01
- Water Level BH03
- Water Level BH06
- Rainfall data (ST: 066011)

Date:	From	Drawn:
08/07/2025	09/04/2025	AG
	To	Checked:
	07/07/2025	STE

Appendix E

Laboratory Results

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook NSW 2304
Ph: (02) 4960 9600

RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Stockland Commercial Property
Project: Proposed Commercial Building
Location: 601 Pacific Hwy, St Leonards NSW

Project No: 86230.01
Report No: 86230.01_12937
Report Date: 02.05.2025
Date of Testing: 29.04.2025
Date Sampled: 14.04.2025

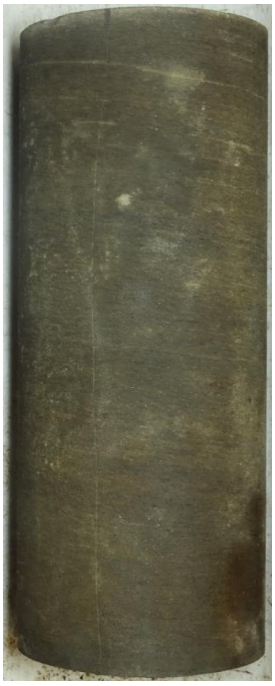
Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-12937A	
Sample Location	BH01	
Depth (m)	7.07 - 7.29	
Rock Description	Interlaminated Siltstone & Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.7	145
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	2.3	
Wet Mass / Unit Volume (t/m3)	2.59	
Dry Mass / Unit Volume (t/m3)	2.53	
Test Duraton (sec)	438	
Rate of Displacement (kN/sec)	0.17	
Failure Mode	Tensile	
Uniaxial Compressive Strength (MPa)	**35.0**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**2.6**	
Poisson's ratio	**0.23**	
TANGENT MODULUS (25 - 55% load)		
Young's modulus (GPa)	**2.7**	
Poisson's ratio	**0.39**	

Before



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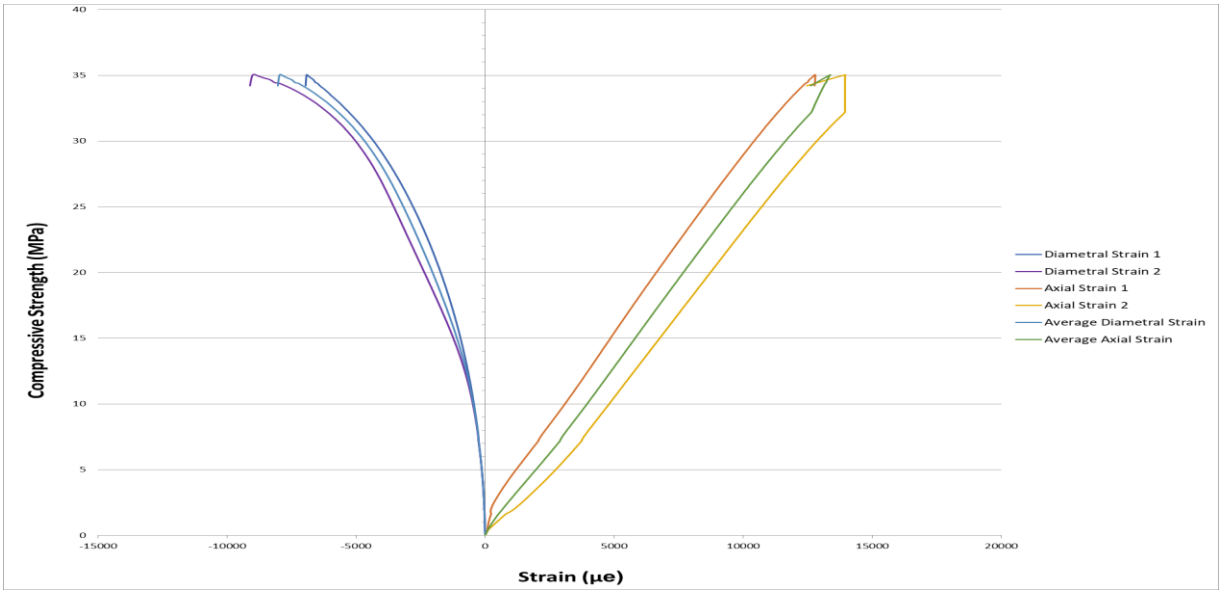

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RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Stockland Commercial Property
Project: Proposed Commercial Building
Location: 601 Pacific Hwy, St Leonards NSW

Project No: 86230.01
Report No: 86230.01_12937
Report Date: 02.05.2025
Date of Testing: 29.04.2025
Date Sampled: 14.04.2025

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

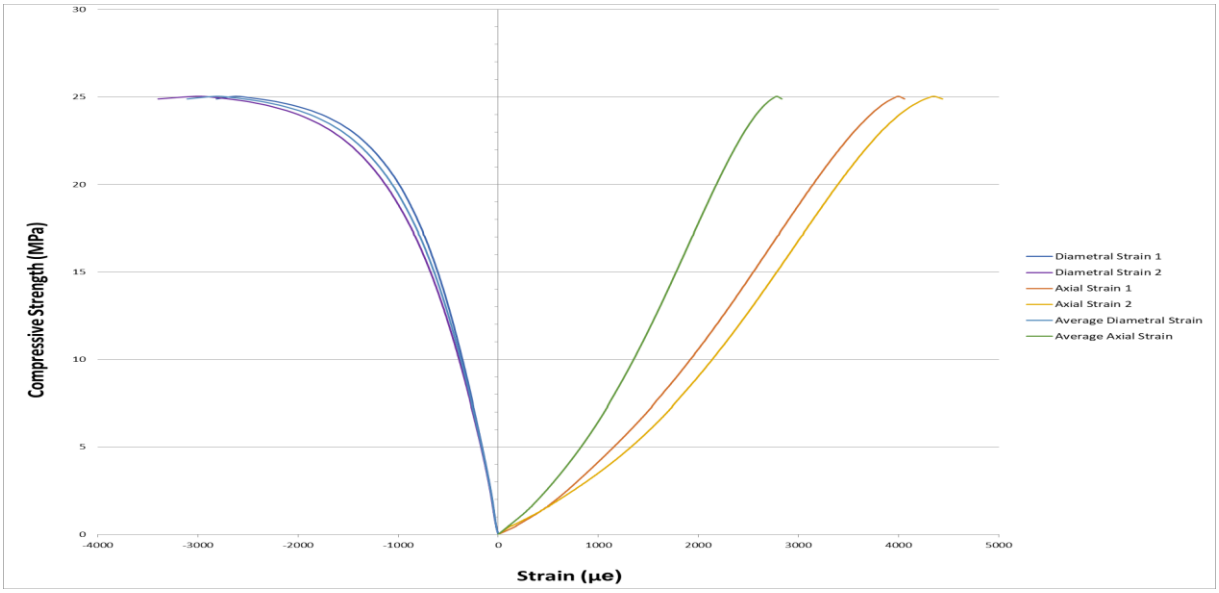
Lab Sample Number	NC-12937B	
Sample Location	BH02	
Depth (m)	13.43 - 13.67	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.4	143
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	6.0	
Wet Mass / Unit Volume (t/m3)	2.40	
Dry Mass / Unit Volume (t/m3)	2.27	
Test Duraton (sec)	469	
Rate of Displacement (kN/sec)	0.11	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**25.0**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**5.3**	
Poisson's ratio	**0.21**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (GPa)	**7.8**	
Poisson's ratio	**0.42**	

Before



After





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RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Stockland Commercial Property
Project: Proposed Commercial Building
Location: 601 Pacific Hwy, St Leonards NSW

Project No: 86230.01
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Report Date: 02.05.2025
Date of Testing: 29.04.2025
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Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

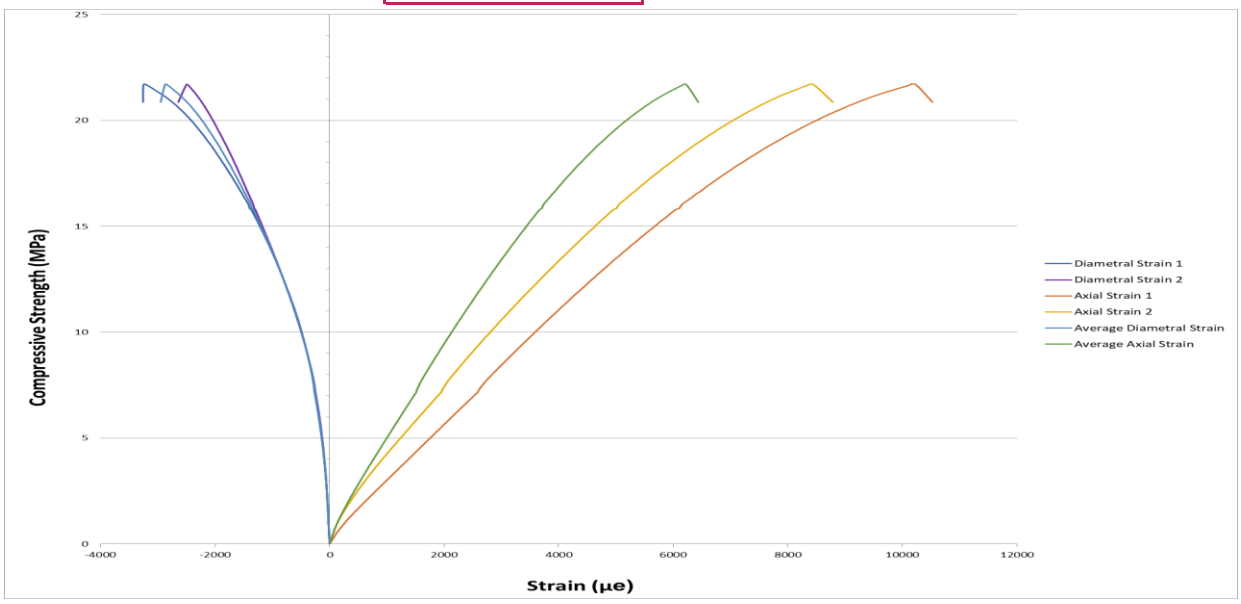
Lab Sample Number	NC-12937C	
Sample Location	BH03	
Depth (m)	8.12 - 8.36	
Rock Description	Interlaminated Siltstone & Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.7	145
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	2.6	
Wet Mass / Unit Volume (t/m3)	2.58	
Dry Mass / Unit Volume (t/m3)	2.52	
Test Duraton (sec)	437	
Rate of Displacement (kN/sec)	0.10	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**21.7**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**3.1**	
Poisson's ratio	**0.17**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (GPa)	**2.7**	
Poisson's ratio	**0.32**	

Before



After





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RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Stockland Commercial Property
Project: Proposed Commercial Building
Location: 601 Pacific Hwy, St Leonards NSW

Project No: 86230.01
Report No: 86230.01_12937
Report Date: 02.05.2025
Date of Testing: 29.04.2025
Date Sampled: 14.04.2025

Approved Signatory: Peter Gorseski
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NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

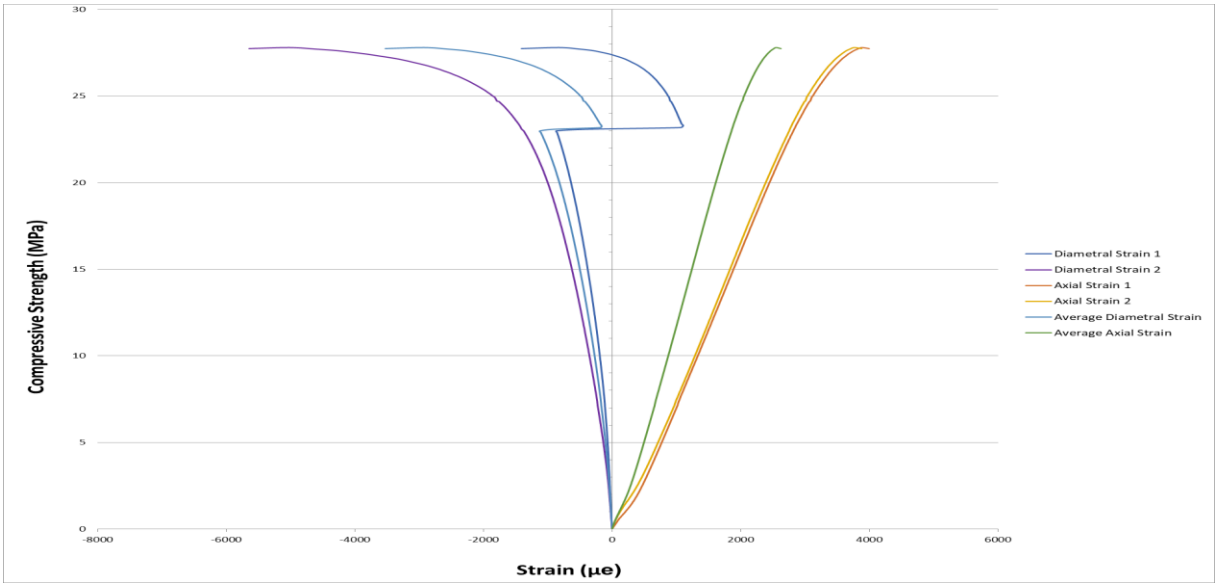
Lab Sample Number	NC-12937D	
Sample Location	BH04	
Depth (m)	25.03 - 25.36	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.8	145
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	5.0	
Wet Mass / Unit Volume (t/m3)	2.44	
Dry Mass / Unit Volume (t/m3)	2.32	
Test Duraton (sec)	501	
Rate of Displacement (kN/sec)	0.12	
Failure Mode	Tensile	
Uniaxial Compressive Strength (MPa)	**27.8**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**8.0**	
Poisson's ratio	**0.26**	
TANGENT MODULUS (25 - 55% load)		
Young's modulus (GPa)	**9.0**	
Poisson's ratio	**0.39**	

Before



After





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RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Stockland Commercial Property
Project: Proposed Commercial Building
Location: 601 Pacific Hwy, St Leonards NSW

Project No: 86230.01
Report No: 86230.01_12937
Report Date: 02.05.2025
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NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

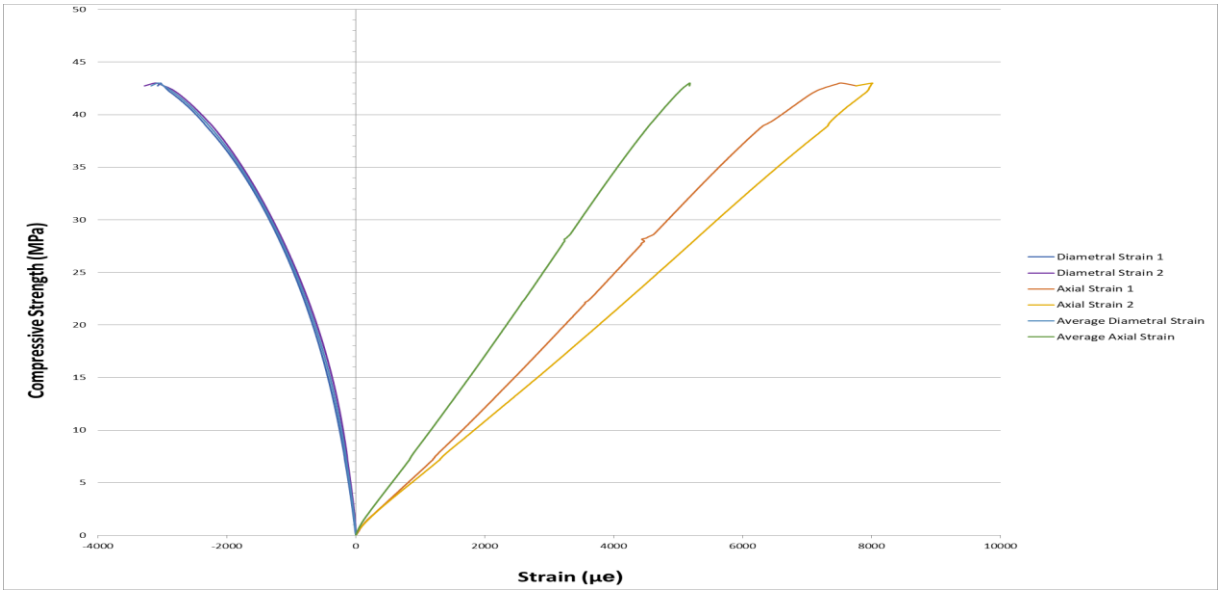
Lab Sample Number	NC-12937E	
Sample Location	BH05	
Depth (m)	7.61 - 7.87	
Rock Description	Interlaminated Siltstone & Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.6	144
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	1.7	
Wet Mass / Unit Volume (t/m3)	2.55	
Dry Mass / Unit Volume (t/m3)	2.51	
Test Duraton (sec)	658	
Rate of Displacement (kN/sec)	0.14	
Failure Mode	Mixed	
Uniaxial Compressive Strength (MPa)	**43.0**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**5.7**	
Poisson's ratio	**0.19**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (GPa)	**5.9**	
Poisson's ratio	**0.34**	

Before



After





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RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Stockland Commercial Property
Project: Proposed Commercial Building
Location: 601 Pacific Hwy, St Leonards NSW

Project No: 86230.01
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peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

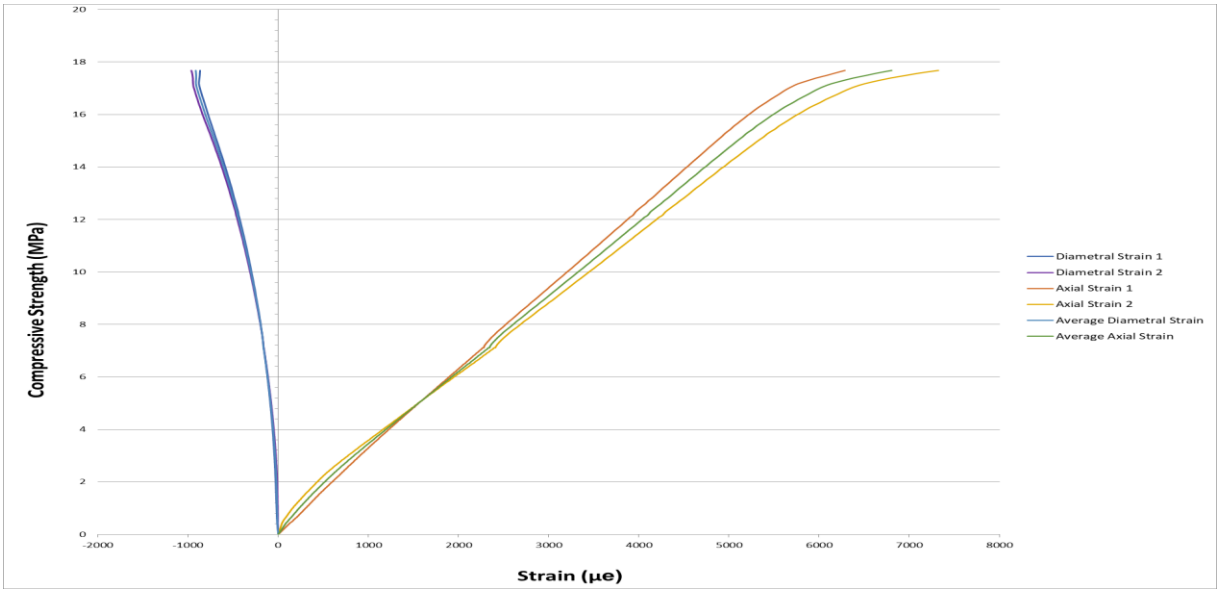
Lab Sample Number	NC-12937F	
Sample Location	BH06	
Depth (m)	6.41 6.64	
Rock Description	Interlaminated Siltstone & Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.8	144
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	4.8	
Wet Mass / Unit Volume (t/m3)	2.47	
Dry Mass / Unit Volume (t/m3)	2.35	
Test Duraton (sec)	396	
Rate of Displacement (kN/sec)	0.09	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**17.7**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**3.0**	
Poisson's ratio	**0.10**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (GPa)	**2.9**	
Poisson's ratio	**0.15**	

Before



After





Douglas PARTNERS

GROUNDED EXPERTISE

Report on Groundwater Inflow Assessment

Proposed Residential Building

601 Pacific Highway, St Leonards NSW

Prepared for Stockland

Project 86230.01

18 March 2026

Douglas Partners Pty Ltd
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Document History

Details

Project No.	86230.01
Document Title	Report on Groundwater Inflow Assessment
Site Address	601 Pacific Highway, St Leonards NSW
Report Prepared For	Stockland
Filename	86230.01.R.004.Rev2

Status and Review

Status	Prepared by	Reviewed by	Date issued
Revision 0	James Connaughton	Scott Easton	21 November 2025
Revision 1	James Connaughton	Scott Easton	24 November 2025
Revision 2	James Connaughton (Associate – Engineering Geologist)	Scott Easton (Principal – Geotechnical Engineer)	18 March 2026

Distribution of Copies

Status	Issued to
Revision 0	Hee-Jung Yoon, Stockland
Revision 1	Hee-Jung Yoon, Stockland
Revision 2	Diego Eguiguren, Stockland

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature	Date
Author	18 March 2026
Reviewer	18 March 2026



FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

Douglas PARTNERS | GROUNDED EXPERTISE

Executive Summary

Stockland Development (Stockland) submitted an EOI for an SSDA and concurrent rezoning proposal on 17 January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19 February 2025, the HDA recommended to the Minister that the applicant's project be declared SSD, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).

A request for SEARs was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This groundwater inflow assessment report has been prepared by Douglas and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.
- Demolition of the existing 14 storey commercial office building that is currently on the site.
- Site excavation, remediation and other preparatory works.
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m^2), comprising:
    - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
    - A contribution of 5% of the residential GFA toward Affordable Housing.
    - Retail and commercial land uses at the ground and podium levels.
    - Internal and external residential amenities provided throughout the building.
    - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
- Vehicular access to the basement via Atchison Street.
- Landscaping and Public Domain works.
- Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

This geotechnical report has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out in the Table 1 below.

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Table 1: Secretary's Environmental Assessment Requirements relevant to this report

SEARs	Report Reference
12. Ground and Groundwater Conditions • Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion. • Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies.	Sections 4, and 6 to 13

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Appendix A: About This Report

Appendix B: Drawings

Appendix C: Groundwater Data

Report on Groundwater Inflow Assessment
Proposed Residential Building
601 Pacific Highway, St Leonards NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a groundwater inflow assessment undertaken for a proposed residential building at 601 Pacific Highway, St Leonards NSW (the site). The assessment was commissioned by email instructing to proceed dated 04 November 2024 from Diego Eguiguren of Stockland and was undertaken in accordance with Douglas' proposal 86230.01.P.001.Rev2 dated 17 September 2024.

Based on the supplied architectural drawings prepared by Bates Smart, it is understood that the proposed development comprises the demolition of the existing 14-storey commercial building and construction of a new 52-storey mixed-used residential building with six basement levels. The existing basement has 4 partial basement levels in a gradually spiralling arrangement with the lowest basement level understood to be at about RL 81.3 m relative to Australian Height Datum (AHD). It is proposed to deepen the existing basement by about 8.3 m to RL 73 m AHD.

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Previous work

This report follows a number of previously issued Douglas reports for the project which include:

- Geotechnical Investigation Report (86230.01.R.001.Rev3, dated March 2026);
- Due Diligence Contamination Assessment (Ref.: 86230.01.R.002.Rev4, dated March 2026);
- Detailed Site Investigation (DSI) for contamination) (Ref.: 86230.03.R.002.Rev2, dated March 2026);
- Remediation Action Plan (RAP) (Ref.: 86230.03.R.001.Rev2, dated March 2026); and
- Groundwater Monitoring Memorandum (86230.01.R.003.Rev0, dated July 2025).

3. Site description

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400m (walking distance) from the Crows Nest Metro station.

A site aerial and location plan is provided at Figure 1 below.

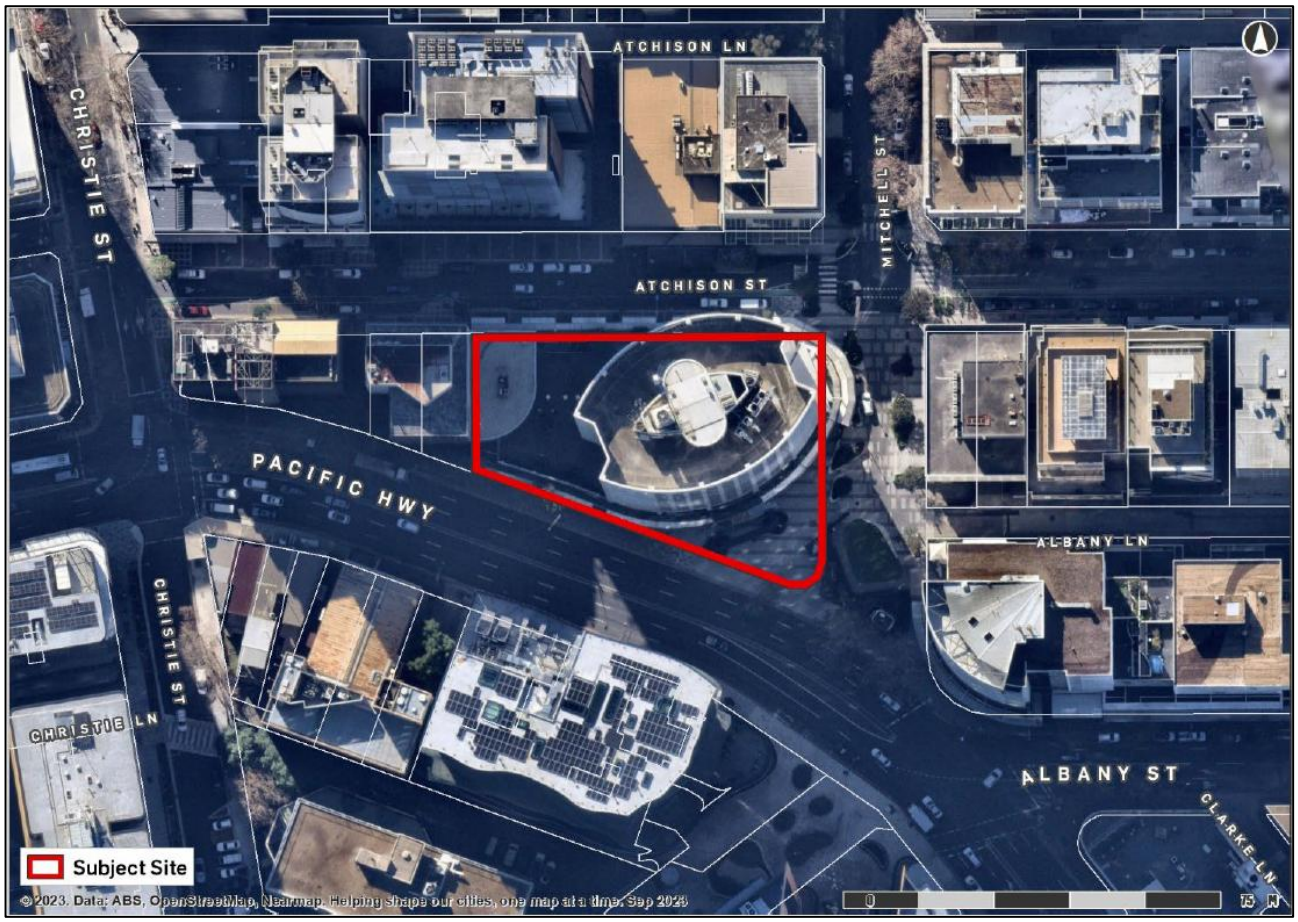

Figure 1: Site Location (provided by Urbis)

The site is bounded by a 7-storey commercial building with one level of basement carpark to the west, located at 619 Pacific Highway, and Mitchell Street to the east. Beyond Aitchson Street to the north is a 27-storey residential building understood to have a single level basement. Beyond Mitchell Street to the east is a five-storey commercial building with a basement car park.

Based on the available 'NSW 2 m Elevation Contours'; the site topography generally slopes down towards the west, with surface levels of approximately RL 93 m in the east, falling to RL 88 m in the west, relative to Australian Height Datum.

At the time of writing this report, the site is occupied by a 14-storey commercial building in the eastern portion of the site, and single level mixed-use retail in the western portion of the site, over the basement entrance. The basement levels comprise 4 partial basement levels in a gradually spiralling arrangement with the lowest basement level understood to grade from RL 82.4 m at its highest point, down to about RL 81.3 m at its lowest, measured during the initial surveying of the site. Based on the supplied existing basement drawings, it is understood that the basement retention system comprises a soldier pile wall. Shotcrete panels in the basement car park were observed and signs of minor cracking with seepage and iron staining noted.

The closest body of water to the site is Berrys Creek located approximately 750 m to the southwest, at a significantly lower elevation.

The site location is shown in Drawing 1, Appendix B.

4. Geotechnical and Hydrogeological Model

4.1 Subsurface Profile

Reference to the Sydney 1:100 000 Seamless Geology Sheet indicates that the site is underlain by the Ashfield Shale of the Wianamatta Group, described as black to dark-grey shale and laminite. Below the Ashfield Shale is the Hawkesbury Sandstone which typically comprises medium to coarse grained quartz sandstone with some shale and laminite bands or lenses. The Mittagong Formation is a transitional unit often found between the Ashfield Shale and Hawkesbury Sandstone and typically includes laminite and fine-grained sandstone of variable strength, ranging in thickness from about 2 m to 10 m.

Ashfield Shale is typically closely bedded and contains an orthogonal pair of steeply dipping (70° to 90°) joint sets striking NNE and ESE, spaced 0.5 m to 5 m. Randomly orientated, 30° to 45° dipping ubiquitous joints are also present. These joint sets persist through the Hawkesbury Sandstone, which is typically light to mid grey in colour and has massive and cross-bedded facies. The Hawkesbury Sandstone normally has near-horizontal bedding partings spaced from less than 1 m to well over 3 m in places.

The previous investigation, undertaken in March and April 2025, included the drilling of six boreholes (BH01-BH06). The boreholes were initiated using diacore barrel and solid flight augering to the top of weathered rock, then extended to their target depths using NMLC diamond coring. The boreholes were drilled from the existing basement level to depths of between 11 m and 15 m (BH01 – BH03, BH05 & BH06) with one borehole extended to a depth of 31.5 m (BH04).

Groundwater monitoring wells were installed in boreholes BH01, BH03, and BH06 to 14.8 m, 12.1 m, and 11.1 m, respectively.

The general subsurface profile encountered at the borehole locations may be summarised as follows:

CONCRETE - Concrete slab at all borehole locations, measured to be between 130 mm and 180 mm thick. At BH01, the concrete slab comprised two slabs of 90 mm and 130 mm, with bedding sand separating the two. Reinforcement of 8 mm diameter was noted within the concrete slabs.

FILL - Typically sandy clay and clayey sand with various proportions of igneous gravel within the shallow depths of the boreholes, with variable thickness in a range of 0.4 m to 2.4 m. The fill layer was observed to reduce in thickness in boreholes which were located in the deeper basement levels, with the thickest layer observed in BH01, and the thinnest in BH06.

SHALE BEDROCK - Generally low to medium strength, fresh, dark grey shale (Ashfield Shale) encountered in all boreholes below the fill to depths between 4.1 m and 4.8 m. The shale was typically

		slightly fractured. Frequent joints dipping 30° to 70° were observed within the shale bedrock. Sub-horizontal crushed zones with clay infill were also noted within BH02 between 3.9 m and 4.7 m depth. Very low strength bands accompanied with crushed zones and joints dipping 35° to 60° were noted in BH05 between 2.7 m and 5.3 m depth in BH05.
SANDSTONE and LAMINITE BEDROCK	-	Typically medium and medium to high strength, fresh to slightly weathered, pale grey and grey fine to medium grained sandstone and laminite (Mittagong Formation), and pale grey medium to coarse grained sandstone (Hawkesbury Sandstone) to depths of about 10.4 m and 17.0 m. Zones of very low and low strength rock were noted within the laminite bedrock at BH01 at depths of 5.0 m, 7.5 m, and 8.5 m. The rock was typically slightly fractured to unbroken. Sub-vertical joints dipping 70° to 90° were observed within BH03 between 7.2 m and 9.5 m depth.
HIGH STRENGTH SANDSTONE ROCK	-	Medium to high strength and high strength, fresh, pale grey to grey, fine to medium grained sandstone and laminite (Mittagong Formation), grading to fresh, high strength, medium to coarse grained sandstone (Hawkesbury Sandstone) to the termination depth of boreholes. A very high strength band was noted within BH01 between 14.3 m and 14.8 m depth. The high strength rock was typically unbroken. A low to medium strength, fractured zone was noted in BH04 between 26.2 m and 30.5 m depth.
POSSIBLE THRUST FAULTS	-	The low to medium strength rock and crushed zones with joints dipping 15° to 25°, observed in BH04 between 26.2 m and 30.5 m depth, were accompanied with significant loss of drilling fluid, indicating a possible presence of a thrust fault.

4.2 Groundwater

Three groundwater monitoring wells were installed during the geotechnical investigation. No groundwater seepage was noted during the augered portion of the boreholes and the necessary use of water as a drilling fluid precluded the observation of groundwater during coring.

A summary of the well construction details is presented within Table 2 below.

Table 2: Well Construction Details

BH Ref	Ground Surface Level (m AHD)	Filter Zone Depth (m)	Filter Zone Formation Material
BH01	82.4	3.0 – 14.8 m	Shale & Sandstone / Laminite
BH03	82.4	0.7 – 12.1 m	Shale & Sandstone / Laminite

BH Ref	Ground Surface Level (m AHD)	Filter Zone Depth (m)	Filter Zone Formation Material
BH06	81.3	1.5 – 11.1 m	Shale /&Sandstone / Laminite

After installation, the groundwater monitoring wells were purged of drilling fluid using a submersible pump on 9 and 10 April 2025.

Data loggers were installed in all wells between 9 April and 7 July 2025 to monitor the ground water level variations for a minimum period of three months.

A summary of the datalogger records during this reporting period is provided in Table 3.

Table 3: Summary of Datalogger Results during the Reporting Period

Borehole	Groundwater Readings (m) [*RL m AHD*]			
	Minimum	Maximum	Mean	Median
BH01	10.71 *[70.78]*	11.62 *[71.69]*	11.08 *[71.32]*	11.05 *[71.35]*
BH03	7.30 *[73.88]*	8.52 *[75.10]*	8.03 *[74.37]*	8.09 *[74.31]*
BH06	5.84 *[75.08]*	6.22 *[75.46]*	6.08 *[75.22]*	6.12 *[75.18]*

Notes: Data influenced by the permeability testing have been removed from this data set.

Manual readings of water levels were also obtained with a dip meter. A summary of the groundwater levels measured during different stages are presented in Table 4 below.

Table 4: Summary of Manual Groundwater Measurement Results (Year 2025)

Borehole	Measured Groundwater Depth (m) and RL [*m AHD*]		
	9 April *	17 April *	7 July
BH01	11.0 *[71.4]*	10.83 *[71.6]*	11.12 *[71.3]*
BH03	9.0 *[73.4]*	6.73 *[75.7]*	8.17 *[74.2]*
BH06	*N.D*	3.40 *[77.9]*	6.13 *[75.2]*

Note: * Measurement may be influenced by purging and permeability testing completed 09/04/25 and 17/04/25
N.D – No data

The groundwater measurements obtained from the dataloggers from 9 April to 7 July 2025 (the reporting period), together with a plot of daily rainfall records obtained from Weather Station No. 066011 and No. 66214 (Ref.: Bureau of Meteorology Station. http://www.bom.gov.au) included within Appendix C.

BOM data indicates that the total rainfall recorded in the reporting period was 380 mm, with a maximum daily rainfall of 73 mm on 2 July 2025.

Review of the datalogger results suggest that the rainfall in the reporting period did not result in a pronounced response in the measured groundwater levels.

Based on the recorded levels, the groundwater flow direction is expected to be towards the southwest with a gradient of about 0.09.

4.3 Permeability Testing

Falling head permeability tests were carried out in three boreholes to evaluate the hydraulic conductivity of the rock mass encountered in the boreholes. The test involves adding water and measuring the changes in water level in the well at regular time intervals using the dataloggers. The results of the permeability tests using Hvorslev's (1951) method are summarised in Table 5 below. Results sheets are provided in Appendix C.

Table 5: Results of Permeability Testing

Test Location	Screened Depth (m)	Test Method	Material	Hydraulic Conductivity (m/sec)
BH01	3.0 – 14.8	Falling Head	Shale & Sandstone/ Laminite	2.3×10^{-7}
BH03	0.5 – 12.1	Falling Head	Shale & Sandstone / Laminite	4.3×10^{-9}
BH03	0.5 – 12.1	Falling Head	Shale & Sandstone / Laminite	5.6×10^{-9}
BH06	1.5 – 11.1	Falling Head	Shale & Sandstone / Laminite	2.8×10^{-7}

The results of the permeability testing undertaken during the investigation for BH03, are up to approximately two orders of magnitude lower than some of the results from nearby previous investigations for "weathered sandstone". However, these values are consistent with the typical expected values for permeability in high strength, unfractured rock (Pells 2019).

4.4 Surface Waters, Groundwater Dependent Ecosystems, Groundwater Extraction Bores and EPA Notified Sites

The surface water sources in the vicinity of the site include the Lane Cover River which is located about 80 m below and 1.4 km southwest of the site. No other surface water sources are mapped within 1 km of the site.

Reference to the Australian Bureau of Meteorology GDE Atlas indicates that there are no mapped groundwater dependant ecosystems (GDEs) in proximity to the site. The nearest being a coastal sandstone gully about 1.1 km to the northeast of the site.

One extraction bore is noted about 420 m north-northeast of the site with a recorded standing water level of RL 35 m. The bore is located in an area about 20 m lower than the subject site, with a surface level of approximately RL 72 AHD.

One EPA registered site associated with a Telstra Data Centre is located approximately 650 m northwest of the subject site. No other EPA registered sites are noted within 1 km of the site. This site is included within the EPA List of Contaminated Sites (List of notified sites (nsw.gov.au), dated July 2025). Reference to this list indicates that the site has been assessed by the EPA and is classified as "Regulation under CLM Act not required". Give this classification, the presence of known plumes of significant contamination are considered unlikely. In addition, the site is noted to be positioned downstream and well below the subject site and the proposed basement level and would be expected to have no impact.

5. Proposed Development

It is understood that the proposed development comprises the demolition of the existing 14-storey commercial building and construction of a new 52-storey mixed-use residential building with six basement levels. The sixth level basement FFL is understood to be RL 73 m AHD, with a bulk excavation level of RL 72.6. m, requiring additional excavation of up to 8 m depth.

The proposed basement excavation is expected to extend up to about 6-7 m below the measured groundwater levels in some locations.

6. Groundwater Modelling

6.1 Methodology

Numerical modelling was undertaken to assess the potential inflow rates into the proposed basement during construction and in the long-term (if the basement is constructed as fully drained). The extent of drawdown likely to be induced by the drained basement was also assessed.

A 2-dimensional (2D) numerical groundwater model was developed for the site. The modelling was carried out using the 2D finite element hydrogeological software SEEP/W, developed by GEOSLOPE International Ltd. Transient flow conditions were modelled over a 1-year period to assess inflow rates during construction and steady state flow conditions were modelled to assess long term inflow rates for drained basement construction.

6.2 Model Geometry

For the purpose of the analysis, Douglas selected a long section along an east-westerly alignment, approximately through the centre of the basement footprint, approximately parallel to the longer basement edge adjacent to Atchison Steet. Details of the general existing and proposed basement shapes and orientation were adapted from the provided Bates Smart drawings (Drawing Ref.: 10B6, Revision P5, dated 02 March 2026).

The subsurface materials were subdivided into four layers corresponding to the soil and rock units. The aquifer boundaries of the model were extended approximately 75 m from the north and south basement boundaries.

The approximate alignment of the section is indicated on Figure 2 below. The general model section is shown in Figure 3 below.

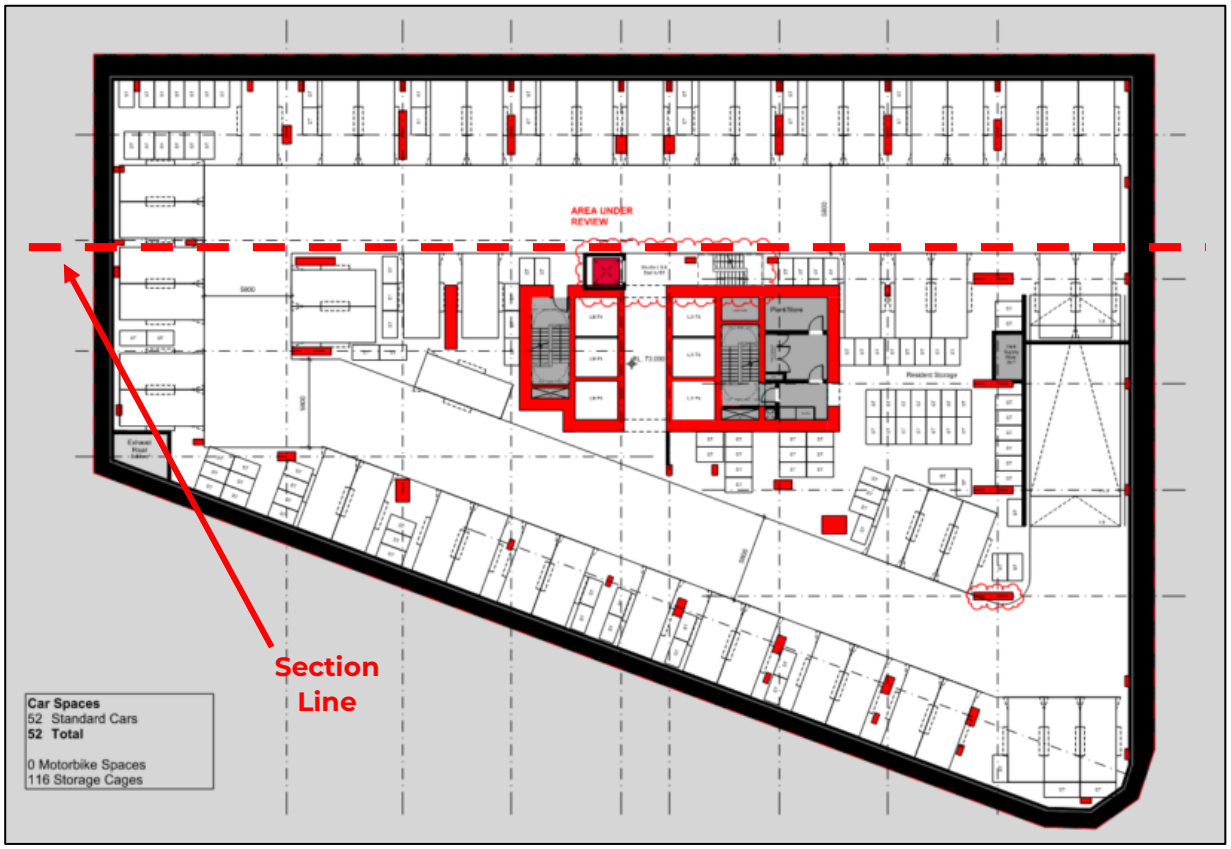

Figure 2: Extract from Bates Smart Drawing with approximate section lines

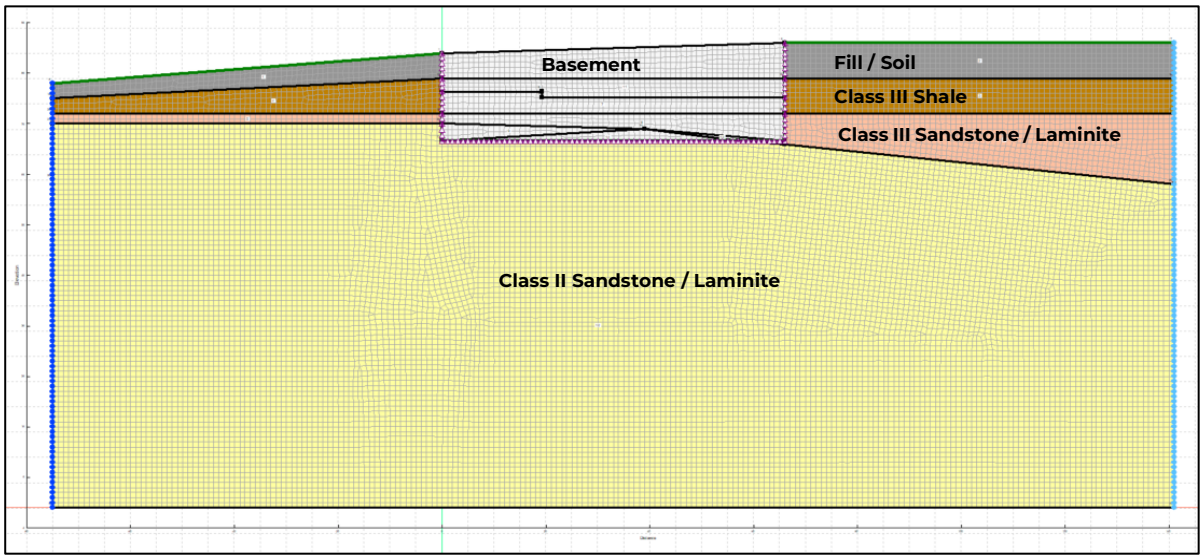

Figure 3: General Model Section

The constant head 'far-end' boundary conditions were selected to generate a similar hydraulic gradient as measured and to match the median hydraulic heads measured in monitoring wells.

Hydraulic parameters required for the multi-layer model include horizontal (K_h) and vertical (K_v) hydraulic conductivities, as well as volumetric water content curves, for each material.

The hydraulic conductivity assigned to the soil was estimated based on literature and Douglas' experience with similar materials in Sydney.

A hydraulic conductivity value assigned to the rock formation was selected based on geometric mean of in-situ permeability testing undertaken on the site for the sandstone / laminite and experience with similar materials. This is considered moderately conservative based on Douglas' experience with other similar developments in this material.

The hydraulic conductivity of the rock unit will vary with changes in the secondary structural features (defects), such as joints, bedding planes, faults, etc. along which groundwater will flow. Changes in the clay or silt content within defect apertures, as well as the orientation and interconnection of defects, will cause changes in the rock mass permeability. Given that the structure of Mittagong Formation commonly contains intersecting horizontal bedding planes and subvertical or steeply dipping joint/fault features which control the rock mass permeability, ratios of vertical and horizontal hydraulic conductivity (k_v / k_h) between 0.3 and 0.6 in the rock have been considered in the model.

The properties adopted in the model are summarised in Table 6 below.

Table 6: Summary of Material Parameters

Material	Saturated Horizontal Hydraulic Conductivity, Khs (m/sec)	Material Model Adopted	Assumed Saturated Volumetric Water Content	Assumed Residual Volumetric Water Content
Fill / Soil	1×10^{-8}	Unsaturated / saturated	0.15	0.05
Class III Shale	1×10^{-7}	Unsaturated / saturated	0.15	0.1
Class III & II Sandstone / Laminite	3.5×10^{-8}	Unsaturated / saturated	0.2	0.1

The hydraulic conductivity curves for unsaturated material types were estimated using the Van Genuchten formulae, included as a built-in function in SEEP/W.

6.3 Basement Shoring and Dewatering

It is understood that the proposed basement is intended to be fully drained, both during construction and in the long term. It has been assumed in the model that any seepage into the basement will be collected in perimeter sumps and pumped out of the basement.

The proposed excavation faces (presumably soldier shoring piles with shotcrete infill panels over strip drains pinned to the excavation face), have been modelled as potential seepage faces over the full height of the proposed excavation.

There are known permanently drained basements at nearby sites, with deeper basement levels. These basements are expected to continue to draw groundwater towards them, resulting in a reduction of inflow into the subject basement. However, for the simplicity, none of the nearby basements is modelled and therefore the assessment is likely conservative.

6.4 Groundwater Modelling Simulations

The model was run under transient conditions to assess the dewatering flow rates during construction, and under steady-state conditions to assess the long-term dewatering flow rates required for a drained basement, and the effect on the water table in the long term.

A number of sensitivity cases were analysed in addition to the base case. The details of the base and sensitivity cases are summarised below:

- Base Case – Material properties as detailed within Table 6.
- Sensitivity 1 – Arithmetic mean of in-situ permeability testing (1.3×10^{-7} m/s) applied to the Class II &III Sandstone and Laminite Units.
- Sensitivity 2 - Highest in-situ permeability test result (3.8×10^{-7} m/s) applied to the Class II &III Sandstone and Laminite Units.

In addition, each of the above cases were analysed for a general sensitivity case in which the observed groundwater level was elevated by 1 m.

7. Modelling Results

7.1 Groundwater Inflow

Groundwater inflow into the excavation along seepage face boundaries on the excavation faces, and along the basement floor, was evaluated using a mesh cross-section through the elements adjacent to the excavation. The predicted inflow rates represent the estimated total rate of groundwater flowing into the excavation, and the volume (per unit time) requiring extraction via the dewatering system (sump-and-pump) in order to dewater the basement excavation during construction and in the long-term. The simulated results are summarised in Table 7 below.

Table 7: Summary of Inflow Modelling Results

Case	Kh/Kv Ratio	Groundwater	Predicted Inflow (ML/year)	
			Transient	Steady State
Base Case	**0.3**	**Observed**	0.5	0.4
Base Case	**0.3**	**+1m**	0.6	0.5
Base Case	**0.6**	**Observed**	0.6	0.5
Base Case	**0.6**	**+1m**	0.8	0.6

Case	Kh/Kv Ratio	Groundwater	Predicted Inflow (ML/year)	
			Transient	Steady State
Sensitivity 1	0.3	Observed	1.3	1.1
Sensitivity 1	0.3	+1m	1.6	1.4
Sensitivity 1	0.6	Observed	1.7	1.4
Sensitivity 1	0.6	+1m	2.0	1.7
Sensitivity 2	0.3	Observed	2.6	2.4
Sensitivity 2	0.3	+1m	3.1	2.8
Sensitivity 2	0.6	Observed	3.2	2.9
Sensitivity 2	0.6	+1m	3.9	3.5

The unit width flows have been multiplied by the width of the overall excavation as well as the half the length of the sides of the excavation. This is considered an overall conservative assumption as flows in the sides of the excavation are expected to be less due to the reduced background groundwater level along the sides.

The SEEP/W results are based on a two-dimensional model, which assumes the excavation is much longer than it's width. In order to convert these predictions to more realistic values, the expression proposed by Kavvadas et al (1992) was used to adjust the results to allow for the length to width ratio of the proposed basement. Based on this a shape factor of 0.7 was adopted and has been applied to the results presented within Table 7.

The results of the SEEP/W analyses were checked using established simplified analytical methods for calculating flow rates into excavations. Predicted inflow rates are very sensitive to the clay content in defect apertures and the degree of fracturing in the bedrock. The estimates provided are based on available information and typical conditions encountered during the investigation, however the actual seepage rate will only be known once excavation is complete and may vary significantly to the predicted value. Flows can also be expected to vary temporally in response to rainfall conditions, with higher flows following rainfall events and reduced flows in dry periods. It is recommended that appropriate allowance and redundancy be included in the design and planning for changes in inflow rates. Where higher inflow occurs along fractured zones grouting could be used to reduce the permeability and inflow, if required.

7.2 **Drawdown and Settlement**

The magnitudes of the potential changes to the groundwater levels resulting from the construction of a drained basement (drawdown) were estimated by subtracting the predicted long-term groundwater levels from the original groundwater levels. The maximum estimated drawdowns at various distances from the north and south excavation faces are summarised Table 8 and Table 9 below.

Table 8: Estimated Drawdown at East Excavation Face

Location	Original Water Level (m AHD)	Final Water Level (m AHD)	Drawdown (m)
Immediately adjacent to basement	79.6	72.6	7
20 m away from basement	81.1	78.8	2.3

Table 9: Estimated Drawdown at West Excavation Face

Location	Original Water Level (m AHD)	Final Water Level (m AHD)	Drawdown (m)
Immediately adjacent to basement	73.4	70.7	2.7
20 m away from basement	71.3	69.4	1.9

The groundwater drawdown is expected to occur within the sandstone/laminite bedrock only. Settlements induced by drawdown in the bedrock are expected to be negligible due to the high deformation moduli of these bedrocks.

8. Aquifer Interference Policy Consideration

The NSW Aquifer Interference Policy (AIP) indicates that the term "aquifer" is commonly understood to mean a groundwater system that is sufficiently permeable to allow water to move within it, and which can yield productive volumes of groundwater. A groundwater system is defined as any type of saturated geological formation that can yield low or high volumes of water. However, for the purpose of the AIP, the term aquifer has the same meaning as groundwater system and includes low yielding and saline systems.

The site is underlain by rock that is typically fractured to unbroken with some highly fractured zones. The soil and rock profile at the site is of relatively low permeability with potentially low yield and is considered to be a 'less productive groundwater source' as outlined in the AIP.

Table 1 in Section 3.2.1 of the AIP outlines minimal impact considerations. The AIP indicates that *"if predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable"*. The following minimal impact considerations are outlined for less productive porous and fractured rock groundwater sources:

- less than or equal to 10% cumulative variation in water table 40 m from any high priority groundwater dependent ecosystem (GDE), high priority culturally significant site, or less than a 2 m decline at any water supply work;
- a cumulative pressure head decline of not more than a 2 m at any water supply work; and
- any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.

The Lane Cover River which is located about 80 m below and 1.4 km southwest of the site. No other surface water sources are mapped within 1 km of the site.

There are no mapped groundwater dependant ecosystems (GDEs) in proximity to the site. The nearest being a coastal sandstone gully about 1.1 km to the northeast of the site.

One extraction bore is noted about 420 m north-northeast of the site with a recorded standing water level of RL 35 m. The bore is located in an area about 20 m lower than the subject site, with a surface level of approximately RL 72 AHD and will not be impacted.

Given the distance from the subject site to the nearest surface water source and registered groundwater extraction well, as well as the absence of GDEs in the vicinity of the site, it is considered unlikely that the impact of the proposed development will exceed "the minimum impact consideration" outlines by the AIP and is therefore compliant.

9. Groundwater Quality

Reference to the Due Diligence Contamination Assessment (86230.01.R.002.Rev4, dated March 2026) completed by Doulas for the site, indicates that, overall, there was no gross groundwater contamination reported during the investigation except for elevated concentrations of chromium, copper, lead, nickel and zinc which are commonly found in urban areas of Sydney. Concentrations of Bromodichloromethane and Dibromodichloromethane were also detected.

Elevated concentrations of some nutrients, anions and cations were also reported for the analysed samples. Whilst these do not constitute contaminants, they will need to be considered for dewatering purposes and it is considered likely that some form of pre-treatment will be required to reduce these concentrations prior to disposal of water collected through the dewatering system.

Reference should be made to the Due Diligence Contamination Assessment report for details of the testing carried out.

10. Groundwater Disposal and Council Requirements

All collected groundwater requiring disposal will need to be tested against the requirements of the receiving authority. For example, disposal to stormwater will require Council approval and be subject to their water quality requirements for discharge to stormwater.

Ongoing monitoring of groundwater quality will be required to check that the groundwater quality complies with the nominated criteria for disposal. Suggested monitoring and reporting requirements are given in Section 12.

Where groundwater does not comply with the nominated requirements some form of groundwater treatment will be required prior to disposal. The treatment system will be determined and adjusted based on the groundwater test results prior to disposal and may include a combination of the following:

- Use of settlement tanks with addition of a flocculation agent to control heavy metals;
- Use of carbon filters to control hydrocarbons; and
- Use of specialist treatment systems to control heavy metals and hydrocarbons.

11. Potential Effects on Neighbouring Properties

An assessment of the potential effects of dewatering on neighbouring properties and groundwater dependent ecosystems has been summarised in Table 10.

Table 10: Assessment of Potential Effects of Dewatering

Item	Comment
Proximity of Groundwater Dependent Ecosystems (GDEs)	No GDEs mapped within 500 m of the site
Water supply losses by neighbouring groundwater users	A review of registered bores within a 500 m radius of the surrounding site was undertaken. The search identified one extraction bore about 420 m north-northeast of the site. Given the predominant groundwater flow direction is to the southwest and the identified well is at a considerably lower elevation than the proposed basement, impact of this will is considered unlikely at this distance.
Potential subsidence of neighbouring structures	Subsidence of bedrocks due to drawdown is considered unlikely due to their high deformation moduli.
Proximity to Contaminated Sites	An EPA registered sites associated with a Telstra Data Centre is located approximately 650 m northwest of the subject site. The site has been assessed by the EPA and is classified as “Regulation under CLM Act not required”. Give this classification, the presence of known plumes of significant contamination are considered unlikely. In addition, the site is noted to be positioned downstream and well below the subject site and the proposed basement level and would be expected to have no impact.

12. Monitoring and Reporting

The following monitoring and associated reporting is suggested during initial construction and should be undertaken during excavation and construction works on-site.

Table 11: Monitoring and Reporting requirements

Item	Monitoring	Monitoring Frequency	Reporting
Assess effect of excavation on groundwater	Monitoring of groundwater levels in three monitoring wells outside the excavation footprint, during and following completion of construction. The locations will be subject to access and approvals and will be determined prior to construction. Existing wells could be used where possible. This	Daily for the first two weeks then weekly. This can be relaxed to monthly once steady groundwater levels are established, during construction	Weekly then monthly during construction

Item	Monitoring	Monitoring Frequency	Reporting
	requirement could be deleted if approved by NRAR given low risk.		
Groundwater Quality Sampling and Testing	Sampling and testing of water from wells and the excavation, or at the point of discharge. Contaminant and physical properties tested to be nominated by the authority accepting water but to include: • Heavy Metals and PAH; • pH & conductivity; • Suspended Solids; • Turbidity; and • Dissolved Oxygen Levels.	pH and turbidity to be measured daily for the first week and then weekly. Two rounds of groundwater sampling and testing initially. Subject to relatively uniform results groundwater testing to be carried out fortnightly or as otherwise agreed with the authority accepting the water.	
Groundwater inflow rates	Groundwater inflow to be measured in collection tanks, of a pre-determined size or using a calibrated flow meter connected to the dewatering system.	Twice daily, or once collection point is filled (whichever is more frequent), for the first two weeks. After steady groundwater inflow rates are established then daily.	Weekly
Quantity of water disposed off-site (includes rainwater)	Calibrated Flowmeter connected to any pump-out system	Automatically	Weekly

13. Conclusion

The geotechnical investigation on the site has identified fill to shallow depths, overlying Ashfield Shale, Mittagong Formation Laminite and Hawkesbury Sandstone bedrock. Groundwater has been recorded in monitoring wells at the site, at elevations between RL 77.9 m AHD and RL 70.8 m AHD, within the bedrock with a gradient generally towards the west.

The proposed basement excavation is expected to extend up to about 6-7 m below the measured groundwater levels in some locations. Some of the groundwater is likely associated with perched seepage along the rock surface and through fractures in the rock as opposed to permanent or regional groundwater table.

Groundwater modelling has been undertaken which predicts that annual groundwater inflow rates of between 0.5 ML/year and 0.8 ML/year during the first year of construction and between 0.4 ML/year and 0.6 ML/year in the long term may be expected for a drained basement construction. This prediction is an estimate based on the information available; actual flow rates may vary from these and will only be known once the excavation is complete and inflow rates can be measured.

Given that the predicted inflow is less than 3 ML/year, for SSDA, it is expected that a Water Access License will not be required from Natural Resources Access Regulator (NRAR). If the actual inflows are greater than 3 ML/year this will require a Water Access Licence and appropriate groundwater share allocation from NRAR (1 water share per 1 ML) for the long-term drainage of the basement.

From a geotechnical point of view, it is considered that a drained basement is feasible without any significant impact to surrounding properties. Most deep basements in the St Leonards area, including nearby and recent deep basements, are constructed as drained basements and Douglas is not aware of any significant issues with groundwater inflow in the area for these basements. In addition, the use of a drained basement is not considered likely to influence any GDEs or groundwater extraction bores in accordance with the AIP minimal impact considerations. Construction of a drained basement will be subject to review and approval from Council and relevant authorities.

14. References

Hvorslev, M. J. (1951). *Time Lag and Soil Permeability in Groundwater Observations*. Bulleton No 36, Vicksburg, Mississippi: Waterways Experiment Station, Corps of Engineers, US Army.

NSW Office of Water. (2012). *NSW Aquifer Interference Policy*.

Pells, P. M. (2019). Classification of Sandstones and Shales in the Sydney Region: A Forty Rear Review. *Austalian Geomechanics,* , Volume 54, 29-55.

15. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 601 Pacific Highway, St Leonards NSW in line with Douglas' proposal dated 17/09/2024 and acceptance received from Diego Eguiguren of Stockland dated 19/11/2024. The work was carried out under contract No. CW96547 dated 15/11/2024. This report is provided for the exclusive use of Stockland for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable

geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical and groundwater components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope of work for this report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

Appendix A

About this Report

About this Report

October 2024

Introduction

These notes have been provided to amplify Douglas' report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

Douglas' reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Engagement Terms for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, Douglas will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, Douglas cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, Douglas will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, Douglas requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. Douglas would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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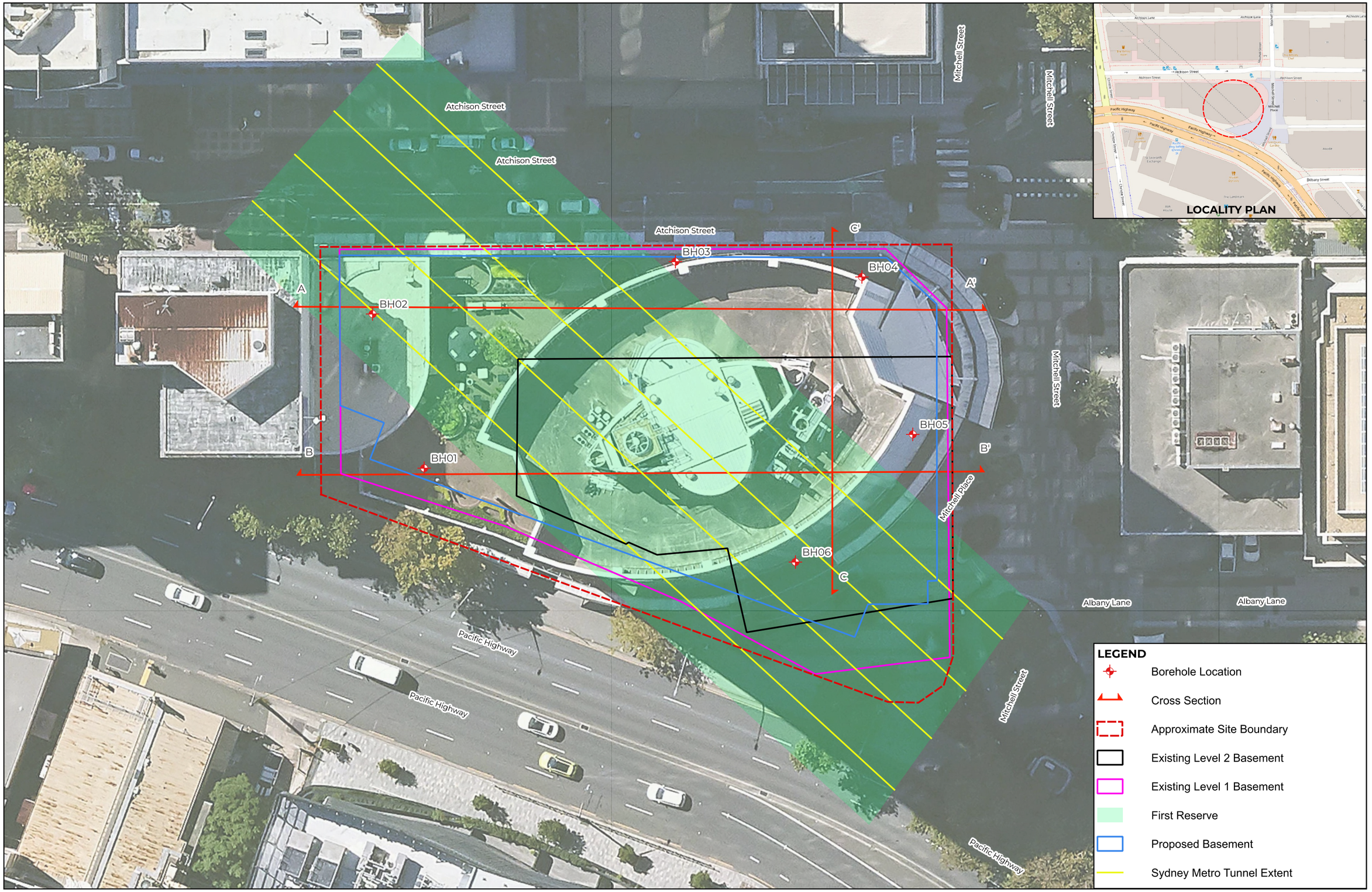
Appendix B

Drawings



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CLIENT:
Stockland Commercial Property

NOTE:
1: Basemap from Metromap (Dated 13.03.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Proposed Commercial Building

PROJECT ADDRESS:
601 Pacific Highway, St Leonards

DRAWING TITLE:
Test Location Plan

PROJECT NO: **86230.01**
DRAWING NO: **1**
REVISION: **0**

Appendix C

Groundwater Data

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index[1] $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	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, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	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 deposition of weathering products in pores.	HW
Moderately weathered	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 but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	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 weathered products in pores.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections > 100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

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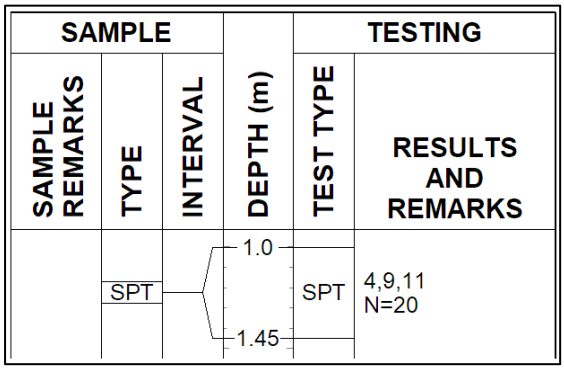
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

October 2024

Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0.25	CONCRETE; reinforcement 8mm, 2 slabs 130mm thick and 90mm thick (low), second slab has no reinforcement observable, 10mm blinding sand separating slabs.		FILL	NA	NA		D	0.40	0.25			Bentonite	
		0.35	FILL / GRAVEL: dark grey; fine to medium, angular, igneous.						D	0.50					
	81	1	FILL / CLAY trace sand: dark grey; low to medium plasticity; fine sand.		FILL	PC	w<PL		D	0.90 1.00	1				
		2	2.00m: poor compaction						D	1.40 1.50	2				
	80	2.60	Continued as rock log						D	1.90 2.00	3			Gravel	
	79	3									4				
	78	4									5				
	77	5									6				
	76	6									7				
	75	7									8				
	74	8									9				
	73	9													

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0				
	81	1													1				
	80	2													2				
		2.60	SILTSTONE: dark grey, indistinct bedding; (horizontal). Ashfield Shale.			2.60		100	100						3	PLT	PL(A)=0.62MPa		
	79	3						100	100		2.87m: JT, 70°, PR, CN, SM 3.23m: JT, 70°, PR, CN, SM,				3	PLT	PL(A)=0.78MPa		
							M				3.00m: Very minimal water loss					PLT	PL(A)=0.65MPa		
	78	4						100	100		3.72m: JT, 70°, PR, CN, SM,				4	PLT	PL(A)=0.62MPa		
		4.54	SANDSTONE: grey, fine to medium grained, indistinct bedding; siltstone ~5 - 10%. Mittagong Formation.		FR						4.09m: JT, 30°, PR, CN, SM,					PLT	PL(A)=0.98MPa		
	77	5				5.00	L	100	100		4.70m: Water loss ~20%				5	PLT	PL(A)=0.28MPa		
						5.60					5.70m: Water loss ~30-40%					PLT	PL(A)=1.1MPa		
	76	6					H	95	100						6	PLT	PL(A)=1.2MPa		
		6.65																	
		6.70				6.70												Gravel	
	75	7					H	100	90		7.30m: Water loss 80-100% recovering to ~40%				7	PLT	PL(A)=1.1MPa		
						7.65					7.55-7.65m: B, 5°, PR, CN, RF, x3								
	74	8			FR		H	100	93		8.03m: B, 10°, PR, CN, RF 8.25m: B, 10°, PR, CN, RF 8.40m: B, 10°, PR, CN, RF				8	PLT	PL(A)=1.6MPa		
						8.60 8.65					8.62-8.70m: B, 0°, PR, RF, x4								
	73	9					M	100	100		8.90m: Water loss 60-90% 9.10m: Water loss ~10-20%				9	PLT	PL(A)=0.73MPa		
								100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11					M	100	100						11	PLT	PL(A)=0.76MPa		
	71					11.50		100	100		10.80m: Water loss ~20-30%					PLT	PL(A)=0.74MPa		
		12.00	SANDSTONE: grey, medium to coarse grained, indistinct bedding. Hawkesbury Sandstone.		FR						11.90m: JT, 90°, PR, SN Fe, RF 12.05m: JT, 90°, PR, CN, RF 12.23m: JT, 50°, PR, CN, RF				12			Gravel	
	70	12					H	100	100		12.60m: B, 5°, PR, INF M, RF					PLT	PL(A)=1.1MPa		
	69	13													13	PLT	PL(A)=1.1MPa		
	68	14				14.20 14.25	H - VH	100	100		14.26m: CS 50mm				14	PLT	PL(A)=3.1MPa		
	67	15	Borehole discontinued at 14.80m depth. Target depth reached.								14.71m: B, 10°, PR, SN Fe, RF								
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 2



2.60-7.00 m depth



7.00-12.00 m depth

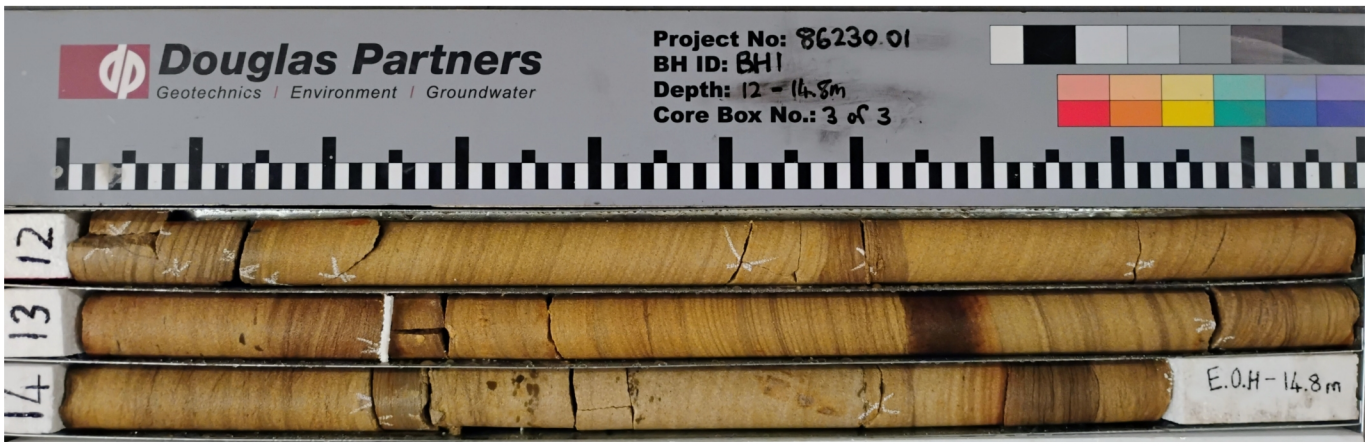
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 2



12.00-14.80 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
28/03/25 No free groundwater observed whilst augering	82	0.18	CONCRETE; 2 layers reinforcement 8mm and 4mm.			NA	NA				0		
		0.40	FILL / Gravelly SAND with clay: brownish-grey; fine to medium; medium, sub-angular, igneous gravel.		FILL	ND	M						
					FILL		D						
		0.90	FILL / Clayey SAND trace gravel: dark grey; fine to medium; low to medium plasticity clay; fine to medium, angular, igneous gravel.		FILL		w<PL						
	81	1.10	FILL / CLAY trace sand trace gravel: dark grey; low to medium plasticity.								1		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 28/03/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
82	0	Continued from soil log												0				
	1	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.		FR	1.10	L	100	100		1.33m: JT, 40°, PR, CN, SM				1	PLT	PL(A)=0.12MPa		
81					2.00		100	100							PLT	PL(A)=0.14MPa		
	2													2	PLT	PL(A)=0.32MPa		
80	2.50									2.50m - 3.60m: Water loss <10%								
	2.63				2.63					2.80m: JT, 50°, PR, CN, SM					PLT	PL(A)=0.60MPa		
	3						88	100		3.27m: JT, 45°, PR, CN, SM				3	PLT	PL(A)=0.66MPa		
79				FR		M												
	4									3.90m: CZ, 0°, PR, Clay, SM, ~5mm				4	PLT	PL(A)=0.87MPa		
78							100	100		4.25m: CZ, 0°, PR, Clay, SM, ~5mm					PLT	PL(A)=0.54MPa		
	4.72									4.62-4.67m: CZ, 5°, PR, Clay								
	5	SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.		SW	4.70									5	PLT	PL(A)=0.48MPa		
77		5.50m-5.80m: rip up clasts			5.30										PLT	PL(A)=0.37MPa		
	6				6.00		100	100						6				
76						H									PLT	PL(A)=1.2MPa		
	7			FR			100	100						7				
75					7.60	M									PLT	PL(A)=1.3MPa		
	8				8.05									8				
74										8.56m: CZ, 20mm					PLT	PL(A)=1.4MPa		
	9					H	100	100						9				
73															PLT	PL(A)=1.1MPa		
							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10	[CONT] SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.		FR	10.00	M	100	100		10.60m CZ, 20mm				10	PLT	PL(A)=0.49MPa		
	71	11				10.40					11.10m - 14.10m: Water loss <10%				11	PLT	PL(A)=1.4MPa		
	70	12					H	100	100						12	PLT	PL(A)=1.8MPa		
	69	13						87	87		13.38m B, 0°, PR, INF Clay 10mm, RF				13	PLT	PL(A)=1.1MPa		
		13.37	SANDSTONE: pale grey, medium to coarse grained; cross-bedded 0-10 degreess. Hawkesbury Sandstone.												14				
	68	13.90	Borehole discontinued at 14.10m depth. Target depth reached.																
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 2



10.00-14.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick.			NA			D	0.15 to 0.20	0.15			Bentonite	
		0.25	FILL / Gravelly SAND: yellow and grey; medium; fine to coarse, igneous, concrete gravel.		FILL	ND	w<PL		D	0.40 to 0.50	0.20				
		0.70	FILL / Sandy CLAY trace gravel: dark grey; low to medium plasticity; fine to coarse sand; fine gravel; shale.		FILL						0.50				
	81	1	Continued as rock log								1				
	80	2									2				
	79	3									3				
	78	4									4				
	77	5									5			Sand	
	76	6									6				
	75	7									7				
	74	8									8				
	73	9									9				

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0			Bentonite	
	81	1	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.		SW	0.70 1.00	VL L M H VH EH	100	100		0.75m: JT, 35°, PR, SN Fe 0.92m: JT, 85°, PR, SN Fe 0.70m - 1.80m: Water loss <10% 1.39m: JT, 70°, PR, CN, SM				1	PLT	PL(A)=1.3MPa		
	80	2						100	100						2	PLT	PL(A)=0.80MPa		
																PLT	PL(A)=0.61MPa		
	79	3						100	100		2.80m: JT, 40°, PR, CN, SM				3	PLT	PL(A)=0.91MPa		
											3.30m - 4.00m: Water loss ~10%					PLT	PL(A)=0.70MPa		
	78	4					M H	100	100		4.13-4.15m: CZ, 0°, PR, SN Clay 4.25m: JT, 80°, PR, CN, SM				4	PLT	PL(A)=0.67MPa		
		4.80														PLT	PL(A)=0.86MPa		
	77	5	SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding 0 to 10 degrees. Mittagong Formation.		FR			100	100						5	PLT	PL(A)=1.1MPa	Sand	
	76	6									6.08m: B, ~5°, PR, CN, RF 6.49m: JT, 15°, PR, CN, RF				6	PLT	PL(A)=0.77MPa		
	75	7				7.00	H	100	90		7.28m: B, 10°, PR, RF 7.30m: B, 5°, PR, HE 7.35m: B, 50°, PR Clay 6 mm 7.41m: B, ~20°, UN, RF 7.50m: JT, 70°, PR, HE 7.62m: JT, 85°, UN, HE 7.75m: JT, 20°, UN, Clay, ~5mm				7	PLT	PL(A)=2.4MPa		
	74	8						100	100		8.46m: B, 5°, ST, Clay, ~2 mm 8.79m: JT, 70°, PR, CN, RF				8	PLT	PL(A)=1.5MPa		
	73	9				9.40	M	100	84		9.45m: JT, 80-90°, CU, Clay, 1-3mm 9.60m: B, ~50°, PR, Clay, PO, 1-2mm				9	PLT	PL(A)=0.37MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding 0 to 10 degrees. Mittagong Formation.		FR		M	100	84						11	PLT	PL(A)=0.92MPa	Sand	
	71							100	100		11.55m: JT, 40°, PR, VNR Clay, RF 11.63m: CS, 30mm					PLT	PL(A)=0.84MPa		
		12									12.06m: JT, 80°, PR, CN, SM				12				
	70		Borehole discontinued at 12.10m depth. Target depth reached.																
		13																	
	69																		
		14																	
	68																		
		15																	
	67																		
		16																	
	66																		
		17																	
	65																		
		18																	
	64																		
		19																	
	63																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 2



0.70-5.00 m depth



5.00-10.00 m depth

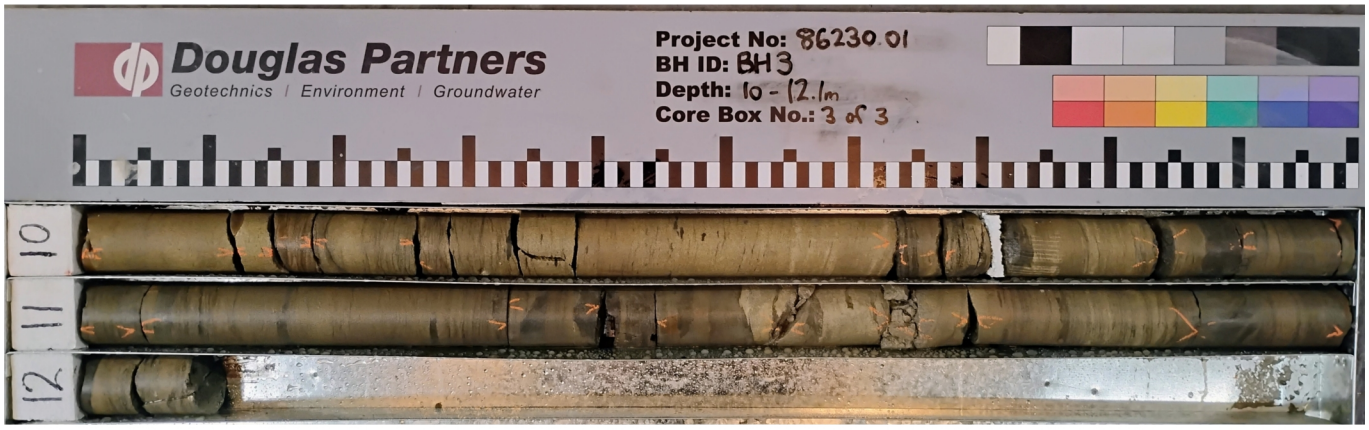
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 2



10.00-12.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 5

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
07/04/25 Water level measured at 25.2m BGL.		0.15	CONCRETE; 150mm thick; one layer bidirectional reinforcement (SL82).			NA	NA				0.15		
	82	0.23	FILL / SAND: grey; medium.		FILL	ND	M		D		0.20		
		0.60	FILL / Sandy GRAVEL: dark grey; fine to medium, sub-angular, igneous; fine to coarse sand.				M / W		D		0.40 0.50		
		1	Continued as rock log								1		
	81												
		2									2		
	80												
		3									3		
	79												
		4									4		
	78												
		5									5		
	77												
		6									6		
	76												
		7									7		
	75												
		8									8		
	74												
		9									9		
	73												

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
07/04/25 Water level measured at 25.2m BGL.	82	0	Continued from soil log												0	PLT	PL(A)=1.1MPa		
			SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.			0.60		100	100										
	81	1													1	PLT	PL(A)=1.0MPa		
											1.71m: JT, 70°, PR, CN, SM								
											1.91m: JT, 50°, PR, CN, SM					PLT	PL(A)=1.2MPa		
	80	2					H	100	100						2	PLT	PL(A)=0.68MPa		
											2.86m: JT, 60°, PR, CN, SM					PLT	PL(A)=0.75MPa		
		3													3	PLT	PL(A)=1.3MPa		
	79					3.40		100	100										
							M				3.79m: JT, 80°, PR, CN, SM					PLT	PL(A)=0.56MPa		
		4									3.70m: Water loss 10-20%				4	PLT	PL(A)=0.22MPa		
		4.15				4.10	L				4.15m: JT, ~70°, PR, CN, RF								
	78		SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.			4.20		100	100		4.20m: Water loss <10%					PLT	PL(A)=0.85MPa		
		5													5				
	77				FR											PLT	PL(A)=1.2MPa		
		6					H	100	100						6				
	76										6.70m - 8.20m: Water loss 10%					PLT	PL(A)=1.7MPa		
		7													7				
	75					7.50	L	100	99		7.60m: JT, 70°, CU, CN, RF								
						7.90	M				7.66m: B, 0°, PR, RF 7.68m: B, 0°, PR, RF					PLT	PL(A)=0.13MPa		
		8				8.10									8	PLT	PL(A)=2.2MPa		
	74						H												
											8.72-8.92m: B, 0-10°, PR, RF, 7x								
		9				9.00		100	87						9				
	73						M				9.00-9.70m: JT, 85°, CU, CN, RF								
						9.90		100	100							PLT	PL(A)=0.73MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10.00	SANDSTONE: grey, pale grey, and pale brown, fine to medium grained, distinct bedding, 0 to 10°; siltstone laminae ~5-15%. Mittagong Formation.					100	100						11	PLT	PL(A)=1.1MPa		
	71	11						100	100						12	PLT	PL(A)=0.99MPa		
	70	12						100	100						13	PLT	PL(A)=0.83MPa		
	69	13 13.05	SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.				M - H	100	100						14	PLT	PL(A)=0.89MPa		
	68	14	From 14.30m: pale grey					100	100		13.81m: B, 5-10°, PR, VNR Clay, RF				15	PLT	PL(A)=0.80MPa		
	67	15	15.00m-15.65m: 50% carbonaceous laminations		FR			100	92		15.54m: B, 0°, PR, VNR Clay, RF 15.67m: B, 10°, PR, VNR, RF				16	PLT	PL(A)=0.73MPa		
	66	16						100	100						17	PLT	PL(A)=1.1MPa		
	65	17				17.00		100	100						18	PLT	PL(A)=1.3MPa		
	64	18					H	100	100						19	PLT	PL(A)=1.0MPa		
	63	19						100	100		19.57m: B, 10°, PR, RF, iron clay 19.80m: Water loss ~20%					PLT	PL(A)=1.1MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	62	20	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		20.77m: CS, 10mm				20	PLT	PL(A)=1.0MPa		
	61	21									21.20m: B, ~5°, PR, Clay 2mm, RF				21	PLT	PL(A)=1.3MPa		
											21.40m: Water loss ~10%								
	60	22						100	100						22	PLT	PL(A)=1.1MPa		
	59	23					H	100	100						23	PLT	PL(A)=1.6MPa		
	58	24						100	100						24	PLT	PL(A)=1.5MPa		
	57	25			FR			100	100						25	PLT	PL(A)=1.7MPa		
	56	26				26.50	L	100	92		26.12m: JT, 90°, UN, CN, RF 26.20m: B, 5-10°, PR, Clay, RF, 3-4mm 26.26m: B, 0°, PR, Clay, RF, 1-2mm 26.57m: B, 15°, PR, Clay 1mm, RF 26.70m: B, 0°, PR, Clay 5mm, RF 26.75m: B, 0°, PR, Clay, RF, 1-2mm				26	PLT	PL(A)=0.34MPa		
	55	27				26.90					26.00m - 27.40m: Water loss 25%				27	PLT	PL(A)=0.59MPa		
	54	28					M	100	90		27.75m: CS, 10°, PR, Clay 40mm, RF 28.08m: CS, Clay 15mm 28.20m: JT, 20°, PR, Clay 4mm, RF 28.25m: B, 0°, PR, Clay, RF, 2-4mm				28	PLT	PL(A)=0.32MPa		
	53	29				29.50	M	100	76		28.70m: JT, 15°, PR, Clay 4mm, RF 28.94m: JT, 20°, PR, VNR Clay, RF 29.04-29.30m: B, 5°, PR, VNR, RF 29.36m: JT, 70°, PR, CN, RF 29.40m: JT, 15°, PR, VNR, RF 29.57-29.67m: CZ, 10°, PR 29.82m: JT, 5°, UN, VNR				29	PLT	PL(A)=0.43MPa		
																PLT	PL(A)=0.29MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 5 of 5

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	52	30	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.		FR	30.00	H	100	90		Clay, RF, 29.92m: JT, 25°, PR, Clay 6mm, RF 29.98m: JT, 15°, PR, Clay, RF, ~2mm 30.10m: Water loss 25% 30.29m: B, 5°, PR, Clay, RF, 2-4mm 30.34-30.39m: B, ~10°, UN, Clay, RF, 4-6mm 30.45m: B, 15°, UN, Clay, RF, ~2mm 30.48m: B, 10°, PR, Clay, RF, ~3mm				31	PLT	PL(A)=0.95MPa PL(A)=1.2MPa		
	51	31	Borehole discontinued at 31.50m depth.																	
	50	32																		
	49	33																		
	48	34																		
	47	35																		
	46	36																		
	45	37																		
	44	38																		
	43	39																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

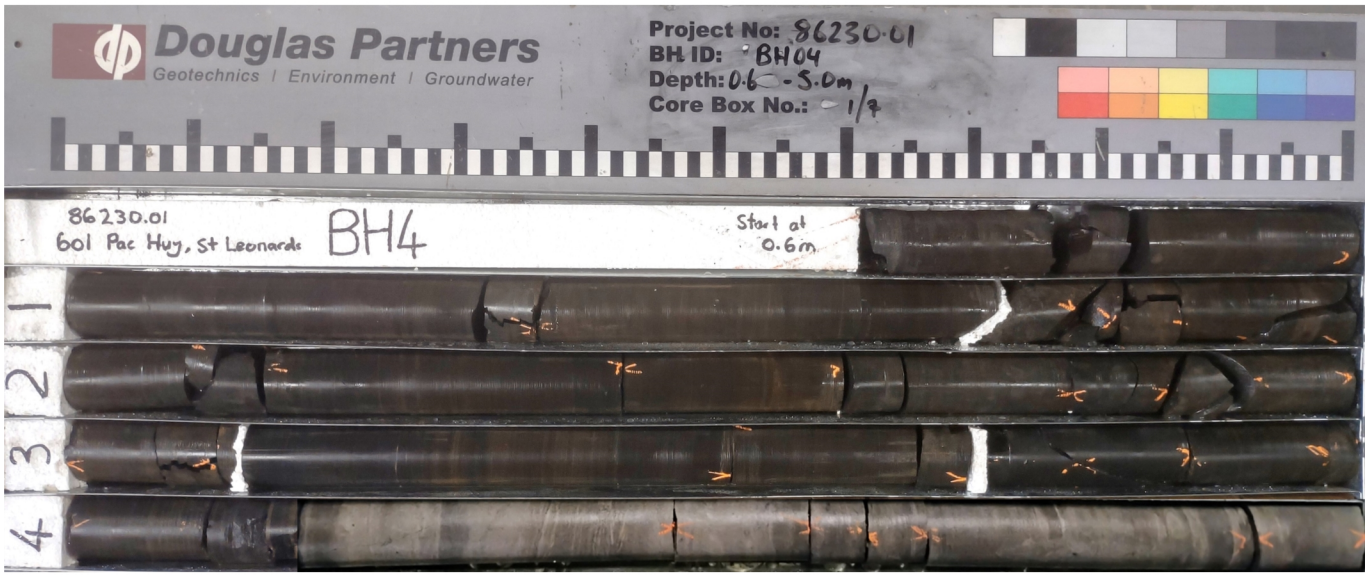
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 4



0.60-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 4



10.00-15.00 m depth



15.00-20.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 4



20.00-25.00 m depth



25.00-30.00 m depth

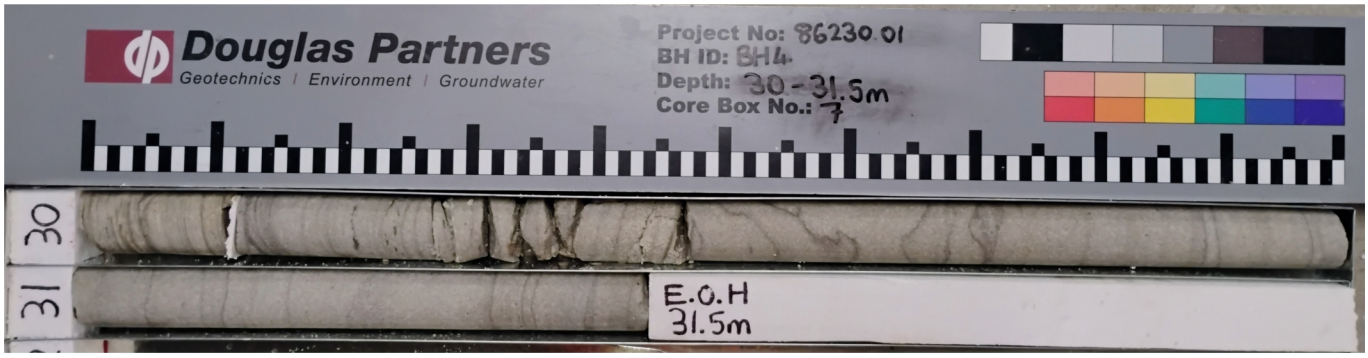
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 4



30.00-31.50 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick; one layer reinforcement 8mm (SL82).			NA	NA		D		0.15 0.20		
		0.25			FILL								
		0.30	FILL / SAND: yellow-grey; medium.						D		0.40 0.50		
			FILL / GRAVEL: grey; fine to medium, sub-angular, igneous.		FILL	ND	M						
	81	1 1.10	FILL / Sandy CLAY trace gravel: grey; low to medium plasticity; fine sand; fine, angular, siltstone gravel; trace PVC fragments.						D		0.90 1.00		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	82	1	Continued from soil log			1.10									1				
	81	1.25	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.			1.25	M	81	81		1.50m: JT, 90°, CU, CN, RF 1.80m: JT, 70°, PR, VNR M, SM, 1.90m - 3.00m: Water loss ~10%				2	PLT	PL(A)=0.77MPa		
	80	2				2.20	VL	100	80		2.06m: JT, 70°, PR, CN, SM 2.15m: JT, 70°, PR, CN, SM 2.20-2.30m: CZ, M					PLT	PL(A)=1.5MPa		
						2.30	M - H									PLT	PL(A)=2.3MPa		
	79	3				3.43	VL	100	60		2.76m: JT, 50-60°, PR, VNR M, SM 2.83m: JT, 50-60°, PR, VNR M, SM 2.88m: JT, 50-60°, PR, VNR M, SM 3.05-3.10m: CZ, M 3.12m: JT, 70°, PR, CN, SM 3.36m: B, PR, M, SM, 3.43-3.65m: CZ, M, 3.75-3.78m: CZ, M,				3	PLT	PL(A)=0.35MPa		
						3.65	L - M									PLT	PL(A)=0.16MPa		
						3.90	VL									PLT	PL(A)=0.66MPa		
	78	4				4.00	L - M				3.90-4.00m: CZ, 6°, M 4.30m: B, 90°, PR, VNR M, SM, 4.30m - 5.90m: Water loss <10%				4	PLT	PL(A)=0.39MPa		
						4.71					4.45m: JT, 35°, PR, VNR M, SM 4.53m: B, 0°, PR, M, SM, 1-2mm 4.67m: B, PR, M, SM, ~2mm 4.71m: B, PR, M, SM, ~2mm					PLT	PL(A)=0.13MPa		
	77	4.75	SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.	FR		4.74		100	86		4.74m: B, PR, M, SM, ~2mm 4.77m: B, PR, M, SM, ~2mm 5.90m - 7.50m: Water loss ~10%				5	PLT	PL(A)=1.0MPa		
	76	6									6.30m: JT, 70°, PR, CN, RF				6				
								100	100		6.56m: JT, 70°, PR, CN, RF 6.60m: B, 0°, PR, SM 6.82m: JT, 70°, PR, CN, RF 6.94m: B, 10°, PR, SM					PLT	PL(A)=0.69MPa		
	75	7					M - H				7.40m: B, 10°, PR, SM				7	PLT	PL(A)=1.4MPa		
	74	8						100	100						8	PLT	PL(A)=1.6MPa		
	73	9						100	100		9.23m: B, 5°, PR, SM				9	PLT	PL(A)=0.90MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.		FR	12.20	M	100	100		10.30m: No drilling muds, water loss ~20%				11	PLT	PL(A)=1.9MPa		
	71							100	92		10.55-1059m: CZ, INF Clay 6mm, 10.66m: B, 15°, PR, Clay 10mm, SM					PLT	PL(A)=0.95MPa		
	70	12									11.57m: B, 10°, PR, M, SM				12				
	69	13				13.20	M	100	100						13	PLT	PL(A)=0.40MPa		
	68	14					H	100	95		13.40m: B, 5°, PR, Clay 1mm, SM 13.45m: JT, 80°, ST, CN, RF				14	PLT	PL(A)=1.0MPa		
	67	15	Borehole discontinued at 14.60m depth. Target depth reached.								14.55m: B, PR, Clay 11mm					PLT	PL(A)=1.1MPa		
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

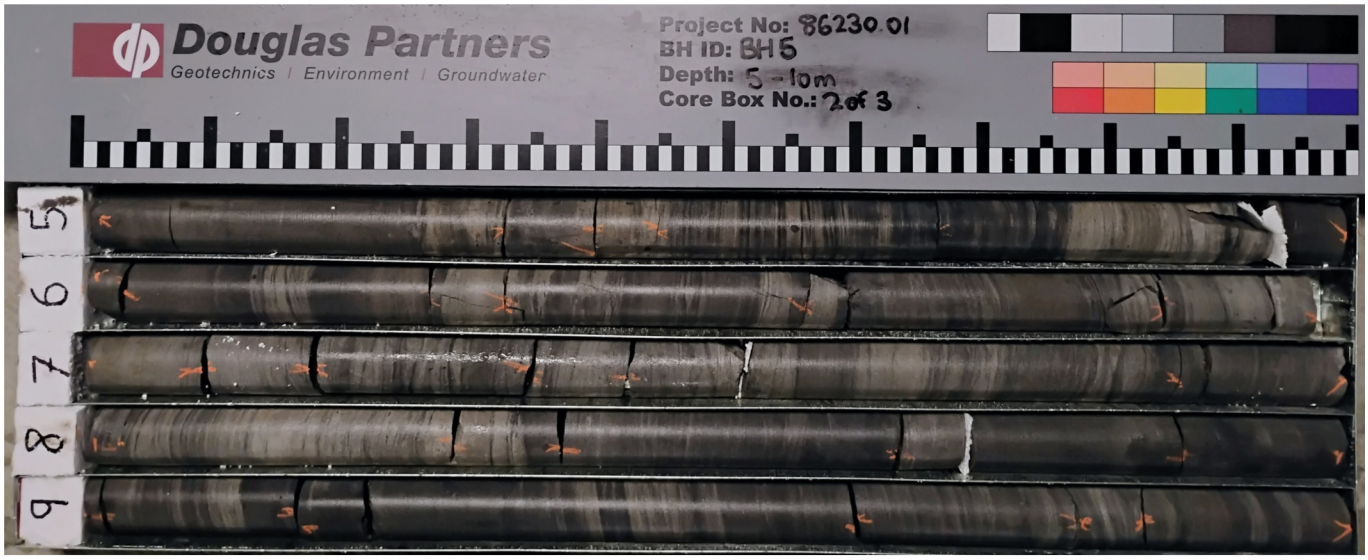
CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 2



10.00-14.60 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0.15	CONCRETE; 150m thick; one layer reinforcement (SL82).			NA	NA				0.15				
		0.25	FILL / SAND: grey-brown; medium.		FILL	ND	M		D		0.25				
		0.50	FILL / Sandy CLAY with gravel: dark grey; low to medium plasticity; fine to coarse sand; fine, siltstone gravel.		FILL		w=PL		D		0.40				
		0.65	SILTSTONE: dark grey. Ashfield Shale.								0.50				
	80	1	Continued as rock log								1			Bentonite	
	79	2									2				
	78	3									3				
	77	4									4				
	76	5									5				
	75	6									6			Sand	
	74	7									7				
	73	8									8				
	72	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

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Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0	Continued from soil log												0				
	80	1	SILTSTONE: dark grey, indistinct bedding, 0 to 10°. Ashfield Shale.			0.65		100	76		0.85m: B, 0°, PR, 1mm, SM, fines 1.15m: JT, 30°, PR, VNR, SM, fines 1.33m: JT, 30°, PR, VNR, SM, fines 1.35m: JT, 70°, PR, CN, SM 1.42m: CZ, 40mm 1.70m: Water loss <10%. no drilling mud added.				1	PLT	PL(A)=0.94MPa	Bentonite	
																PLT	PL(A)=1.8MPa		
	79	2					M	100	100						2	PLT	PL(A)=0.72MPa		
																PLT	PL(A)=0.95MPa		
	78	3						100	95		3.00m: CZ, 40mm				3	PLT	PL(A)=0.80MPa		
																PLT	PL(A)=0.75MPa		
											3.75m: CZ, 20mm 3.98m: CZ, 20mm					PLT	PL(A)=0.88MPa		
	77	4	4.05 SANDSTONE: grey and pale grey, fine to medium grained, indistinct bedding, 0 to 10°; siltstone laminations and bedding. Mittagong Formation.												4	PLT	PL(A)=0.70MPa		
						4.50		100	100							PLT	PL(A)=0.93MPa		
	76	5			FR										5	PLT	PL(A)=1.0MPa	Sand	
								100	93		6.21m: CZ, 20mm 6.31m: CZ, 20mm					PLT	PL(A)=2.0MPa		
	75	6					H								6				
																PLT	PL(A)=2.3MPa		
	74	7						100	100						7	PLT	PL(A)=1.4MPa		
	73	8													8				
								100	91							PLT	PL(A)=1.5MPa		
	72	9													9				

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

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BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	71	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, indistinct bedding, 0 to 10°; siltstone laminations and bedding. Mittagong Formation.		FR		H	100	91		9.97m: CZ, 80mm 10.10m: B, 10°, PR, Clay 10mm, RF				11	PLT	PL(A)=1.3MPa	Sand	
								100	100										
	70	12	Borehole discontinued at 11.05m depth. Target depth reached.																
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	
	62																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 1



0.50-5.00 m depth



5.00-11.05 m depth

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Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	17-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	ZW

Test Location

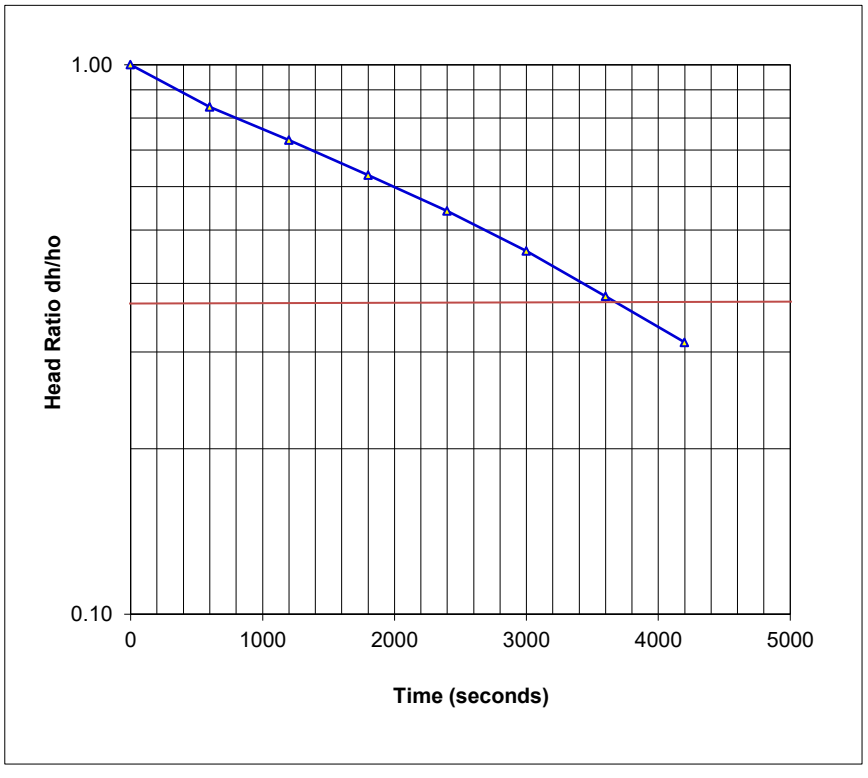
Description:	Falling Head Test (Case 2)	**Test No.**	BH01	
Material type:	Siltstone & Sandstone	Easting:	333081.1	m
		Northing	6255981.1	m
		Surface Level:	82.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	10.8	m
borehole diameter (2R)	76	mm	Depth to water at start of test	8.4	m
Effective Length of well screen (Le)	4.0	m	Depth of top of PVC standpipe	3.0	m
			Depth of base of PVC standpipe	14.8	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	8.40	2.40	1.000
600.00	8.79	2.01	0.838
1200.00	9.05	1.75	0.729
1800.00	9.29	1.51	0.629
2400.00	9.50	1.30	0.542
3000.00	9.70	1.10	0.458
3600.00	9.89	0.91	0.379
4200.00	10.05	0.75	0.313



To = 60.0 mins
3600 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity

k =	**2.3E-07**	m/sec
=	**0.020**	m/day

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Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	10-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	JDS

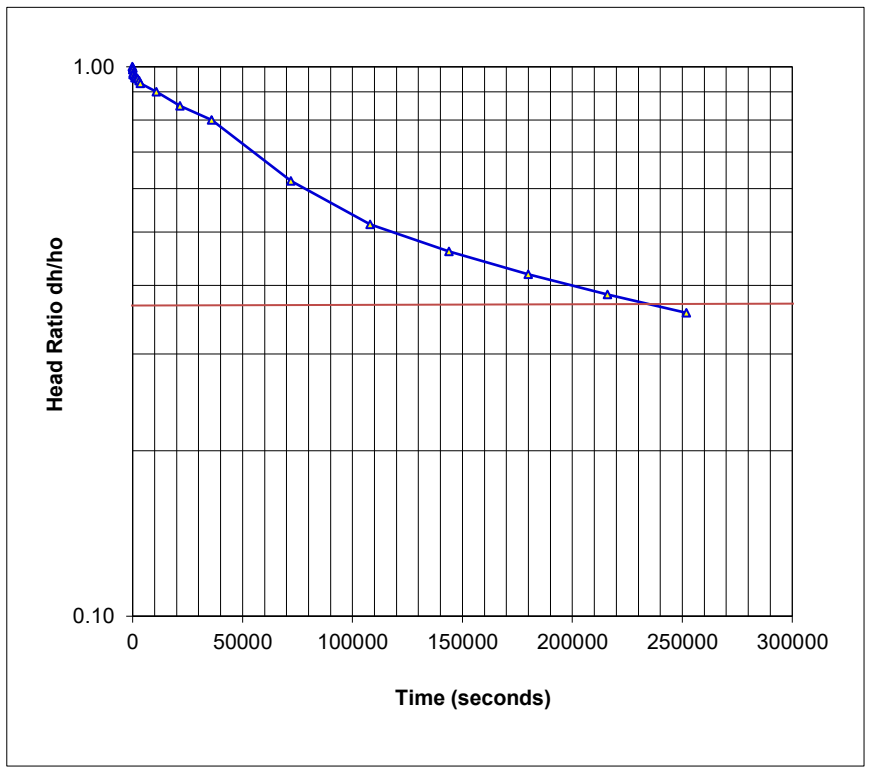
Test Location		**Test No.**	BH3	
Description:	Falling Head Test (Case 2)	Easting:	333109.1	m
Material type:	Siltstone & Sandstone	Northing	6256004.1	m
		Surface Level:	82.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	9	m
borehole diameter (2R)	76	mm	Depth to water at start of test	0.5	m
Effective Length of well screen (Le)	3.1	m	Depth of top of PVC standpipe	0.5	m
			Depth of base of PVC standpipe	12.1	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	0.50	8.50	1.000
60.00	0.53	8.47	0.996
120.00	0.54	8.46	0.995
180.00	0.61	8.39	0.987
240.00	0.72	8.28	0.974
300.00	0.77	8.23	0.968
900.00	0.82	8.18	0.962
1200.00	0.88	8.12	0.955
1800.00	0.89	8.11	0.954
2400.00	0.92	8.08	0.951
3000.00	0.98	8.02	0.944
3600.00	1.07	7.93	0.933
10800.00	1.35	7.65	0.900
21600.00	1.79	7.21	0.848
36000.00	2.20	6.80	0.800
72000.00	3.73	5.27	0.620
108000.00	4.61	4.39	0.516
144000.00	5.08	3.92	0.461
180000.00	5.44	3.56	0.419
216000.00	5.73	3.27	0.385
252000.00	5.97	3.03	0.356



To = 4000 mins
240000 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**4.3E-09**	m/sec
	=	**0.0004**	m/day

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Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	17-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	ZW

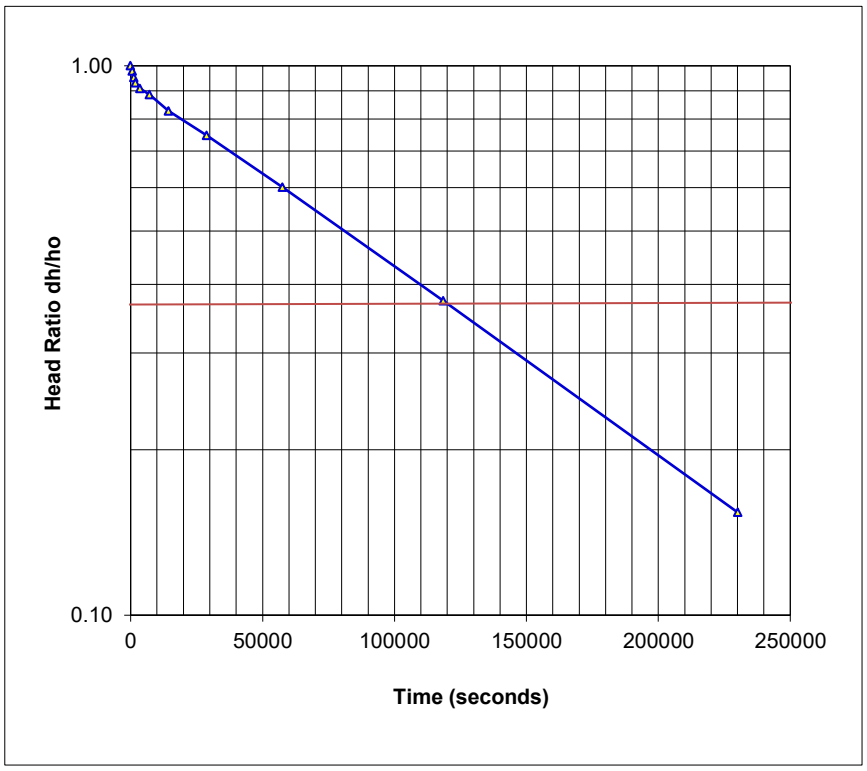
Test Location		**Test No.**	BH3	
Description:	Falling Head Test (Case 2)	Easting:	333109.1	m
Material type:	Siltstone & Sandstone	Northing	6256004.1	m
		Surface Level:	82.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	6.73	m
borehole diameter (2R)	76	mm	Depth to water at start of test	4	m
Effective Length of well screen (Le)	5.4	m	Depth of top of PVC standpipe	0.5	m
			Depth of base of PVC standpipe	12.1	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	4.00	2.73	1.000
600.00	4.06	2.67	0.978
1200.00	4.13	2.60	0.952
1800.00	4.19	2.54	0.930
3600.00	4.25	2.48	0.908
7200.00	4.31	2.42	0.886
14400.00	4.47	2.26	0.828
28800.00	4.69	2.04	0.747
57600.00	5.09	1.64	0.601
118500.00	5.71	1.02	0.374
230100.00	6.31	0.42	0.154



To = 1975 mins
118500 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**5.6E-09**	m/sec
	=	**0.0005**	m/day

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Permeability Testing - Falling Head Test Report

Client:	Stockland Developments Pty Ltd	Project No:	86230.01
Project:	Proposed Residential Development	Test date:	17-Apr-25
Location:	601 Pacific Highway, St Leonards	Tested by:	ZW

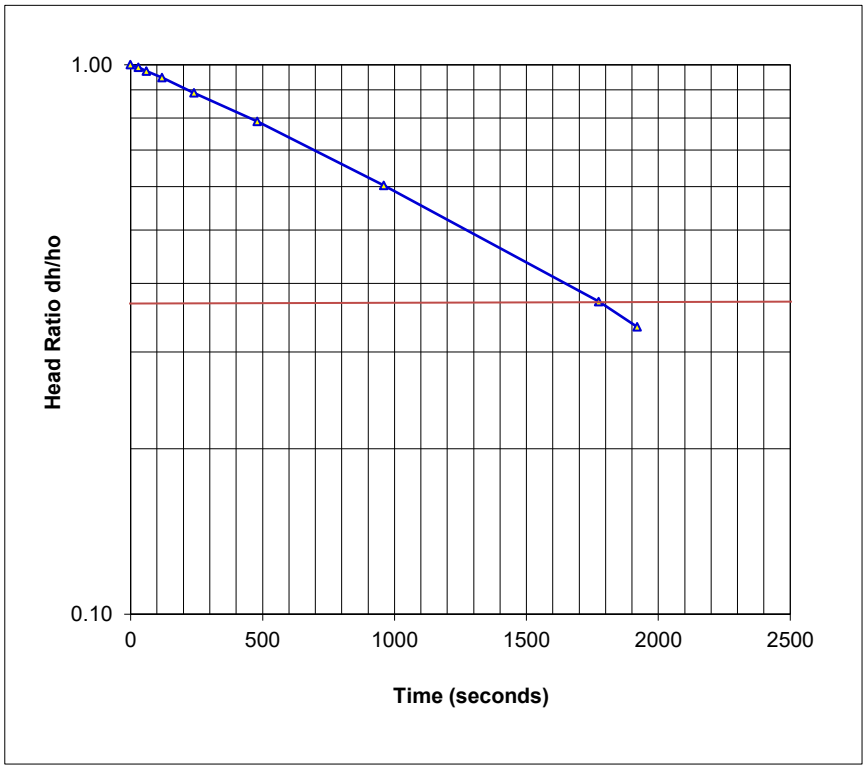
Test Location		**Test No.**	BH06	
Description:	Falling Head Test (Case 2)	Easting:	333122.5	m
Material type:	Siltstone & Sandstone	Northing	6255970.7	m
		Surface Level:	81.3	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	3.4	m
borehole diameter (2R)	76	mm	Depth to water at start of test	1.51	m
Effective Length of well screen (Le)	7.7	m	Depth of top of PVC standpipe	1.5	m
			Depth of base of PVC standpipe	11.1	m

Test Results

Time (sec)	Depth (m)	Change in Head δH (m)	δH/Ho
0.00	1.51	1.89	1.000
30.00	1.53	1.87	0.989
60.00	1.56	1.84	0.974
120.00	1.61	1.79	0.947
240.00	1.72	1.68	0.889
480.00	1.91	1.49	0.788
960.00	2.26	1.14	0.603
1775.00	2.7	0.70	0.370
1920.00	2.77	0.63	0.333



To = 29.6 mins
1775 secs

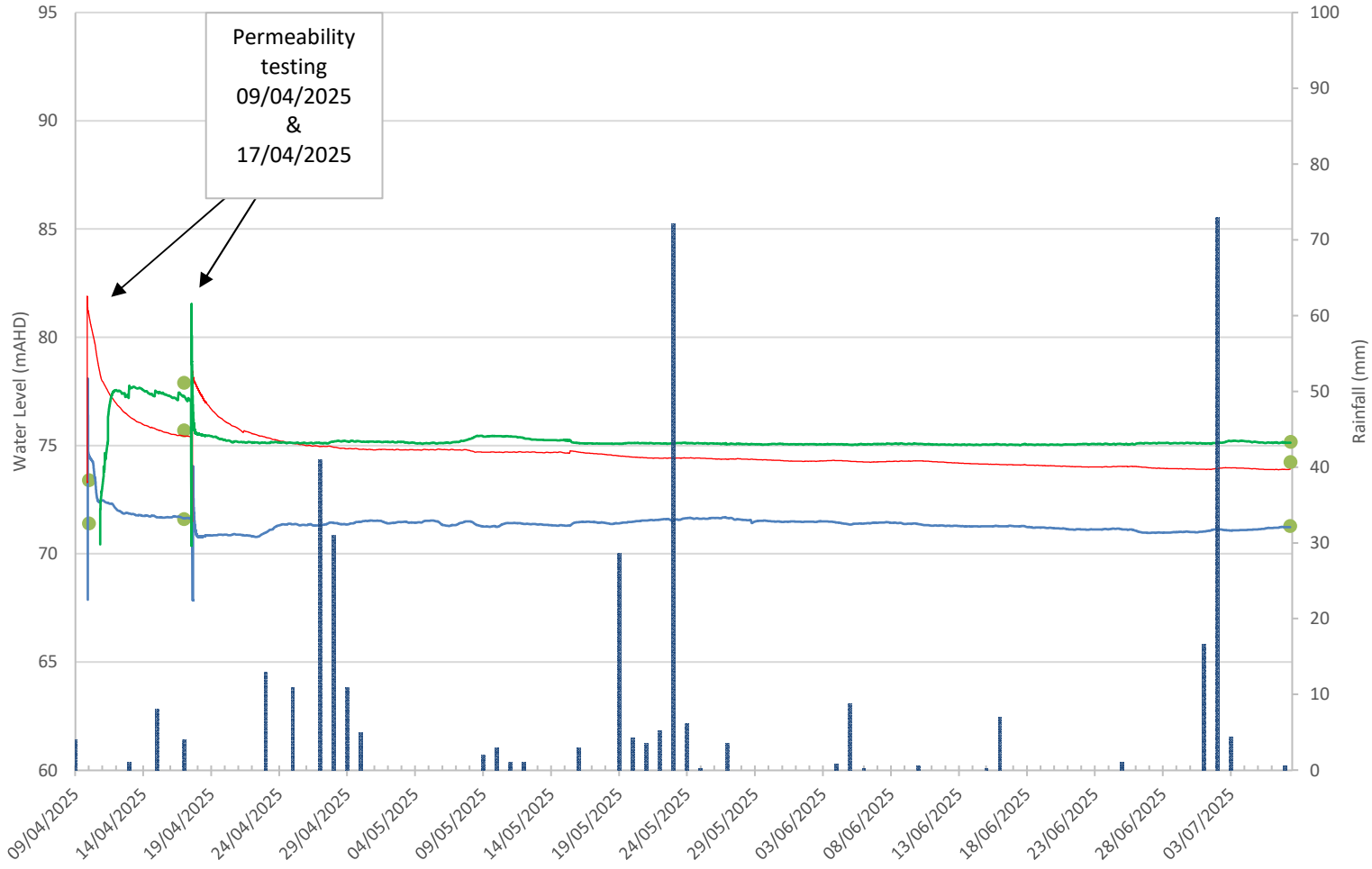
Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity **k =** **2.8E-07** m/sec
= **0.024** m/day

Groundwater Level Monitoring Summary



Note: Reading Interval = 1 hour

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- Manual Levels
- Water Level BH01
- Water Level BH03
- Water Level BH06
- Rainfall data (ST: 066011)

Date:	From	Drawn:
08/07/2025	09/04/2025	AG
	To	Checked:
	07/07/2025	STE

Douglas PARTNERS

GROUNDED EXPERTISE

Report on Due Diligence Contamination Testing

Proposed Mixed Use Residential Development

601 Pacific Highway, St Leonards NSW

Prepared for Stockland Development Pty Limited

Project 86230.01

18 March 2026

Douglas Partners Pty Ltd
ABN 75 053 980 117
douglaspartners.com.au
96 Hermitage Road, West Ryde,
NSW 2114
(02) 9809 0666

Document History

Details

Project No.	86230.01
Document Title	Report on Due Diligence Contamination Testing
Site Address	601 Pacific Highway, St Leonards NSW
Report Prepared For	Stockland Development Pty Limited
Filename	86230.01.R.002.Rev4

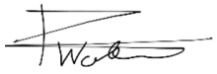
Status and Review

Status	Prepared by	Position / Qualification	Reviewed by	Position / Qualification	Date issued
Revision 0	Philip Waters	Environmental Engineer	Paul Gorman	Environmental Engineer (C EnvP-SC)	30 May 2025
Revision 1	Philip Waters	Environmental Engineer	Paul Gorman	Environmental Engineer	23 October 2025
Revision 3	Philip Waters	Environmental Engineer	Paul Gorman	Environmental Engineer	24 November 2025
Revision 4	Philip Waters	Environmental Engineer	Paul Gorman	Environmental Engineer	18 March 2026

Distribution of Copies

Status	Issued to
Revision 0	Stockland Development Pty Limited
Revision 1	Stockland Development Pty Limited
Revision 3	Stockland Development Pty Limited
Revision 4	Stockland Development Pty Limited

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature		Date
Author		18 March 2026
Reviewer		18 March 2026

FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

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Appendix A: Drawings

Appendix B: About This Report

Appendix C: Borehole Logs and Field Sheets

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Appendix E: Analytical Results Tables

Appendix F: Site Assessment Criteria

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Appendix H: Laboratory Certificates

Appendix I: Quality Assurance and Quality Control

Report on Due Diligence Contamination Testing
Proposed Multi-Use Residential Development
601 Pacific Highway, St Leonards NSW

1. Introduction

This report presents the results of opportunistic contamination testing undertaken by Douglas Partners Pty Ltd (Douglas) for a proposed multi-use development at 601 Pacific Highway, St Leonards NSW (the 'site'). The site is shown on Drawing 1, Appendix A. This due diligence contamination testing report has been prepared by Douglas and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of the SSDA (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site). Further details on the proposed development are provided in Section 3.

The testing was undertaken for Stockland Commercial Property in accordance with Douglas' proposal 86230.01.P.001.Rev2 dated 17 September 2024.

Douglas conducted a geotechnical investigation at the site, reported under separate cover titled *Report on Geotechnical Investigation, Proposed Residential Building, 601 Pacific Highway, St Leonards NSW* (Douglas, 2025). Soil and groundwater samples were taken opportunistically during that investigation and analysed for a range of potential contaminants. The objective of this report on contamination testing was to present the results of sampling and testing against applicable assessment criteria.

This report must be read in conjunction with all appendices.

The following key guidelines were consulted in the preparation of this report:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

2. Background

Stockland Development (Stockland) submitted an EOI for an SSDA and concurrent rezoning proposal on 17th January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19th February 2025, the HDA recommended to the Minister that the applicant's project be declared SSD, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).

A request for SEARs was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This report has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out in the Table 1 below.

Table 1: Secretary's Environmental Assessment Requirements relevant to this report

SEARs	Report Reference (how addressed)
13. Contamination and Remediation In accordance with Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021, assess and quantify and soil and groundwater contamination and demonstrate that the site is suitable (or will be made suitable after remediation) for the development.	Report as a whole presents the results of soil and groundwater testing, demonstrating a low risk of contamination: Section 8: Field and laboratory results. Section 9. Discussion of results. This report will accompany a preliminary site (contamination) investigation report by Golder, and a remediation action plan (RAP) by Douglas, collectively demonstrating that the site can be made suitable for the proposed development through implementation of the RAP. Douglas is also preparing a detailed site investigation (DSI) report which will state that the site can be made suitable for proposed development subject to implementation of the RAP.

3. Proposed development

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NSLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.
- Demolition of the existing 14 storey commercial office building that is currently on the site.
- Site excavation, remediation and other preparatory works.
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m2), comprising:
  - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
  - A contribution of 5% of the residential GFA toward Affordable Housing.
  - Retail and commercial land uses at the ground and podium levels.
  - Internal and external residential amenities provided throughout the building.
  - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
- Vehicular access to the basement via Atchison Street.
- Landscaping and Public Domain works.
- Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

4. Scope of work

The scope of work comprised:

- Recovery of soil samples from the drilling augers at each of the six boreholes constructed as part of Douglas (2025), below the concrete slab, and at regular depth intervals until fill penetration and/or auger refusal; and
- PID screening of soil samples for potential volatiles.
- Dispatch of soil samples to a National Association of Testing Authorities (NATA) accredited laboratory for a combination of commonly encountered contaminants, including:
  - Eight priority heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Total recoverable hydrocarbons (TRH);
  - Benzene, toluene, ethylbenzene and xylenes (BTEX);
  - Total phenols;
  - Organochlorine pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB);
  - Asbestos identification; and
  - Toxicity characteristic leaching procedure (TCLP) testing for metals for preliminary waste classification purposes.
- Sampling of groundwater from three groundwater monitoring wells installed as part of Douglas (2025) using low-flow minimal drawdown sampling methods following collection of stabilised field parameters for pH, temperature, redox, electrical conductivity (EC) and turbidity;
- Dispatch of groundwater samples to a NATA accredited laboratory for the analysis of heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB and VOC testing. QA/QC testing included an intra-laboratory replicate, trip spike and blank;
- Comparison of the analytical data against the applicable assessment criteria published in the national guidelines NEPC (2013), plus any other relevant guidelines; and
- Preparation of this report.

5. Site information

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844 m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400 m (walking distance) from the Crows Nest Metro station.

The site is zoned as E2 – Commercial Centre. The surrounding landscape has combination of commercial E2, MU1 mixed use and both R2 low density and R4 high density residential zoning.

A site aerial and location plan is provided at Figure 1 below.



Figure 1. Site Location and Boundary

Additional site information is presented in (Douglas, 2025).

6. Sampling and analysis plan

6.1 Data quality objectives

The contamination sampling and testing was undertaken with reference to the seven-step data quality objectives (DQO) process which is provided in Appendix B Schedule B2, NEPC (2013). The data quality objective process is outlined in Appendix D.

6.2 Soil sampling

Based on the DQOs the following sampling rationale was adopted.

Borehole locations were selected for geotechnical investigation purposes, and were opportunistically sampled for this contamination assessment. Borehole locations are shown on Drawing 1, in Appendix A.

Soil samples were collected from each borehole (BH101 to BH106) at the surface (or below slab) of the fill and at regular depth intervals or where changes in lithology or signs of contamination were observed. Sampling for contamination testing purposes was carried out to a maximum depth of 1.5 m below ground level (bgl).

At least one sample per borehole in shallow fill was analysed for the full suite of analytes listed in Section 3, and additional samples were tested where fill was deeper, or signs of contamination were noted. Samples were selected from boreholes spread across the site to provide a reasonable overall coverage.

The general sampling methods are described in the fieldwork methodology, included in Appendix G.

6.3 Groundwater sampling

Groundwater was sampled opportunistically from groundwater wells installed at BH01, BH03 and BH06 from essentially the middle of the well's slotted screen section. Well screen details are shown on the borehole logs in Appendix C. Monitoring well locations are shown in Drawing 1, Appendix A.

Laboratory testing included heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, and VOCs to assess general groundwater quality from site contamination and dewatering perspectives.

The general sampling methods are described in the fieldwork methodology, included in Appendix G.

7. Site assessment criteria

The site assessment criteria (SAC) applied in the current investigation are informed by the proposed land use and development intentions which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The investigation and screening levels applied comprise levels adopted for a generic Residential B land use scenario (as an initial conservative screen), notwithstanding that the proposed development is a mixed use with multiple basement levels. The derivation of the SAC is in Appendix F, and the adopted SAC are listed on the summary analytical results tables in Appendix E.

8. Results

8.1 Fieldwork results

8.1.1 Soil

The borehole logs for this assessment are included in Appendix C. The logs recorded the following general sub-surface soil profile.

Pavement:	BH01 and BH02 comprised of a double concrete slab, 250mm and 180mm deep respectively with binding sand separating the layers. BH03-BH06 comprised of a single 150mm thick concrete slab.
Fill:	Fill materials comprised of gravels / sand to maximum depths between 0.25 m and 1.0 m bgl. Sandy clays are observed below this layer maximum depth of between 0.7 m and 2.60 m bgl. BH04 contained no clay layer and consisted of solely gravels / sands to a depth of 0.6 m bgl.
Residual soils:	No residual soil observed.
Ashfield Shale:	Typically, very low to low strength, highly weathered siltstone encountered at depths between 0.6 m and 4.8 m; overlying
Mittagong Formation:	Interbedded and interlaminated siltstone and fine-grained sandstone, of very low to high strength, at depths between 4.05 m and 14.6 m; overlying
Hawkesbury Sandstone:	Medium to coarse grained Hawkesbury Sandstone, encountered at depths of between 12.0 m and 31.5 m, typically medium to high strength. No Hawkesbury sandstone was encountered in BH03, BH05 and BH06.

Visual anthropogenic inclusions were noted in BH05 as “trace PVC fragments”.

No olfactory evidence was observed during the drilling.

8.1.2 Groundwater

Groundwater wells were installed in BH01, BH03 and BH06. Well details are included in the borehole logs in Appendix C and summarised in Table 8 below. Free groundwater was only observed at 25.2 m bgl during auger drilling in borehole BH04, however no well was constructed at this location. The necessary introduction of water to the borehole while wash boring or rock coring precluded any further groundwater observations during drilling.

During groundwater sampling (after well development), groundwater levels were measured at 10.83 m bgl for BH01, 6.73 m bgl for BH03 and 3.4 m bgl for BH06. BH05 (82.4 m AHD, 82.4 m AHD and 81.3 m AHD respectively). It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time.

It is noted that the well construction was designed for geotechnical investigation purposes and therefore may not be ideal to detect free phase product should it be present due to a perched water table.

Table 2: Summary of well installation and groundwater levels

Well ID	Surface Level (RL m AHD)	Standing water level (m bgl)	Standing water level (RL m AHD)	Screened Depth (m bgl)*	Screened geology
BH01	82.4	10.83	71.57	3.1 – 14.8	Siltstone (Ashfield Shale), Interbedded and interlaminated Siltstone with fine grained sandstone (Mittagong Formation) and Sandstone (Hawkesbury Sandstone)
BH03	82.4	6.73	75.67	0.7 – 12.1	Siltstone (Ashfield Shale), Interbedded and interlaminated Siltstone with fine grained sandstone (Mittagong Formation)
BH06	81.3	3.40	77.9	2.00 – 11.05	Siltstone (Ashfield Shale), Interbedded and interlaminated Siltstone with fine grained sandstone (Mittagong Formation)

Notes: *Screened depth in this table refers to the depth range where the slotted well pipe has been installed

Groundwater sampling was carried out after stabilised groundwater readings were obtained for each groundwater well and are presented in Table 3.

Table 3: Stabilised groundwater readings prior to sampling on 28 November 2024

Borehole	Temperature (°C)	Dissolved oxygen (mg/L)	Electrical conductivity (mS/cm)	pH	Redox (mV)	Turbidity
BH01	20.4	1.26	1290	5.07	122.1	335
BH04	20.9	1.07	530	6.29	-31.5	129
BH05	21.1	2.48	620	5.65	118.5	334

8.2 Laboratory analytical results

The results of laboratory analysis are summarised in the following tables in Appendix E:

- Table E1: Summary of Laboratory Results - Soil Site Assessment Results;
- Table E2: Summary of Laboratory Results – Groundwater; and
- Table E3: Summary of Laboratory Results – Preliminary Waste Classification.

The laboratory certificates of analysis together with the chain of custody and sample receipt information are provided in Appendix H.

8.3 Data quality assurance and quality control

The field and laboratory data quality assurance and quality control (QA/QC) procedures and results are summarised in the following Table 4. Reference should be made to the field work methodology and the laboratory results / certificates of analysis for further details. The relative percentage difference (RPD) results, along with the other field QC samples are included in the summary results tables in Appendix I.

Table 4: Field and laboratory quality control

Item	Evaluation / acceptance criteria	Compliance
Analytical laboratories used	NATA accreditation	C
Holding times	Various based on type of analysis	C
Intra-laboratory replicates	10% of primary samples; <30% RPD	PC
Trip spikes	1 per sampling event; 60-140% recovery	C
Trip blanks	1 per sampling event; <PQL	C
Laboratory / reagent blanks	1 per batch; <PQL	C
Laboratory duplicate	1 per lab batch; as laboratory certificate	C
Matrix spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Surrogate spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Control samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Standard operating procedures (SOP)	Adopting SOP for all aspects of the sampling field work	C

Notes:
C = compliance; PC = partial compliance; NC = non-compliance

The RPD results were all within the acceptable range, with the exception of those indicated in Tables QA1 and QA1W in Appendix I. The exceedances are not, however, considered to be of concern given that:

- The actual differences in the concentrations of the replicate pair where the RPD exceedance occurred were typically low;
- The replicate pairs were collected from fill soils which by its nature are heterogeneous; and
- All other QA/QC parameters met the data quality indicators.

In summary, the QC data is determined to be of sufficient quality for the primary analytical results to be considered acceptable for the assessment.

9. Discussion

9.1 Soils

The analytical results for all contaminants tested (heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, and asbestos) in all samples were below the SAC. No asbestos was detected in the analysed samples using the testing method implemented.

9.2 Groundwater

The analytical results for all contaminants tested (heavy metals, TRH, BTEX, PAH, OCP, OPP and PCB) in all samples were below the SAC with the exception of the following:

- Total chromium in samples BH03 (2 µg/L) and BH06 (9 µg/L) which exceeded the ANZG 95% freshwater ecological guideline of 1.0 µg/L;
- Copper in samples BH01 (13 µg/L), BH03 (24 µg/L) and BH06 (36 µg/L) which exceeded the ANZG 95% freshwater ecological guideline of 1.4 µg/L;
- Lead in sample BH06 (8 µg/L), which exceeded the ANZG 95% freshwater ecological guideline of 3.4 µg/L;
- Nickel in samples BH01 (130 µg/L), BH03 (22 µg/L) and BH06 (28 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 11 µg/L;
- Zinc in samples BH01 (270 µg/L), BH03 (59 µg/L) and BH01 (110 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 8 µg/L;
- Dissolved copper in samples BH01 (3.0 µg/L) and BH06 (3.0 µg/L) which exceeded the ANZG 95% freshwater ecological guideline of 1.4 µg/L;
- Dissolved nickel in samples BH01 (100 µg/L), BH03 (17 µg/L) and BH06 (15 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 11 µg/L;
- Dissolved zinc in samples BH01 (120 µg/L), BH03 (28 µg/L) and BH06 (41 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 8 µg/L;
- Bromodichloromethane in sample BH03 (5 µg/L) which has no SAC;
- Dibromochloromethane in sample BH03 (1 µg/L) which has no SAC; and
- The Residential criteria is below the Practical Quantitation Limit (PQL) for additional analytes in the categories of PAHs, OCPs, OPPs, and PCBs. However, it should be noted that the sum of all analytes within each of these categories is below the PQL, indicating no detections have been made in their respective contamination groups.

It is noted also that elevated concentrations of some nutrients, anions and cations were reported for the analysed samples. Whilst these do not constitute contaminants, they will need to be considered for dewatering purposes.

9.3 Preliminary waste classification assessment

9.3.1 Fill soils

To assist with project planning, a preliminary waste classification was undertaking using the data obtained from the soil testing. The preliminary classification for fill at the site was undertaken with reference to NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (NSW EPA, 2014).

Table 5: Six step classification procedure

No.	Item	Comment	Rationale
1.	Is the waste special waste?	No	No ACM, clinical or related waste, or waste tyres were observed in the boreholes.
2.	Is the waste liquid waste?	No	The fill comprised a soil matrix.
3.	Is the waste "pre-classified"?	No	The fill is not pre-classified with reference to NSW EPA (2014).
4.	Does the waste possess hazardous waste characteristics?	No	The fill was not observed to contain or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5.	Determining a wastes classification using chemical assessment.	Conducted	Refer to Table E3, Appendix E.
6.	Is the waste putrescible or non-putrescible? [1]	Non-putrescible	The fill does not contain material that is considered to be putrescible.

Notes:
1. Wastes that are generally not classified as putrescible include soils, timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials (NSW EPA, 2014).

As shown in Table E3, contaminant concentrations for the analysed fill samples exceeded the CT1 criteria for nickel at BH01/0.5-0.6, BH01/1.4-1.5, BH02/0.4-0.5, BH04/0.4-0.5, BH06/0.4-0.5 and total arsenic at BH06/0.4-0.5.

Toxicity characteristics leaching procedure (TCLP) tests were conducted for the analytes exceeding the CT1 thresholds on representative "worst case" samples. The specific contaminant concentration (SCC) and TCLP concentrations for those samples were below the contaminant thresholds SCC1 and TCLP1 for general solid waste, respectively.

Based on the above, all fill soils across the site are preliminarily classified as general solid waste (non putrescible).

This preliminary classification is not to be used for waste disposal. Further work prior to offsite disposal of any excess soil to the development is required before a formal classification suitable for waste disposal can be provided. The waste classification is to be confirmed by a qualified environmental consultant including visual and analytical assessments.

10. Conclusions and recommendations

Based on the field and testing results presented herein, the following comments are made:

- This report presents the results of opportunistic testing of soils and groundwater. It does not constitute a contamination investigation report as defined under NEPC (2013) or the NSW EPA (2020) reporting guidelines;
- The soils within the site, at the tested locations (boreholes) do not exceed the SAC applicable to a Residential B land use;
- The testing focussed on fill soils at the borehole locations. The test results suggest that the fill at the boreholes preliminarily classifies as general solid waste (non putrescible) under the NSW EPA (2014) guidelines;
- Douglas is undertaking a DSI for the site which will capture and supplement the results presented in this report, and will state that the site can be made suitable for the proposed development subject to implementation of a RAP; and
- Groundwater below the site is not considered to present a risk of harm or exposure to occupants and workers at the site. However, given the marginally elevated metals, nutrients, anion and cation concentrations discussed in Section 8.1.2, it is considered likely that some form of pre-treatment will be required to reduce these concentrations prior to disposal of water collected through a dewatering scheme. It is envisaged that would be captured in a dewatering management plan.

11. References

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene*. Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

Douglas. (2025). *Report on Geotechnical Investigation - 601 Pacific Highway, St Leonards, NSW*. Reference 86230.01.R.001.Rev1 Dated 24 October 2025.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

NSW EPA. (2022). *Contaminated Sites, Sampling Design Guidelines*. NSW Environment Protection Authority.

NSW EPA. (2014). *Waste Classification Guidelines, Part 1: Classifying Waste*. NSW Environment Protection Authority.

12. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 601 Pacific Highway, St Leonards NSW in line with Douglas' proposal dated 17/09/2024 and acceptance received from Guy Bell of Stockland Commercial Property dated 19/11/2024. The work was carried out under contract No. CW96547 dated 15/11/2024. This report is provided for the exclusive use of Stockland Commercial Property for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

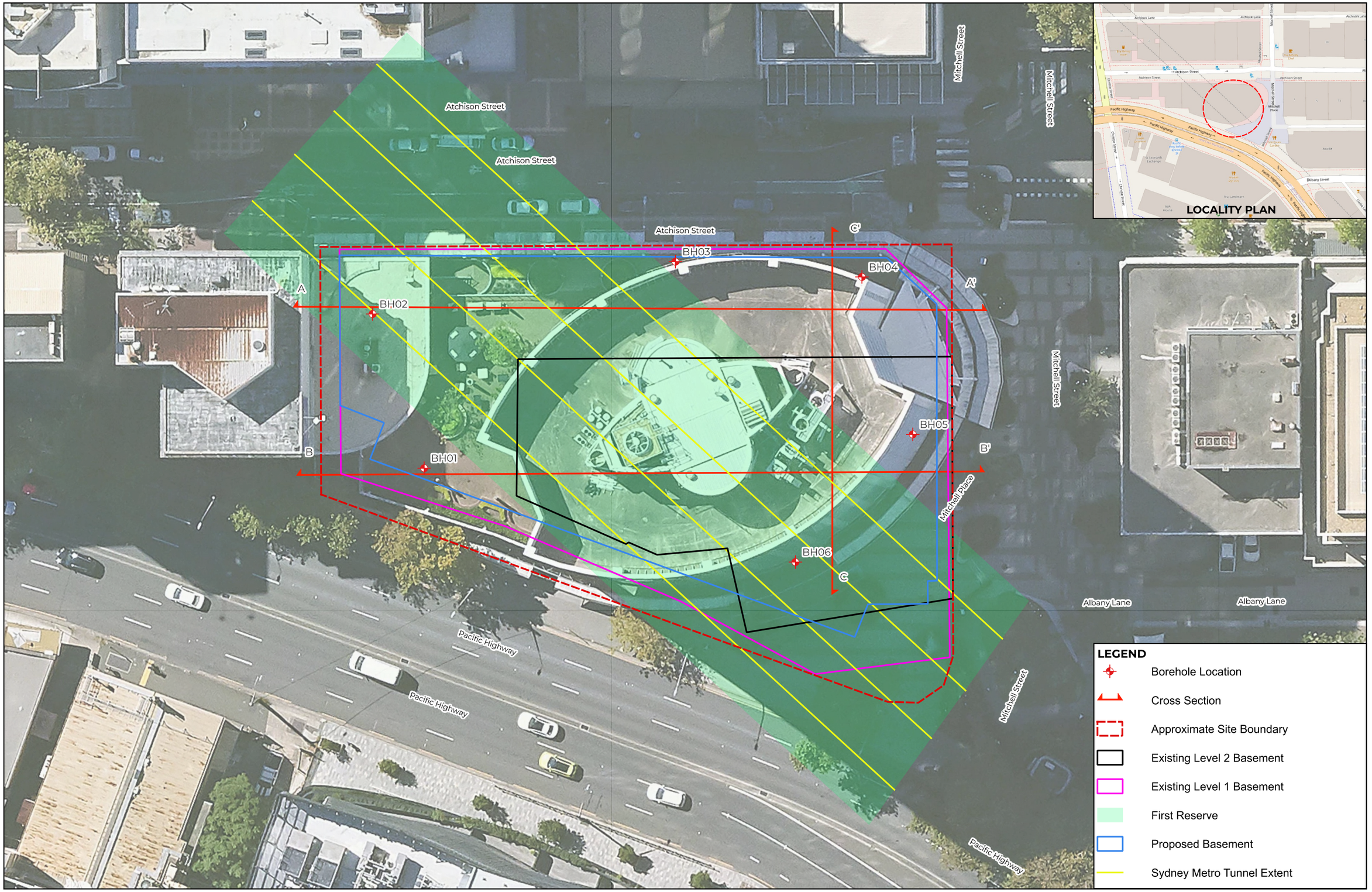
This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope of work for this report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

Appendix A

Drawings



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	15.04.2025	EC

SCALE: 0 4 8 12 16 20 m
1:400 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Stockland Commercial Property

NOTE:
1: Basemap from Metromap (Dated 13.03.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Proposed Commercial Building

PROJECT ADDRESS:
601 Pacific Highway, St Leonards

DRAWING TITLE:
Test Location Plan

PROJECT NO: **86230.01**
DRAWING NO: **1**
REVISION: **0**

Appendix B

About This Report

About this Report

October 2024

Introduction

These notes have been provided to amplify Douglas' report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

Douglas' reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Engagement Terms for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, Douglas will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, Douglas cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, Douglas will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, Douglas requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. Douglas would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index[1] $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	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, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	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 deposition of weathering products in pores.	HW
Moderately weathered	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 but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	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 weathered products in pores.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections > 100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

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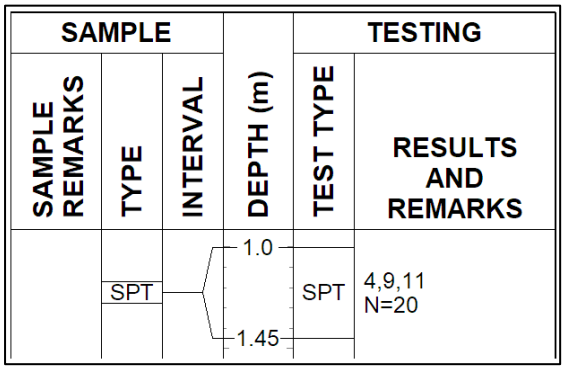
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

October 2024

Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Douglas PARTNERS

Cone Penetration Testing

October 2024

Introduction

The Cone Penetration Test (CPT) is a sophisticated soil profiling test carried out in-situ. A special cone shaped probe is used which is connected to a digital data acquisition system. The cone and adjoining sleeve section contain a series of strain gauges and other transducers which continuously monitor and record various soil parameters as the cone penetrates the soils.

The soil parameters measured depend on the type of cone being used, however they always include the following basic measurements

- Cone tip resistance q_c
- Sleeve friction f_s
- Inclination (from vertical) i
- Depth below ground z

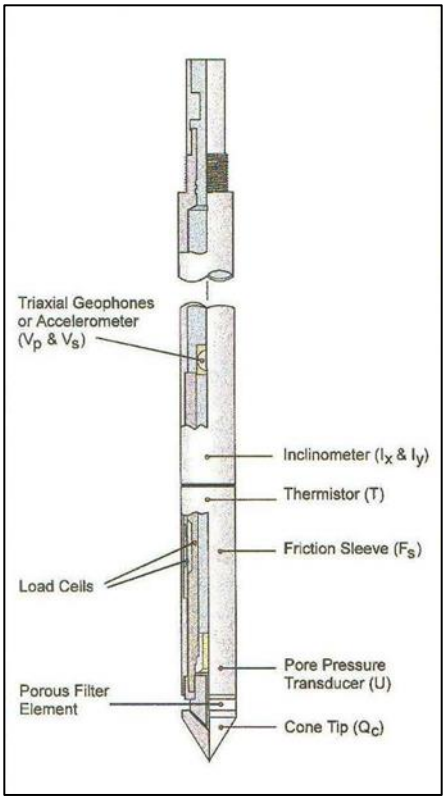


Figure 1: Cone Diagram

The inclinometer in the cone enables the verticality of the test to be confirmed and, if required, the vertical depth can be corrected.

The cone is thrust into the ground at a steady rate of about 20 mm/sec, usually using the hydraulic rams of a purpose built CPT rig, or a drilling rig. The testing is carried out in accordance with the Australian Standard AS1289 Test 6.5.1.



Figure 2: Purpose built CPT rig

The CPT can penetrate most soil types and is particularly suited to alluvial soils, being able to detect fine layering and strength variations. With sufficient thrust the cone can often penetrate a short distance into weathered rock. The cone will usually reach refusal in coarse filling, medium to coarse gravel and on very low strength or better rock. Tests have been successfully completed to more than 60 m.

Types of CPTs

Douglas Partners (and its subsidiary GroundTest) owns and operates the following types of CPT cones:

Type	Measures
Standard	Basic parameters (qc, fs, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (□) plus basic parameters
Seismic	Shear wave velocity (Vs), compression wave velocity (Vp), plus basic parameters

Strata Interpretation

The CPT parameters can be used to infer the Soil Behaviour Type (SBT), based on normalised values of cone resistance (Qt) and friction ratio (Fr). These are used in conjunction with soil classification charts, such as the one below (after Robertson 1990)

Cone Penetration testing

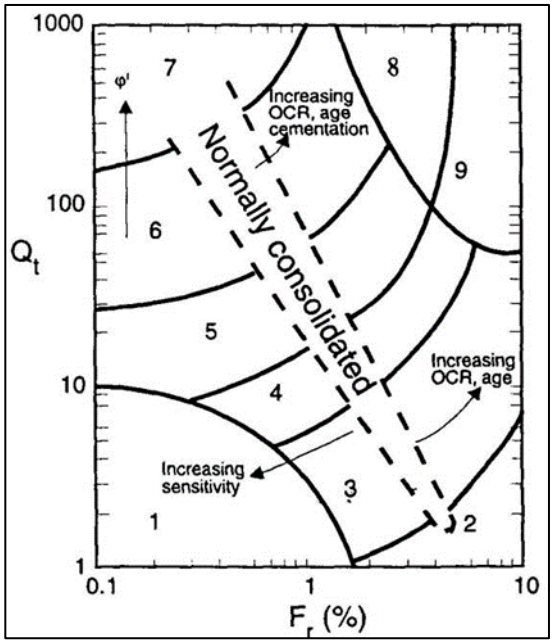


Figure 3: Soil Classification Chart

Douglas' in-house CPT software provides computer aided interpretation of soil strata, generating soil descriptions and strengths for each layer. The software can also produce plots of estimated soil parameters, including modulus, friction angle, relative density, shear strength and over consolidation ratio.

Douglas' CPT software helps our engineers quickly evaluate the critical soil layers and then focus on developing practical solutions for the client's project.

Engineering Applications

There are many uses for CPT data. The main applications are briefly introduced below:

Settlement

CPT provides a continuous profile of soil type and strength, providing an excellent basis for settlement analysis. Soil compressibility can be estimated from cone derived moduli, or known consolidation parameters for the critical layers (eg. from laboratory testing). Further, if pore pressure dissipation tests are undertaken using a piezocone, in-situ consolidation coefficients can be estimated to aid analysis.

Pile Capacity

The cone is, in effect, a small scale pile and, therefore, ideal for direct estimation of pile capacity. Douglas' in-house program ConePile can analyse most pile types and produces pile capacity versus depth plots. The analysis methods are based on proven static theory and empirical studies, taking account of scale effects, pile materials and method of installation.

The results are expressed in limit state format, consistent with the Piling Code AS2159.

Dynamic or Earthquake Analysis

CPT and, in particular, Seismic CPT are suitable for dynamic foundation studies and earthquake response analyses, by profiling the low strain shear modulus G0. Techniques have also been developed relating CPT results to the risk of soil liquefaction.

Other Applications

Other applications of CPT include ground improvement monitoring (testing before and after works), salinity and contaminant plume mapping (conductivity cone), preloading studies and verification of strength gain.

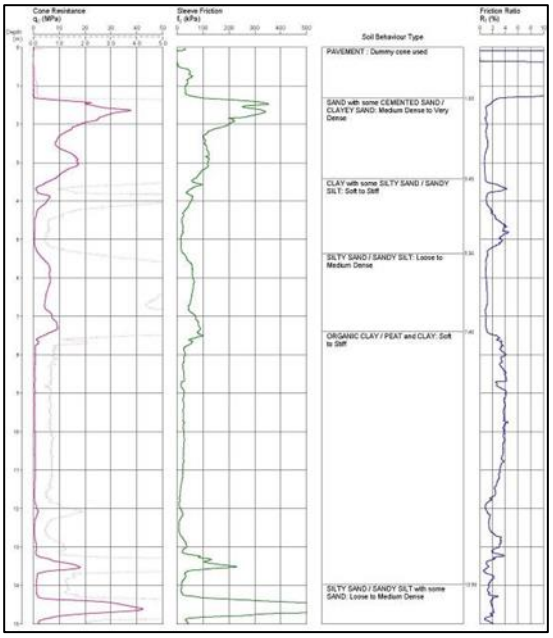


Figure 4: Sample Cone Plot

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Appendix C

Borehole Logs and Field Sheets

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0.25	CONCRETE; reinforcement 8mm, 2 slabs 130mm thick and 90mm thick (low), second slab has no reinforcement observable, 10mm blinding sand separating slabs.		FILL	NA	NA								
		0.35	FILL / GRAVEL: dark grey; fine to medium, angular, igneous.		FILL	PC	w<PL		D		0.40			Bentonite	
									D		0.50				
		1	FILL / CLAY trace sand: dark grey; low to medium plasticity; fine sand.						D		0.90 / 1.00				
	81								D		1.40 / 1.50				
		2	2.00m: very poor compaction						D		1.90 / 2.00				
	80	2.60	Continued as rock log												
		3									3			Gravel	
	79														
		4									4				
	78														
		5									5				
	77														
		6									6				
	76														
		7									7				
	75														
		8									8				
	74														
		9									9				
	73														

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

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Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
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LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW [HW, MW, SW], FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0			Bentonite	
	81	1													1				
	80	2													2				
		2.60	SILTSTONE: dark grey, indistinct, bedded; (horizontal). Ashfield Shale.			2.60		100	100		2.87m: JT, 70°, PR, CN, SM 3.23m: JT, 70°, PR, CN, SM,				3	PLT	PL(A)=0.62MPa		
	79	3						100	100		3.00m: Very minimal water loss				3	PLT	PL(A)=0.78MPa		
		4					M	100	100		3.72m: JT, 70°, PR, CN, SM,				4	PLT	PL(A)=0.65MPa		
	78	4.54													4	PLT	PL(A)=0.62MPa		
		4.54	SANDSTONE: grey, fine to medium grained, indistinct bedding; siltstone ~5 - 10%. Mittagong Formation.		FR						4.09m: JT, 30°, PR, CN, SM,					PLT	PL(A)=0.98MPa		
		5				5.00	L	100	100		4.70m: Water loss ~20%				5	PLT	PL(A)=0.28MPa		
	77					5.60													
		6					H	95	100		5.70m: Water loss ~30-40%				6	PLT	PL(A)=1.1MPa		
	76	6.65														PLT	PL(A)=1.2MPa	Gravel	
		6.70				6.70													
		7					L	100	90		7.30m: Water loss 80-100% recovering to ~40%				7	PLT	PL(A)=1.1MPa		
	75					7.65					7.55-7.65m: B, 5°, PR, CN, RF, x3								
		8					H	100	93		8.03m: B, 10°, PR, CN, RF 8.25m: B, 10°, PR, CN, RF 8.40m: B, 10°, PR, CN, RF				8	PLT	PL(A)=1.6MPa		
	74				FR	8.60					8.62-8.70m: B, 0°, PR, RF, x4								
						8.65													
		9					M	100	100		8.90m: Water loss 60-90% 9.10m: Water loss ~10-20%				9	PLT	PL(A)=0.73MPa		
	73							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, MW, SW, FR; DW)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.2, 0.6, 2.0)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11					M	100	100		10.80m: Water loss ~20-30%				11	PLT	PL(A)=0.76MPa	Gravel	
	71					11.50		100	100							PLT	PL(A)=0.74MPa		
		12.00	SANDSTONE: grey, medium to coarse grained, indistinct bedding. Hawkesbury Sandstone.		FR										12				
	70						H	100	100							PLT	PL(A)=1.1MPa		
	69	13													13	PLT	PL(A)=1.1MPa		
	68	14				14.20		100	100						14				
						14.25	H - VH									PLT	PL(A)=3.1MPa		
	67	15	Borehole discontinued at 14.80m depth. Target depth reached.																
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 2



2.60-7.00 m depth



7.00-12.00 m depth

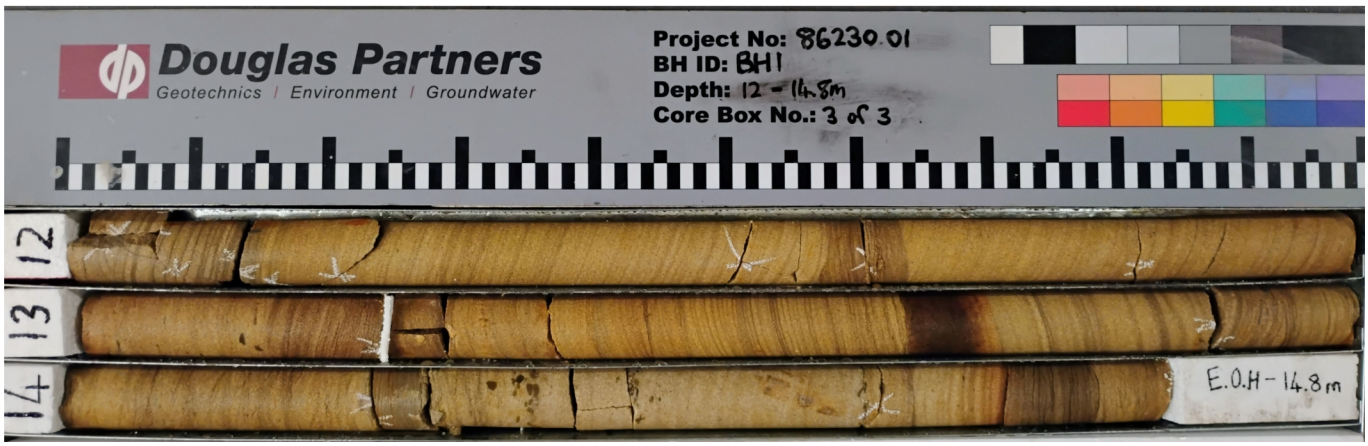
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 2



12.00-14.80 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
28/03/25 No free groundwater observed whilst augering	82	0.18	CONCRETE; 2 layers reinforcement 8mm and 4mm.			NA	NA				0		
		0.40	FILL / Gravelly SAND with clay: brownish-grey; fine to medium; medium, sub-angular, igneous gravel.		FILL	ND	M						
					FILL		D						
		0.90	FILL / Clayey SAND trace gravel: dark grey; fine to medium; low to medium plasticity clay; fine to medium, angular, igneous gravel.		FILL		w<PL						
	81	1.10	FILL / CLAY trace sand trace gravel: dark grey; low to medium plasticity.								1		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 28/03/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
82	0	Continued from soil log												0				
	1	SILTSTONE: dark grey, indistinct bedding. Ashfield Shale.		FR	1.10	L	100	100		1.33m: JT, 40°, PR, CN, SM				1	PLT	PL(A)=0.12MPa		
81	2				2.00		100	100						2	PLT	PL(A)=0.14MPa		
	2.50														PLT	PL(A)=0.32MPa		
80	2.63				2.63					2.50m - 3.60m: Water loss <10%					PLT	PL(A)=0.60MPa		
	3			SW		M	88	100		3.27m: JT, 45°, PR, CN, SM				3	PLT	PL(A)=0.66MPa		
79	4						100	100		3.90m: CZ, 0°, PR, Clay, SM, ~5mm 4.25m: CZ, 0°, PR, Clay, SM, ~5mm 4.62-4.67m: CZ, 5°, PR, Clay				4	PLT	PL(A)=0.87MPa PL(A)=0.54MPa		
78	4.72	SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation. 5.50m-5.80m: rip up clasts			5.30										PLT	PL(A)=0.48MPa		
77	5			FR										5	PLT	PL(A)=0.37MPa		
	6				6.00	H	100	100						6	PLT	PL(A)=1.2MPa		
76	7				7.60	M	100	100						7	PLT	PL(A)=1.3MPa		
75	8				8.05					8.56m: CZ, 20mm				8	PLT	PL(A)=1.4MPa		
74	9					H	100	90						9	PLT	PL(A)=1.1MPa		
73							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72		[CONT] SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.			10.00	M												
		11				10.40		100	100		10.60m CZ, 20mm				11				
	71										11.10m - 14.10m: Water loss <10%					PLT	PL(A)=0.49MPa		
		12			FR			100	100						12	PLT	PL(A)=1.4MPa		
	70						H									PLT	PL(A)=1.8MPa		
		13													13				
	69	13.37	SANDSTONE: pale grey, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					87	87							PLT	PL(A)=1.1MPa		
		13.90													14				
	68		Borehole discontinued at 14.10m depth. Target depth reached.																
		15																	
	67																		
		16																	
	66																		
		17																	
	65																		
		18																	
	64																		
		19																	
	63																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 2



10.00-14.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick.			NA			D	0.15 to 0.20	0.15			Bentonite	
		0.25	FILL / Gravelly SAND: yellow and grey; medium; fine to coarse, igneous, concrete gravel.		FILL	ND	w<PL		D	0.40 to 0.50	0.20				
		0.70	FILL / Sandy CLAY trace gravel: dark grey; low to medium plasticity; fine to coarse sand; fine gravel; shale.		FILL						0.50				
	81	1	Continued as rock log								1				
	80	2									2				
	79	3									3				
	78	4									4				
	77	5									5			Sand	
	76	6									6				
	75	7									7				
	74	8									8				
	73	9									9				

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0	Continued from soil log																
	81	1	SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.		SW	0.70 1.00		100	100		0.75m: JT, 35°, PR, SN Fe 0.92m: JT, 85°, PR, SN Fe 0.70m - 1.80m: Water loss <10%				1	PLT	PL(A)=1.3MPa		
	80	2						100	100						2	PLT	PL(A)=0.80MPa		
	79	3						100	100						3	PLT	PL(A)=0.61MPa		
	78	4					M H	100	100		3.30m - 4.00m: Water loss ~10% 4.13-4.15m: CZ, 0°, PR, SN Clay		SPT		3.30	PLT	PL(A)=0.91MPa		
	77	4.80 5	SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding. Mittagong Formation.		FR			100	100						3.75	PLT	PL(A)=0.70MPa		
	76	6						100	100		6.08m: B, ~5°, PR, CN, RF 6.49m: JT, 15°, PR, CN, RF				4	PLT	PL(A)=0.67MPa		
	75	7				7.00	H	100	90		7.28m: B, 10°, PR, RF 7.30m: B, 5°, PR, HE 7.35m: B, 50°, PR Clay 6 mm 7.41m: B, ~20°, UN, RF 7.50m: JT, 70°, PR, HE 7.62m: JT, 85°, UN, HE 7.75m: JT, 20°, UN, Clay, ~5mm				4.75	PLT	PL(A)=0.67MPa		
	74	8						100	100		8.46m: B, 5°, ST, Clay, ~2 mm 8.79m: JT, 70°, PR, CN, RF				5 5.20	PLT	PL(A)=0.86MPa	Sand	
	73	9				9.40	M	100	84		9.45m: JT, 80-90°, CU, Clay, 1-3mm 9.60m: B, ~50°, PR, Clay, PO, 1-2mm				6	PLT	PL(A)=1.1MPa		
															7	PLT	PL(A)=0.77MPa		
															8	PLT	PL(A)=2.4MPa		
															9	PLT	PL(A)=1.5MPa		
																PLT	PL(A)=0.37MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding. Mittagong Formation.		FR		M	100	84						11	PLT	PL(A)=0.92MPa	Sand	
	71							100	100		11.55m: JT, 40°, PR, VNR Clay, RF 11.63m: CS, 30mm					PLT	PL(A)=0.84MPa		
		12									12.06m: JT, 80°, PR, CN, SM				12				
	70		Borehole discontinued at 12.10m depth. Target depth reached.																
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 2



0.70-5.00 m depth



5.00-10.00 m depth

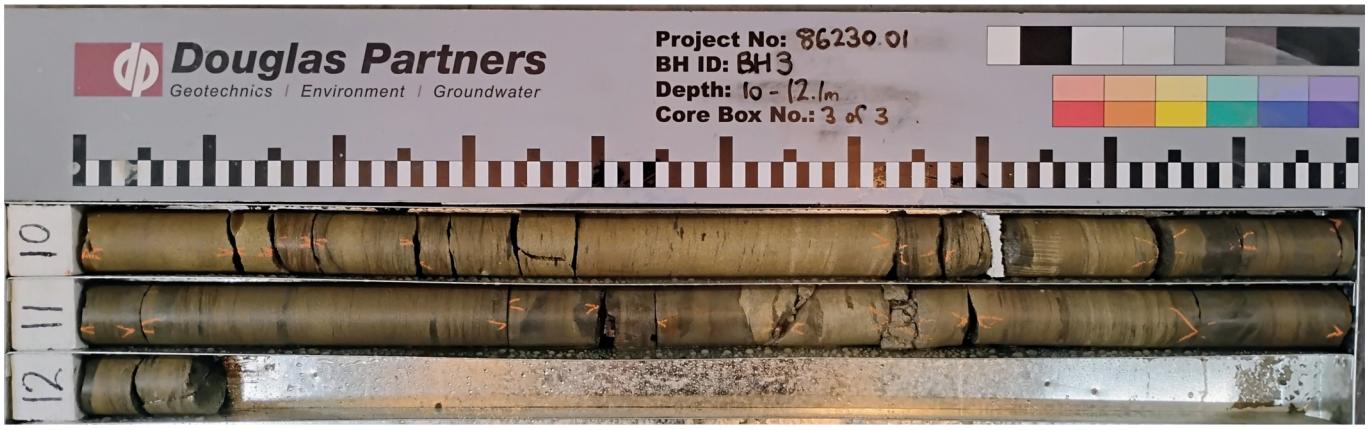
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 2



10.00-12.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 5

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
07/04/25 Water level measured at 25.2m BGL.		0.15	CONCRETE; 150mm thick; one layer bidirectional reinforcement (SL82).			NA	NA				0.15		
	82	0.23	FILL / SAND: grey; medium.		FILL	ND	M		D		0.20		
		0.60	FILL / Sandy GRAVEL: dark grey; fine to medium, sub-angular, igneous; fine to coarse sand.				M / W		D		0.40 0.50		
		1	Continued as rock log								1		
	81												
		2									2		
	80												
		3									3		
	79												
		4									4		
	78												
		5									5		
	77												
		6									6		
	76												
		7									7		
	75												
		8									8		
	74												
		9									9		
	73												

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
07/04/25 Water level measured at 25.2m BGL.	82	0	Continued from soil log												0	PLT	PL(A)=1.1MPa		
			SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			0.60		100	100							PLT	PL(A)=1.0MPa		
	81	1													1				
		2					H	100	100		1.91m: JT, 50°, PR, CN, SM				2	PLT	PL(A)=1.2MPa		
	80															PLT	PL(A)=0.68MPa		
		3									2.86m: JT, 60°, PR, CN, SM				3	PLT	PL(A)=0.75MPa		
						3.40		100	100							PLT	PL(A)=1.3MPa		
	79	4					M				3.70m: Water loss 10-20%				4	PLT	PL(A)=0.56MPa		
	4.15		SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.			4.10	L				4.15m: JT, ~70°, PR, CN, RF					PLT	PL(A)=0.22MPa		
						4.20		100	100		4.20m: Water loss <10%					PLT	PL(A)=0.85MPa		
	78	5													5				
					FR		H	100	100							PLT	PL(A)=1.2MPa		
	77	6													6				
								100	99		6.70m - 8.20m: Water loss 10%					PLT	PL(A)=1.7MPa		
	76	7				7.50	L				7.60m: JT, 70°, CU, CN, RF				7				
						7.90	M				7.66m: B, 0°, PR, RF 7.68m: B, 0°, PR, RF					PLT	PL(A)=0.13MPa		
	75	8				8.10									8				
							H									PLT	PL(A)=2.2MPa		
	74	9				9.00		100	87		8.72-8.92m: B, 0-10°, PR, RF, 7x				9				
							M				9.00-9.70m: JT, 85°, CU, CN, RF								
	73					9.90		100	100							PLT	PL(A)=0.73MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10.00	SANDSTONE: grey, pale grey, and pale brown, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.					100	100						11	PLT	PL(A)=1.1MPa		
	71	11														PLT	PL(A)=0.99MPa		
	70	12						100	100						12	PLT	PL(A)=0.83MPa		
	69	13					M - H	100	100						13	PLT	PL(A)=0.89MPa		
		13.05	SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.								13.81m: B, 5-10°, PR, VNR Clay, RF								
	68	14	From 14.30m: pale grey					100	92						14	PLT	PL(A)=0.80MPa		
	67	15			FR										15	PLT	PL(A)=0.73MPa		
											15.54m: B, 0°, PR, VNR Clay, RF 15.67m: B, 10°, PR, VNR, RF								
	66	16						100	100						16	PLT	PL(A)=1.1MPa		
	65	17				17.00		100	100						17	PLT	PL(A)=1.3MPa		
	64	18					H								18	PLT	PL(A)=1.0MPa		
	63	19						100	100		19.57m: B, 10°, PR, RF, iron clay 19.80m: Water loss ~20%				19	PLT	PL(A)=1.1MPa		
								100	100										

NOTES: [H] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	62	20	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		20.77m: CS, 10mm				20	PLT	PL(A)=1.0MPa		
	61	21									21.20m: B, ~5°, PR, Clay 2mm, RF				21	PLT	PL(A)=1.3MPa		
											21.40m: Water loss ~10%								
	60	22						100	100						22	PLT	PL(A)=1.1MPa		
	59	23					H	100	100						23	PLT	PL(A)=1.6MPa		
	58	24						100	100						24	PLT	PL(A)=1.5MPa		
	57	25			FR			100	100						25	PLT	PL(A)=1.7MPa		
	56	26				26.50	L	100	92		26.12m: JT, 90°, UN, CN, RF 26.20m: B, 5-10°, PR, Clay, RF, 3-4mm 26.26m: B, 0°, PR, Clay, RF, 1-2mm 26.57m: B, 15°, PR, Clay 1mm, RF 26.70m: B, 0°, PR, Clay 5mm, RF 26.75m: B, 0°, PR, Clay, RF, 1-2mm				26	PLT	PL(A)=0.34MPa		
	55	27				26.90					26.00m - 27.40m: Water loss 25%				27	PLT	PL(A)=0.59MPa		
	54	28					M	100	90		27.75m: CS, 10°, PR, Clay 40mm, RF 28.08m: CS, Clay 15mm 28.20m: JT, 20°, PR, Clay 4mm, RF 28.25m: B, 0°, PR, Clay, RF, 2-4mm				28	PLT	PL(A)=0.32MPa		
	53	29				29.50	M	100	76		28.70m: JT, 15°, PR, Clay 4mm, RF 28.94m: JT, 20°, PR, VNR Clay, RF 29.04-29.30m: B, 5°, PR, VNR, RF 29.36m: JT, 70°, PR, CN, RF 29.40m: JT, 15°, PR, VNR, RF 29.57-29.67m: CZ, 10°, PR 29.82m: JT, 5°, UN, VNR				29	PLT	PL(A)=0.43MPa		
																PLT	PL(A)=0.29MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 5 of 5

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	52	30	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.		FR	30.00	H	100	90		Clay, RF, 29.92m: JT, 25°, PR, Clay 6mm, RF 29.98m: JT, 15°, PR, Clay, RF, ~2mm 30.10m: Water loss 25% 30.29m: B, 5°, PR, Clay, RF, 2-4mm 30.34-30.39m: B, ~10°, UN, Clay, RF, 4-6mm 30.45m: B, 15°, UN, Clay, RF, ~2mm 30.48m: B, 10°, PR, Clay, RF, ~3mm				31	PLT	PL(A)=0.95MPa PL(A)=1.2MPa		
	51	31	Borehole discontinued at 31.50m depth.																	
	50	32																		
	49	33																		
	48	34																		
	47	35																		
	46	36																		
	45	37																		
	44	38																		
	43	39																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 4



0.60-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 4



10.00-15.00 m depth



15.00-20.00 m depth

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CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 4



20.00-25.00 m depth



25.00-30.00 m depth

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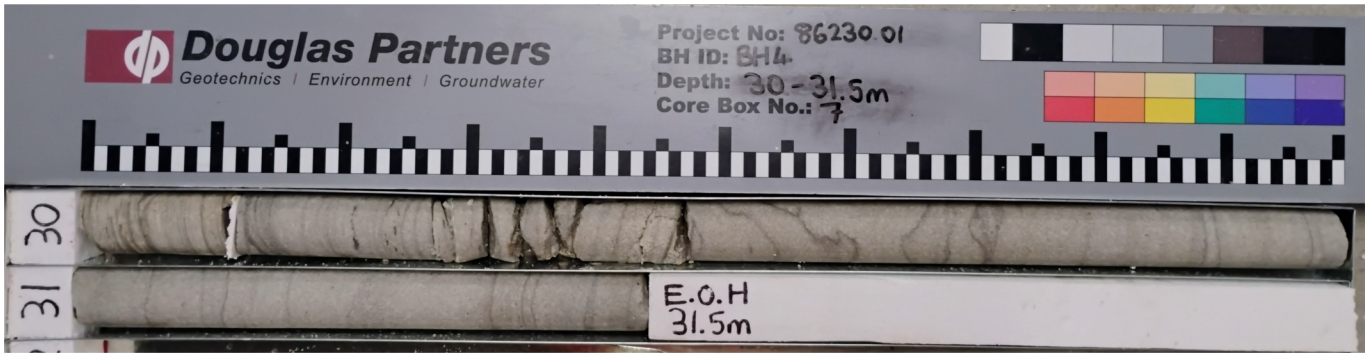
CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 4



30.00-31.50 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick; one layer reinforcement 8mm (SL82).			NA	NA		D		0.15 0.20		
		0.25			FILL								
		0.30	FILL / SAND: yellow-grey; medium.						D		0.40 0.50		
			FILL / GRAVEL: grey; fine to medium, sub-angular, igneous.		FILL	ND	M						
	81	1 1.10	FILL / Sandy CLAY trace gravel: grey; low to medium plasticity; fine sand; fine, angular, siltstone gravel; trace PVC fragments.						D		0.90 1.00		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW, PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	82	0													0				
	81	1	Continued from soil log			1.10									1				
		1.25	SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			1.25	M	81	81		1.80m: JT, 70°, PR, VNR M, SM,					PLT	PL(A)=0.77MPa		
	80	2				2.20	VL	100	80		1.90m - 3.00m: Water loss ~10%				2	PLT	PL(A)=1.5MPa		
						2.30	M - H				2.20-2.30m: CZ, M, fine to medium					PLT	PL(A)=2.3MPa		
	79	3				3.43	VL	100	60		2.76m: JT, 50-60°, PR, VNR M, SM 2.83m: JT, 50-60°, PR, VNR M, SM 2.88m: JT, 50-60°, PR, VNR M, SM 3.05-3.10m: CZ, M, medium 3.36m: B, PR, M, SM, fine to course				3	PLT	PL(A)=0.35MPa		
						3.65	L - M				3.43-3.65m: CZ, M, fine to course					PLT	PL(A)=0.16MPa		
						3.90	VL				3.75-3.78m: CZ, M, fine to course gravel					PLT	PL(A)=0.66MPa		
	78	4				4.00	L - M				4.30m - 5.90m: Water loss <10%				4	PLT	PL(A)=0.39MPa		
		4.75	SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.			4.71					3.90-4.00m: CZ, 6°, M, fine to medium					PLT	PL(A)=0.13MPa		
	77	5						100	86		4.09m: B, 0°, PR, M, 4mm 4.45m: JT, 35°, PR, VNR M, SM 4.53m: B, 0°, PR, M, SM, 1-2mm 4.67m: B, PR, M, SM, ~2mm 4.71m: B, PR, M, SM, ~2mm				5	PLT	PL(A)=1.0MPa		
				FR							5.90m - 7.50m: Water loss ~10%								
	76	6						100	100		4.74m: B, PR, M, SM, ~2mm 4.77m: B, PR, M, SM, ~2mm 5.33m: B, 5°, PR, SM 6.30m: JT, 70°, PR, CN, RF 6.56m: JT, 70°, PR, CN, RF 6.60m: B, 0°, PR, SM 6.82m: JT, 70°, PR, CN, RF 6.94m: B, 10°, PR, SM				6	PLT	PL(A)=0.69MPa		
	75	7					M - H				7.40m: B, 10°, PR, SM				7	PLT	PL(A)=1.4MPa		
	74	8						100	100						8	PLT	PL(A)=1.6MPa		
	73	9						100	100		9.23m: B, 5°, PR, SM				9	PLT	PL(A)=0.90MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.		FR	12.20	M-H	100	100		10.30m: No drilling muds, water loss ~20%				11	PLT	PL(A)=1.9MPa		
	71							100	92		10.55-1059m: CZ, Clay, coating, infill 6mm 10.66m: B, 15°, PR, Clay 10mm, SM					PLT	PL(A)=0.95MPa		
	70	12									11.57m: B, 10°, PR, M, SM				12				
	69	13				13.20	M	100	100						13	PLT	PL(A)=0.40MPa		
	68	14					H	100	95		13.40m: B, 5°, PR, Clay 1mm, SM 13.45m: JT, 80°, ST, CN, RF				14	PLT	PL(A)=1.0MPa		
											14.55m: B, PR, Clay 11mm					PLT	PL(A)=1.1MPa		
	67	15	Borehole discontinued at 14.60m depth. Target depth reached.																
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
CASING: HWT to 1m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

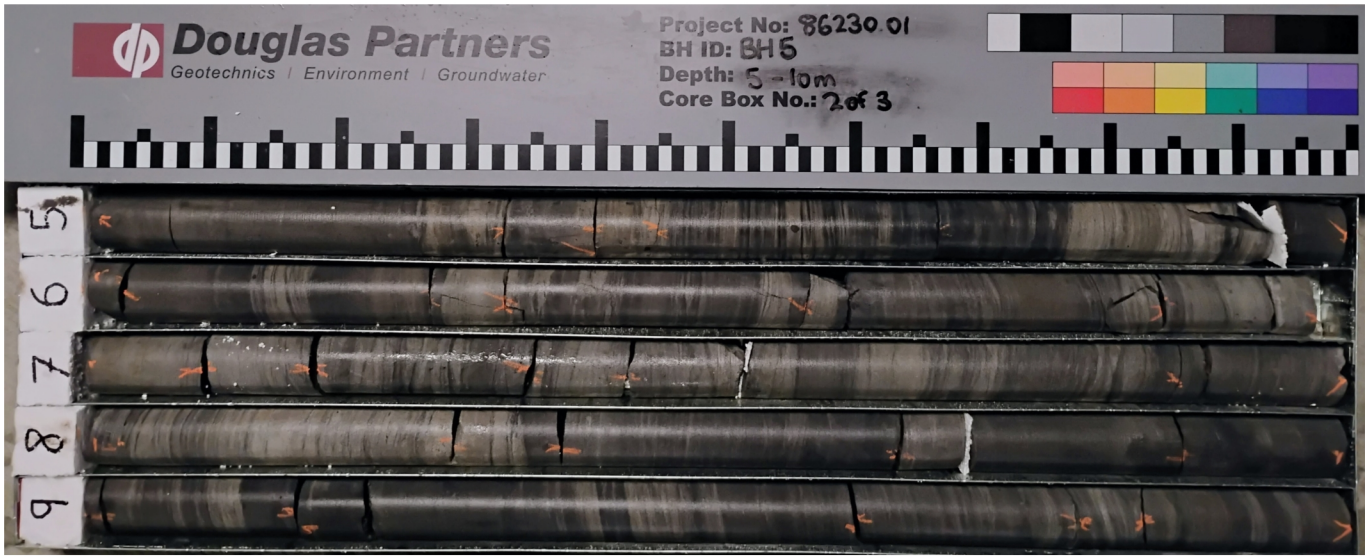
CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 2



10.00-14.60 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0.15	CONCRETE; 150m thick; one layer reinforcement (SL82).			NA	NA				0.15				
		0.25	FILL / SAND: grey-brown; medium.		FILL	ND	M		D		0.25				
		0.50	FILL / Sandy CLAY with gravel: dark grey; low to medium plasticity; fine to coarse sand; fine, siltstone gravel.		FILL		w=PL		D		0.40				
		0.65	SILTSTONE: dark grey. Ashfield Shale.								0.50				
	80	1	Continued as rock log								1			Bentonite	
	79	2									2				
	78	3									3				
	77	4									4				
	76	5									5				
	75	6									6			Sand	
	74	7									7				
	73	8									8				
	72	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 08/04/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS
81	0	Continued from soil log								
		SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			0.65		100	76		0.85m: B, 0°, PR, 1mm, SM, fines 1.15m: JT, 30°, PR, VNR, SM, fines 1.33m: JT, 30°, PR, VNR, SM, fines 1.35m: JT, 70°, PR, CN, SM 1.42m: CZ, 40mm 1.70m: Water loss <10%. no drilling mud added.
80	1						100	100		
79	2					M				
78	3						100	95		3.00m: CZ, 40mm 3.75m: CZ, 20mm 3.98m: CZ, 20mm
77	4				4.50					
	4.05	SANDSTONE: grey and pale grey, fine to medium grained, indistinct, bedded; siltstone laminations and bedding. Mittagong Formation.		FR			100	100		
76	5									
75	6						100	93		6.21m: CZ, 20mm 6.31m: CZ, 20mm
74	7					H				
73	8						100	100		
72	9						100	91		

SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
			0	PLT	PL(A)=0.94MPa	Bentonite	
			1	PLT	PL(A)=1.8MPa		
				PLT	PL(A)=0.72MPa		
			2	PLT	PL(A)=0.95MPa		
				PLT	PL(A)=0.80MPa		
			3	PLT	PL(A)=0.75MPa		
				PLT	PL(A)=0.88MPa		
			4	PLT	PL(A)=0.70MPa		
				PLT	PL(A)=0.93MPa		
			5	PLT	PL(A)=1.0MPa		
						Sand	
			6	PLT	PL(A)=2.0MPa		
				PLT	PL(A)=2.3MPa		
			7	PLT	PL(A)=1.4MPa		
			8				
			9	PLT	PL(A)=1.5MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	71	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, indistinct, bedded; siltstone laminations and bedding. Mittagong Formation.		FR		H	100	91		9.97m: CZ, 80mm 10.10m: B, 10°, PR, Clay 10mm, RF				11	PLT	PL(A)=1.3MPa	Sand	
	70	12	Borehole discontinued at 11.05m depth. Target depth reached.					100	100										
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	
	62																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 1



0.50-5.00 m depth



5.00-11.05 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

Groundwater (GW) Field Sheet

Project and Bore Installation Details						
Project Name / Site Location					Project Number	86230.01
Well Construction Details	Well ID	BH01	Drilling Method		Hole Diameter (m)~	
	Well Depth (m bgl)	14.8	Screened (m bgl)	3.1	Stick Up (m)	
Survey Information	Easting	333081.1	Northing	6255981.1	Elevation RL	82.4 AHD
GW Level During Drilling		m bgl				
Contaminants/Comments						

Well Development Details					
Date / Time / Weather Conditions	10/4/25			Purged By	JDS
Purge Method / Equipment	Twister pump.				
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))		
GW Level (pre-purge)	11.0	m bgl	Observed Well Depth	14.6	m bgl
Height of Water Column (H)	3.6	m bgl	Estimated Bore Volume*	~10L	L
GW Level (post-purge)	N/A	m bgl	Total Volume Purged**	N/A	L
Appearance/Comments	permeability test carried out.				

Sampling Details					
Date / Time / Weather Conditions	17/4/25 2:45 pm Sunny			Sampled By	ZW
Sampling Method / Equipment	Bladder Pump + HDPE, interface Probe				
WQM Model	YSI		WQM Calibration Date	17/4/25	
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))	N	
GW Level (pre-micropurge)	10.83	m bgl	Observed Well Depth	14.63	m bgl
Height of Water Column	3.8	m bgl	Estimated Bore Volume*	~10.64	L
GW Level (post sample)	11.67	m bgl	Total Volume of Micro-Purged	~2.5	L

Water Quality Parameters

Time	Cumulative Volume (L)	Temp (°C)	DO (mg/L)#	EC (µS or mS/cm)	pH	Redox (mV)	Turbidity^
Stabilisation Target (3 readings)		0.2	+/- 10%	+/- 5%	+/- 0.1	+/- 10 mV	+/- 10%
		21.5	3.01	1090	5.20	109	350
		21.1	2.21	~~EE~~ 1152	5.13	113	364
		20.8	1.81	1222	5.07	117.0	360
		20.6	1.71	1244	5.07	111.8	386
		20.4	1.34	1261	5.08	119.8	371
		20.4	1.29	1269	5.07	120.5	354
		20.4	1.26	1290	5.07	122.1	335

Notes: # Considered stabilised if three DO values are less than 0.5 mg/L ^ Considered stabilised if three Turbidity values are less than 5 NTU

Sample Details						
Sampling Depth (rationale)	12	m bgl,	mid WC			
Sample Observations (e.g. colour, sediment, sheen, odour)	P. brown, slightly silty, no sheen or odour.					
Sample ID	BH01					
QAQC Samples	Replicate		Triplicate		Other	
Sample Containers Quantity / Preservation / Filtration	Amber glass		Plastic		PFAS (no teflon)	
	Metals (F/UF) (HNO3)		Phenols/COD/NH3 (H2SO4)		Vials (HCl)	
	Ferrous/Ferric Iron (HCl)		Cyanides/Chromium (NaOH)		Other	
Comments						

*Estimated Well Volume = H * F	Std. Drilling Diameter	NMLC (0.075)	HQ (0.096)	PQ (0.1226)	SFA (0.125)	HFA (0.194)
**Purge Target: min. 3 well volumes	Factor (F):	2.8	3.7	5.2	5.4	11.1

Groundwater (GW) Field Sheet

Project and Bore Installation Details						
Project Name / Site Location					Project Number	86230.01
Well Construction Details	Well ID	BH03	Drilling Method		Hole Diameter (m)~	
	Well Depth (m bgl)	12.1	Screened (m bgl)	0.7	Stick Up (m)	
Survey Information	Easting	333109.1	Northing	6256004.1	Elevation RL	82.4
GW Level During Drilling		m bgl				
Contaminants/Comments						

Well Development Details					
Date / Time / Weather Conditions	10/4/25			Purged By	JDS
Purge Method / Equipment	Twister pump				
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))		
GW Level (pre-purge)	9.0	m bgl	Observed Well Depth	11.0	m bgl
Height of Water Column (H)	2.0	m bgl	Estimated Bore Volume*	~ 5.6	L
GW Level (post-purge)	N/A	m bgl	Total Volume Purged**	N/A	L
Appearance/Comments	Permeability test carried out				

Sampling Details					
Date / Time / Weather Conditions	17/4/25, 1:40 pm, Overcast.			Sampled By	ZW
Sampling Method / Equipment	Bladder Pump + HDPE, Interface probe				
WQM Model	YSI		WQM Calibration Date	17/4/25	
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))	N	
GW Level (pre-micropurge)	6.73	m bgl	Observed Well Depth	10.92	m bgl
Height of Water Column	4.19	m bgl	Estimated Bore Volume*	~ 11.7	L
GW Level (post sample)	7.02	m bgl	Total Volume of Micro-Purged	~ 2.5	L

Water Quality Parameters

Time	Cumulative Volume (L)	Temp (°C)	DO (mg/L)#	EC (µS or mS/cm)	pH	Redox (mV)	Turbidity^
Stabilisation Target (3 readings)		0.2	+/- 10%	+/- 5%	+/- 0.1	+/- 10 mV	+/- 10%
		21.4	2.81	552	6.37	4.0	220
		21.1	2.31	526	6.34	-2.5	223
		21.0	1.95	528	6.32	-10.3	192
		21.0	1.32	530	6.31	-20.1	159
		20.9	1.27	530	6.3	-27.2	146
		20.9	1.1	530	6.29	-29.8	141
		20.9	1.07	530	6.29	-31.5	129
Notes:	# Considered stabilised if three DO values are less than 0.5 mg/L			^ Considered stabilised if three Turbidity values are less than 5 NTU			

Sample Details						
Sampling Depth (rationale)	9	m bgl,	mid WC / screen			
Sample Observations (e.g. colour, sediment, sheen, odour)	p. grey, slightly silty, no sheen or odour					
Sample ID	BH03					
QAQC Samples	Replicate		Triplicate		Other	
Sample Containers Quantity / Preservation / Filtration	Amber glass		Plastic		PFAS (no teflon)	
	Metals (F/UF) (HNO3)		Phenols/COD/NH3 (H2SO4)		Vials (HCl)	
	Ferrous/Ferric Iron (HCl)		Cyanides/Chromium (NaOH)		Other	
Comments						

*Estimated Well Volume = H * F	Std. Drilling Diameter	NMLC (0.075)	HQ (0.096)	PQ (0.1226)	SFA (0.125)	HFA (0.194)
**Purge Target: min. 3 well volumes	Factor (F):	2.8	3.7	5.2	5.4	11.1

Groundwater (GW) Field Sheet

Project and Bore Installation Details						
Project Name / Site Location					Project Number	86230.01
Well Construction Details	Well ID	BH06	Drilling Method		Hole Diameter (m)	
	Well Depth (m bgl)		Screened (m bgl)	2.0	Stick Up (m)	
Survey Information	Easting	333122.5	Northing	6255970.7	Elevation RL	81.3
GW Level During Drilling		m bgl				
Contaminants/Comments						

Well Development Details					
Date / Time / Weather Conditions	10/4/25			Purged By	JDS
Purge Method / Equipment	Twister pump				
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / N)		
GW Level (pre-purge)	3.7	m bgl	Observed Well Depth	10.9	m bgl
Height of Water Column (H)	7.2	m bgl	Estimated Bore Volume*	~20L	L
GW Level (post-purge)	10.5	m bgl	Total Volume Purged**	~20	L
Appearance/Comments	drained with twister pump.				

Sampling Details						
Date / Time / Weather Conditions	17/4/25, 12:45 pm, Overcast			Sampled By	ZW	
Sampling Method / Equipment	Bladder pump TYGON, Interface probe					
WQM Model	YSI		WQM Calibration Date	17/4/25		
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / N)	N		
GW Level (pre-micropurge)	3.4	m bgl	Observed Well Depth	10.85	m bgl	
Height of Water Column	7.45	m bgl	Estimated Bore Volume*	~20	L	
GW Level (post sample)	4.12	m bgl	Total Volume of Micro-Purged	~2.5	L	

Water Quality Parameters

Time	Cumulative Volume (L)	Temp (°C)	DO (mg/L)#	EC (µS or mS/cm)	pH	Redox (mV)	Turbidity^
Stabilisation Target (3 readings)		0.2	+/- 10%	+/- 5%	+/- 0.1	+/- 10 mV	+/- 10%
	0.5	21.5	4.0	623	5.65	129	310
	0.75	21.1	3.02	619	5.66	124.6	323
	1	21.1	2.84	618	5.66	121.3	348
	1.25	21.1	2.60	620	5.66	119.5	342
	2	21.1	2.48	620	5.65	118.5	334
Notes:	# Considered stabilised if three DO values are less than 0.5 mg/L			^ Considered stabilised if three Turbidity values are less than 5 NTU			

Sample Details						
Sampling Depth (rationale)	8	m bgl,	mid WC / Screen			
Sample Observations (e.g. colour, sediment, sheen, odour)	P. brown, slightly silty, no sheen, no odour.					
Sample ID	BH06					
QAQC Samples	Replicate	BD1/250417	Triplicate		Other	
Sample Containers Quantity / Preservation / Filtration	Amber glass		Plastic		PFAS (no teflon)	
	Metals (F/UF) (HNO3)		Phenols/COD/NH3 (H2SO4)		Vials (HCl)	
	Ferrous/Ferric Iron (HCl)		Cyanides/Chromium (NaOH)		Other	
Comments						

*Estimated Well Volume = H * F	Std. Drilling Diameter	NMLC (0.075)	HQ (0.096)	PQ (0.1226)	SFA (0.125)	HFA (0.194)
**Purge Target: min. 3 well volumes	Factor (F):	2.8	3.7	5.2	5.4	11.1

Appendix D

Data Quality Objectives

1. Data quality objectives

The contamination testing has been devised broadly in accordance with the seven-step data quality objectives (DQO) process which is provided in Appendix B, Schedule B2 of NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

Table 1: Data quality objectives

Step	Summary
1: State the problem	The objective of the report on opportunistic contamination testing was to present the results of sampling and testing of soil and groundwater against applicable assessment criteria. The report was prepared for due diligence purposes. The project team consist of experienced environmental engineers and scientists working in the roles of Project Principal, Project Reviewer, Project Manager and field staff.
2: Identify the decisions / goal of the study	The site assessment criteria (SAC) for each of the CoPC are detailed in Appendix F. The decision is to establish whether or not the results fall below the SAC. This is only an indicative due diligence assessment and no analysis into the site's suitability has been derived.
3: Identify the information inputs	Inputs will be the analytical results for the CoPC and media from NATA accredited laboratories and methods, where possible. The SAC for each of the CoPC are detailed in Appendix F. Field results and observations such as observations of building debris, ash, odours, staining etc will be used to inform sample selection for laboratory analysis.
4: Define the study boundaries	The lateral boundaries of the investigation area are shown on Drawing 1, Appendix A. The vertical boundaries are to the depth of the boreholes. The assessment is limited to the timeframe over which the field works were undertaken.
5: Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with the SAC (Appendix F, based on NEPC (2013)). Where guideline values are absent, other sources of guideline values accepted by NEPC (2013) shall be adopted where available and warranted. Where a sample result exceeds the adopted criterion, a further qualitative site-specific assessment will be made as to the risk posed by the presence of that contaminant(s). Initial comparisons will be with individual results then, where appropriate, summary statistics (including mean, standard deviation and 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL)) to further assess potential risks posed by the site contamination. Quality control results are to be assessed according to their relative percent difference (RPD) values. For field duplicates and laboratory results, RPD values should generally be below 30%; for field blanks results should be at or less than the limits of reporting (NEPC, 2013). The field and laboratory quality assurance assessment are included in Appendix E.

Step	Summary
6: Specify the performance or acceptance criteria	Baseline condition: Contaminants at the site and/or statistical analysis of data (in line with NEPC (2013)) exceed the human health and environmental SAC and pose a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the site and statistical analysis of data (in line with NEPC (2013)) comply with the human health and environmental SAC and therefore, do not pose a potentially unacceptable risk to receptors (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it will be assumed that the baseline condition is true.
7: Optimise the design for obtaining data	The design was not optimised and was based only on opportunistic sampling and testing. Further details regarding the sampling plan are in Section 5.

2. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix E

Analytical Results Tables

Table E1: Summary of Laboratory Results – Priority metals, Priority PAH, Priority TRH, BTEX

			Priority metals								Priority PAH				Priority TRH						BTEX			
			Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes
		PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	25	50	25	50	100	100	0.2	0.5	1	1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	**6**	**0.9**	**6**	**41**	**18**	<0.1	**45**	**370**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BD1/20250325	0 m	25/03/25	**5**	**0.6**	**7**	**41**	**15**	<0.1	**51**	**260**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH01	1.4 - 1.5 m	25/03/25	**11**	**0.5**	**4**	**37**	**20**	<0.1	**55**	**260**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	NL -	- -	4 -	400 -	- -	- -	70 -	240 -	- -	- -	0.5 -	220 -	NL -	60 -
BH02	0.13 - 0.2 m	25/03/25	<4	<0.4	**4**	**15**	**3**	<0.1	**27**	**18**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH02	0.4 - 0.5 m	25/03/25	<4	<0.4	**5**	**24**	**2**	<0.1	**62**	**27**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH03	0.4 - 0.5 m	25/03/25	**11**	<0.4	**9**	**38**	**22**	<0.1	**36**	**190**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	**120**	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH04	0.4 - 0.5 m	25/03/25	**4**	<0.4	**13**	**40**	**11**	<0.1	**47**	**130**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05	0.15 - 0.2 m	25/03/25	<4	<0.4	**2**	**5**	**2**	<0.1	**1**	**3**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05	0.4 - 0.5 m	25/03/25	<4	<0.4	**9**	**27**	**16**	<0.1	**25**	**78**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05	0.9 - 1 m	25/03/25	**5**	<0.4	**8**	**41**	**22**	<0.1	**28**	**110**	<1	<0.05	<0.5	<0.05	<25	**56**	<25	**56**	**130**	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06	0.4 - 0.5 m	25/03/25	**170**	<0.4	**6**	**25**	**30**	**0.2**	**63**	**62**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	<4	<0.4	**5**	**46**	**4**	<0.1	**59**	**49**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	**100**	<0.4	**6**	**23**	**17**	**0.1**	**45**	**60**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Lab result

HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level EGV = Environmental Guideline Value ML = Management Limit DC = Direct Contact HSL

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential B with minimal opportunities for soil access

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

HIL	HIL-B (NEPC, 2013 or HEPA, 2025 (PFAS only))	ML	Residential, Parkland and Public Open Space (NEPC, 2013)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)		
DC	Direct contact HSL B Residential (High density) (CRC CARE, 2011)		

Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		Metals								Metals - Dissolved								TRH				BTEX					
		Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes
	PQL	1	0.1	1	1	1	0.05	1	1	1	0.1	1	1	1	0.05	1	1	10	50	100	100	1	1	1	1	2	1
ANZG (2018) 95% LOP Fresh		13	0.2	1	1.4	3.4	**0.06**	11	8	13	0.2	1	1.4	3.4	**0.06**	11	8					950	180	80	350	75	
NEPC (2013) HSL 2-4m																		1000	1000			800	NL	NL			NL
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	**3**	<0.1	<1	**13**	**2**	<0.05	**130**	**270**	<1	<0.1	<1	**3**	<1	<0.05	**100**	**120**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1
BH03	17/04/25	**6**	<0.1	**2**	**24**	**2**	<0.05	**22**	**59**	**2**	<0.1	<1	<1	<1	<0.05	**17**	**28**	**30**	<50	<100	<100	<1	<1	<1	<1	<2	<1
BH06	17/04/25	**5**	<0.1	**9**	**36**	**8**	<0.05	**28**	**110**	<1	<0.1	<1	**3**	<1	<0.05	**15**	**41**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1
BD1/250417	17/04/25	**6**	<0.1	**11**	**33**	**10**	<0.05	**33**	**100**	-	-	-	-	-	-	-	-	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1

Notes:

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- * QA/QC replicate of sample listed directly below the primary sample
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Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		PAH																									
		Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (BaP)	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	Sum of detected PAH	DDE	DDT	DDD	Aldrin	Dieldrin	Aldrin + Dieldrin (calculated)	alpha-chlordane	gamma-Chlordane	Endosulfan I	Endosulfan II
	PQL	0.1	0.1	0.1	0.1	1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh				**0.01**		16	**0.1**					**1**			**0.6**				**0.006**		**<u>0.001</u>**	**<u>0.01</u>**					
NEPC (2013) HSL 2-4m						NL																					
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH03	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH06	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/250417	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		OCP													OPP																	
		Endosulfan Sulphate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Methoxychlor	Mirex	alpha-BHC	beta-BHC	delta-BHC	Lindane	Sum of detected OCP	Azinphos methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Ronnel (fenchlorphos)	Fenitrothion	Fenthion	Malathion	Parathion	Parathion-methyl	Methidathion	Fenamiphos	Sum of detected OPP
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh			**0.01**		**0.01**		0.1	**0.005**	**0.04**				0.2		0.02		**0.00004**		0.01		0.15			0.2		0.05	0.004				
NEPC (2013) HSL 2-4m																																
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH03	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

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Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		PCB																																
		Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arodor 1260	Sum of detected PCB	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,2-trichloroethane	1,1,2-trichloroethylene	1,1-dichloroethane	1,1-Dichloroethene	1,2-dichloropropane	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethyl benzene	1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3,5-trimethyl benzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-chlorotoluene
	PQL	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ANZG (2018) 95% LOP Fresh					**0.3**		**0.01**				270	400	70	6,500	330		700		**3**		**85**			160	1,900	900		260	1,100	60		
NEPC (2013) HSL 2-4m																																		
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH03	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH06	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BD1/250417	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		VOC (excluding BTEX)																														
		4-chlorotoluene	4-isopropyl toluene	Bromobenzene	Bromochloromethane	Bromodichloroethane	Bromoform	carbon tetrachloride	Chloroethane	Vinyl Chloride	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Isopropylbenzene (cumene)	Cyclohexane	dibromochloroethane	Dibromomethane	Dichlorodifluoromethane	1,2-dibromoethane	hexachlorobutadiene	Bromomethane	Monochlorobenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene (vinylbenzene)	Tert-butyl benzene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane	Sum of detected VOC
	PQL	1	1	1	1	1	1	1	10	10	1	10	1	1	1	1	1	1	10	1	1	10	1	1	1	1	1	1	1	1	10	1
ANZG (2018) 95% LOP Fresh								240		100	770				30								55									
NEPC (2013) HSL 2-4m																																
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<1	<1	<1	<1	<1	<1	<1	<10	<10	**3**	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**3**
BH03	17/04/25	<1	<1	<1	<1	**5**	<1	<1	<10	<10	**32**	<10	<1	<1	<1	<1	<1	**1**	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**38**
BH06	17/04/25	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
BD1/250417	17/04/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- No criterion / not defined / not tested / not applicable
- * QA/QC replicate of sample listed directly below the primary sample
- NL Not limiting
- PQL Practical quantitation limit

Shaded cell is exceedance of guideline value

Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection

Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.

ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic

ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered

ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		Nutrients								Anions & Cations	
		Nitrogen	Ammonia as N	TKN in water	Nitrate as N	Nitrite as N	NOx as N	Organic Nitrogen as N	Phosphorous	Chloride	Sulphate
	PQL	100	5	100	5	5	5	200	50	1000	1000
ANZG (2018) 95% LOP Fresh			900		1,100						
NEPC (2013) HSL 2-4m											
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	**100**	**12**	**100**	<5	<5	<5	<200	<50	**250,000**	**120,000**
BH03	17/04/25	**300**	<5	**300**	<5	<5	<5	**300**	**60**	**56,000**	**55,000**
BH06	17/04/25	**100**	**12**	**100**	<5	<5	<5	<200	**2,900**	**66,000**	**71,000**
BD1/250417	17/04/25	-	-	-	-	-	-	-	-	-	-

Notes:

-	No criterion / not defined / not tested / not applicable
*	QA/QC replicate of sample listed directly below the primary sample
NL	Not limiting
PQL	Practical quantitation limit
	Shaded cell is exceedance of guideline value
	Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded
	NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]
	ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection
	Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.
	ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic
	ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered
	ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table E3: Summary of Laboratory Results – Waste Classification

			Metals								TRH		BTEX				PAH		Phenols	OCP				
			Total Arsenic	TCLP Total Arsenic	Cadmium	Total Chromium	Lead	Mercury (inorganic)	Nickel	TCLP Nickel	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo(a)pyrene (B(a)P)	Total PAH	Total Phenolics	Scheduled Chemical Waste (standard)	Chlordane	Total Endosulfan	Total Analysed OCP	Mirex
		PQL	4	0.05	0.4	1	1	0.1	1	0.02	25	50	0.2	0.5	1	1	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Sample ID	Depth	Sample Date	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	**6**	-	**0.9**	**6**	**18**	<0.1	**45**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/20250325	0 m	25/03/25	**5**	-	**0.6**	**7**	**15**	<0.1	**51**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	**11**	-	**0.5**	**4**	**20**	<0.1	**55**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH02	0.13 - 0.2 m	25/03/25	<4	-	<0.4	**4**	**3**	<0.1	**27**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH02	0.4 - 0.5 m	25/03/25	<4	-	<0.4	**5**	**2**	<0.1	**62**	**0.07**	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	0.4 - 0.5 m	25/03/25	**11**	-	<0.4	**9**	**22**	<0.1	**36**	-	<25	**110**	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH04	0.4 - 0.5 m	25/03/25	**4**	-	<0.4	**13**	**11**	<0.1	**47**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	0.15 - 0.2 m	25/03/25	<4	-	<0.4	**2**	**2**	<0.1	**1**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH05	0.4 - 0.5 m	25/03/25	<4	-	<0.4	**9**	**16**	<0.1	**25**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	0.9 - 1 m	25/03/25	**5**	-	<0.4	**8**	**22**	<0.1	**28**	-	<25	**140**	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06	0.4 - 0.5 m	25/03/25	**170**	<0.05	<0.4	**6**	**30**	**0.2**	**63**	**0.2**	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	<4	-	<0.4	**5**	**4**	<0.1	**59**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	**100**	-	<0.4	**6**	**17**	**0.1**	**45**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Summary Statistics																								
Min			4	0.05	0.4	2	2	0.1	1	0.07	25	50	0.2	0.5	1	1	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Max			170	0.05	0.9	13	30	0.2	63	0.2	25	140	88	87	88	177	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Mean			26	0.05	0.5	6	14	0.1	42	0.14	25	64	7	7.2	8	15	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Waste Classification Criteria [f]																								
CT1			100	-	20	100	100	4	40	-	-	10,000	10	288	600	1000	0.8	200	288	<50	-	60	-	-
SCC1			500	-	100	1,900	1,500	50	1,050	-	-	10,000	18	518	1,080	1,800	10	200	518	<50	-	108	-	-
TCLP1			-	5	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2			400	-	80	400	400	16	160	-	-	40,000	40	1,152	2,400	4,000	3.2	800	1,152	<50	-	240	-	-
SCC2			2,000	-	400	7,600	6,000	200	4,200	-	-	40,000	72	2,073	4,320	7,200	23	800	2,073	<50	-	432	-	-
TCLP2			-	20	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorpyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table E3: Summary of Laboratory Results – Waste Classification

			OPP	PCB	VOC														Asbestos				
			Total Analysed OPP	Total PCB	Tetrachloromethane (carbon tetrachloride / CT)	Monochlorobenzene	Trichloromethane (chloroform / TCM)	1,2-dichlorobenzene	1,4-dichlorobenzene	1,2-dichloroethane	1,1-Dichloroethene	Styrene (vinylbenzene)	1,1,1,2-tetrachloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene (PCE)	1,1,1-trichloroethane	1,1,2-trichloroethane	Trichloroethene (TCE)	Chloroethene (vinyl chloride / VC)	Asbestos ID in materials	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos Comment	Asbestos Summary
		PQL	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-	-	
BH01	0.5 - 0.6 m	25/03/25	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BD1/20250325	0 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH02	0.13 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH02	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH03	0.4 - 0.5 m	25/03/25	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH04	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH05	0.15 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH05	0.4 - 0.5 m	25/03/25	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH05	0.9 - 1 m	25/03/25	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	NAD	-	-
BH06	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Summary Statistics																								
Min			0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
Max			0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
Mean			0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
Waste Classification Criteria [f]																								
CT1			4	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCC1			7.5	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TCLP1			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2			16	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCC2			30	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TCLP2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorpyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Appendix F

Site Assessment Criteria

1. Introduction

1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and/or derivation of the SAC:

- Land use: residential, high density (mixed use):
    - Corresponding to land use category 'B', residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats. Whilst the site is proposed for a mixed-use residential development with basement levels, the "B" criteria have been used as an initial conservative screen. Where exceeded, more development-specific criteria will be referenced in accordance with the cited guidelines.
- Soil type: sand (sand has been adopted as a screening tool due to more conservative criteria however on-site soils present multiple fill layers ranging from coarse to fine soils).

2. Soils

2.1 Health investigation and screening levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and Table 2.

Table 1: Health investigation levels (mg/kg)

Contaminant	HIL-B
Metals	
Arsenic	500
Cadmium	150
Chromium (VI)	500
Copper	30 000
Lead	1200
Mercury (inorganic)	120
Nickel	1200
Zinc	60 000
PAH	
B(a)P TEQ	4
Total PAH	400
Phenols	
Phenol	45 000
Pentachlorophenol	130
OCP	
DDT+DDE+DDD	600
Aldrin and dieldrin	10
Chlordane	90
Endosulfan	400
Endrin	20
Heptachlor	10
HCB	15
Methoxychlor	500
OPP	
Chlorpyrifos	340
PCB	
PCB	1

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	HSL-A&B
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	0.5	0.5	0.5	0.5
Toluene	160	220	310	540
Ethylbenzene	55	NL	NL	NL
Xylenes	40	60	95	170
Naphthalene	3	NL	NL	NL
TRH F1	45	70	110	200
TRH F2	110	240	440	NL

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'
scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health screening levels for direct contact (mg/kg)

Contaminant	DC HSL-B	DC HSL-IMW
Benzene	140	1100
Toluene	21 000	120 000
Ethylbenzene	5900	85 000
Xylenes	17 000	130 000
Naphthalene	2200	29 000
TRH F1	5600	82 000
TRH F2	4200	62 000
TRH F3	5800	85 000
TRH F4	8100	120 000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
IMW intrusive maintenance worker

2.2 Asbestos in soil

Based on the CSM and/or current site access limitations, a detailed asbestos assessment was not considered to be warranted at this stage. However, due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted for this investigation / assessment as an initial screen.

2.3 Ecological investigation levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), have not been evaluated due to the construction of multiple basement levels at the site. There are not considered to be any environmental receptors as a result.

2.4 Ecological screening levels

The ESL's have not been evaluated due to the construction of multiple basement levels at the site. There are not considered to be any environmental receptors as a result.

2.5 Management limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

The adopted management limits are in Table 4.

Table 4: Management limits (mg/kg)

Contaminant	Soil type	ML-A-B-C
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	2500
TRH F4	Coarse	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML-A-B-C residential, parkland and public open space

3. Groundwater

3.1 Introduction

The groundwater investigation levels (GIL) used for interpretation of the groundwater data (as a Tier 1 assessment) have been selected for the purposes of a preliminary screening tool, the most conservative criteria for Residential B Land use has been adopted.

Table 5: Groundwater investigation level rationale

Receptor / beneficial use	GIL	Source	Comments / rationale
Aquatic ecosystem	DGV	ANZG (2018)	Freshwater 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants
Building occupants (vapour intrusion)	HSL	NEPC (2013)	2 m to <4 m, 4-8 m, and >8m based on measured depths to groundwater. Note that the multi-level basement is likely to sit within groundwater, and therefore the HSL do not apply. If concentrations exceed the laboratory PQL the report will recommend a site specific assessment of groundwater seepage risk into the new basement.

Notes: DGV default guideline value
% LOP percentage level of protection of species
HSL health screening level
GV guideline value
LTV long term value (up to 100 years)
STV short term value (up to 20 years)

3.2 Groundwater investigation levels for aquatic ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 6.

Table 6: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant	Freshwater DGV 95% LOP	Notes
Metals / metalloids		
Arsenic	24 / 13	Levels provided for As III / As IV respectively. Moderate reliability.
Cadmium	0.2	Very high reliability.
Chromium (VI)	1	Chromium VI levels adopted as initial screen for total chromium. Very high reliability.
Copper	1.4	Very high reliability.
Lead	3.4	Moderate reliability.
Mercury (inorganic)	0.06	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Nickel	11	Low reliability.
Zinc	8	Very high reliability.
BTEX		
Benzene	950	Moderate reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Ethylbenzene	80	Unknown reliability.
m-Xylene	75	Unknown reliability.
o-xylene	350	Low reliability.
p-Xylene	200	Low reliability.
Toluene	180	Unknown reliability.
PAH		
Anthracene	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Benzo(a)pyrene	0.1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Fluoranthene	1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Naphthalene	16	Low reliability.
Phenanthrene	0.6	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
OCP		
Aldrin	0.001	Unknown reliability and LOP.
Chlordane	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
DDT	0.006	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Dieldrin	0.01	Unknown reliability and LOP.
Endosulfan	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Endrin	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Heptachlor	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Methoxychlor	0.005	Unknown reliability and LOP.
OPP		
Chlorpyrifos	0.01	Moderate reliability.
Diazinon	0.01	Moderate reliability.
Dimethoate	0.15	Low reliability.
Fenitrothion	0.2	Moderate reliability.
Malathion	0.05	Moderate reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Parathion	0.004	Moderate reliability.
PCB		
Aroclor 1242	0.3	99% LOP adopted as recommended due to potential for bioaccumulation. Low reliability.
Aroclor 1254	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
VOC		
Tetrachloroethene (PCE)	70	Unknown reliability.
Trichloroethene (TCE)	330	Unknown reliability.
1,1-dichloroethene (DCE)	700	Unknown reliability.
Chloroethene (vinyl chloride / VC)	100	Unknown reliability.
Tetrachloromethane (carbon tetrachloride / CT)	240	Unknown reliability.
Trichloromethane (chloroform / TCM)	370	99% LOP adopted as recommended to protect key species from chronic toxicity. Unknown reliability.
Inorganics		
Ammonia	900	Very high reliability.

Notes: 95% LOP for non-bioaccumulative contaminants
99% LOP for bioaccumulative contaminants

3.3 Health screening levels for vapour intrusion

The HSL to evaluate potential vapour intrusion risks derived from NEPC (2013) are in Table 7. There are no generic HSL for groundwater within 2 m of the ground (or basement) level.

Table 7: Groundwater health screening levels for vapour intrusion (µg/L)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	Solubility limit
SAND	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**-**
Benzene	800	800	900	59 000
Toluene	NL	NL	NL	61 000
Ethylbenzene	NL	NL	NL	3900
Xylenes	NL	NL	NL	21 000
Naphthalene	NL	NL	NL	170
TRH F1	1000	1000	1000	9000
TRH F2	1000	1000	1000	3000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

4. References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australia and New Zealand Environment and Conservation Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater.* Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC, NRMMC. (2022). *Australian Drinking Water Guidelines 6 2011, Version 3.7.* Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

Appendix G

Field Work Methodology

1. Guidelines

The following key guidelines were consulted for the field work methodology:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

2. Soil sampling

Soil sampling was carried out in accordance with Douglas' standard operating procedures. The general sampling and sample management procedures comprise:

- Collect soil samples directly from the solid flight auger and hand auger at regular intervals to a maximum depth of 1.5 m bgl;
- Place samples into laboratory-prepared glass jars with Teflon lined lids, capping immediately and minimising headspace within the sample jar;
- Collect replicate samples in zip-lock bags for photoionisation detector (PID) screening;
- Collect ~500 ml samples for fibrous asbestos and asbestos fines (FA and AF) analysis;
- Collect ~40 g to 50 g samples in zip-lock bags for asbestos (presence / absence) analysis;
- Wear a new disposable nitrile glove for each sample point thereby minimising potential for cross-contamination;
- Collect 10% replicate samples for quality control (QC) purposes;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable);
- Place samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain of custody documentation.

3. Groundwater sampling

3.1 Monitoring well installation

Monitoring wells are constructed using class 18 uPVC machine slotted screen and blank sections with screw threaded joints. The screened section of each well is backfilled with a washed gravel filter pack to approximately 0.5 m above the screened interval. Each well is completed with a hydrated bentonite plug at least 0.5 m thick and then backfilled to the surface.

3.2 Monitoring well development

Groundwater monitoring wells are developed as soon as practicable following well installation. The purpose of well development is to remove sediments and / or drilling fluid introduced to the well during drilling and to facilitate connection of the monitoring well to the aquifer. The wells are developed by pumping / bailing to remove a minimum of three well volumes, or until dry.

3.3 Groundwater sampling

Bladder pump

Groundwater sampling is carried out in accordance with Douglas' standard operating procedures. Groundwater samples are collected using a positive displacement low flow bladder pump via the micro-purge (minimal drawdown) method. The method minimises aeration of the sample and disturbance to the water column thereby enhancing the quality of results for oxygen sensitive analytes. The sampling method is described as follows:

- Measure the static water level using an electronic interface probe and record the thickness of any LNAPL (if encountered);
- Decontaminate the interface probe and cable between monitoring wells by rinsing in a diluted Liquinox solution and then rinsing in demineralised water;
- Fit the pump with a well-dedicated bladder and tubing. Lower the pump into the well then clamp at a level estimated to be the approximate mid-point of the well screen;
- Set the pump at the lowest rate possible that could produce laminar flow to minimise drawdown of the water column;
- Measure physical parameters by continuously passing the purged water through a flow cell; and
- Following stabilisation of the field parameters, collect samples in laboratory-prepared bottles minimising headspace within the sample bottle and cap immediately.

Sample handling

The general groundwater sample handling and management procedures comprise:

- Collect 10% replicate samples for QC purposes;
- Label sample containers with individual and unique identification details, including project number and sample location;
- Place the sample jars into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain of custody documentation.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix H

Laboratory Certificates

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 378301

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.01, St Leonards**
Number of Samples	21 Soil, 1 Material
Date samples received	15/04/2025
Date completed instructions received	15/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	24/04/2025
Date of Issue	24/04/2025

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Giovanni Agosti, Group Technical Manager
Jack Wallis, Senior Chemist
Jenny He, Inorganic Team Leader
Liam Timmins, Organics Supervisor
Lucy Zhu, Asbestos Supervisor
Priya Samarawickrama, Senior Chemist
Steven Luong, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in soil						
Our Reference		378301-5	378301-8	378301-13	378301-16	378301-19
Your Reference	UNITS	BH01	BH02	BH04	BH05	BH06
Depth		1.4-1.5	0.4-0.5	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date Analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Dichlorodifluoromethane	mg/kg	<1	<1	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethane	mg/kg	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
Bromochloromethane	mg/kg	<1	<1	<1	<1	<1
Chloroform	mg/kg	<1	<1	<1	<1	<1
2,2-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
1,2-Dichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1	<1	<1
Carbon Tetrachloride	mg/kg	<1	<1	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromomethane	mg/kg	<1	<1	<1	<1	<1
1,2-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
Trichloroethene	mg/kg	<1	<1	<1	<1	<1
Bromodichloromethane	mg/kg	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	mg/kg	<1	<1	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
Dibromochloromethane	mg/kg	<1	<1	<1	<1	<1
1,2-Dibromoethane	mg/kg	<1	<1	<1	<1	<1
Tetrachloroethene	mg/kg	<1	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
Chlorobenzene	mg/kg	<1	<1	<1	<1	<1

VOCs in soil						
Our Reference		378301-5	378301-8	378301-13	378301-16	378301-19
Your Reference	UNITS	BH01	BH02	BH04	BH05	BH06
Depth		1.4-1.5	0.4-0.5	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
Bromoform	mg/kg	<1	<1	<1	<1	<1
m+p-Xylene	mg/kg	<2	<2	<2	<2	<2
Styrene	mg/kg	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1	<1	<1
1,2,3-Trichloropropane	mg/kg	<1	<1	<1	<1	<1
Isopropylbenzene	mg/kg	<1	<1	<1	<1	<1
Bromobenzene	mg/kg	<1	<1	<1	<1	<1
n-Propylbenzene	mg/kg	<1	<1	<1	<1	<1
2-Chlorotoluene	mg/kg	<1	<1	<1	<1	<1
4-Chlorotoluene	mg/kg	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	mg/kg	<1	<1	<1	<1	<1
tert-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	mg/kg	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
sec-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
4-Isopropyltoluene	mg/kg	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
n-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	mg/kg	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Hexachlorobutadiene	mg/kg	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	101	114	103	102	100
Surrogate aaa-Trifluorotoluene	%	96	97	97	100	106
Surrogate Toluene-d_8	%	99	102	99	99	99
Surrogate 4-Bromofluorobenzene	%	99	101	99	98	99

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	96	104	97	103

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	91	100	100	106

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		378301-20	378301-21	378301-22
Your Reference	UNITS	TB	TS	BD1/20250325
Depth		-	-	-
Date Sampled		25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025
TRH C_6 - C_9	mg/kg	[NA]	[NA]	<25
TRH C_6 - C_{10}	mg/kg	[NA]	[NA]	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	[NA]	[NA]	<25
Benzene	mg/kg	<0.2	88%	<0.2
Toluene	mg/kg	<0.5	87%	<0.5
Ethylbenzene	mg/kg	<1	88%	<1
m+p-xylene	mg/kg	<2	89%	<2
o-Xylene	mg/kg	<1	88%	<1
Naphthalene	mg/kg	[NA]	[NA]	<1
Total +ve Xylenes	mg/kg	[NA]	[NA]	<1
Surrogate aaa-Trifluorotoluene	%	109	88	102

svTRH (C10-C40) in Soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	110
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	110
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	120
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	120
Surrogate o-Terphenyl	%	110	121	102	109	109

svTRH (C10-C40) in Soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	140	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	140	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	56	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	56	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	130	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	190	<50
Surrogate o-Terphenyl	%	105	101	115	106	103

svTRH (C10-C40) in Soil		
Our Reference		378301-22
Your Reference	UNITS	BD1/20250325
Depth		-
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	17/04/2025
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	117

PAHs in Soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	111	119	118	113	107

PAHs in Soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	109	109	106	126	112

PAHs in Soil		
Our Reference		378301-22
Your Reference	UNITS	BD1/20250325
Depth		-
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	113

Organochlorine Pesticides in soil						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	120	118	120	122	122

Organochlorine Pesticides in soil		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Mirex	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1
Surrogate 4-Chloro-3-NBTF	%	121

Organophosphorus Pesticides in Soil						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	120	118	120	122	122

Organophosphorus Pesticides in Soil		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
Dichlorvos	mg/kg	<0.1
Mevinphos	mg/kg	<0.1
Phorate	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Disulfoton	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Parathion-Methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Fenthion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Methidathion	mg/kg	<0.1
Fenamiphos	mg/kg	<0.1
Ethion	mg/kg	<0.1
Phosalone	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Coumaphos	mg/kg	<0.1
Surrogate 4-Chloro-3-NBTF	%	121

PCBs in Soil						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	117	117	118	117	117

PCBs in Soil		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate 2-Fluorobiphenyl	%	117

Misc Soil - Inorg						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date prepared	-	16/04/2025
Date analysed	-	24/04/2025
Total Phenolics (as Phenol)	mg/kg	<5

Acid Extractable metals in soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Arsenic	mg/kg	6	11	<4	<4	11
Cadmium	mg/kg	0.9	0.5	<0.4	<0.4	<0.4
Chromium	mg/kg	6	4	4	5	9
Copper	mg/kg	41	37	15	24	38
Lead	mg/kg	18	20	3	2	22
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	45	55	27	62	36
Zinc	mg/kg	370	260	18	27	190

Acid Extractable metals in soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Arsenic	mg/kg	4	<4	<4	5	170
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	2	9	8	6
Copper	mg/kg	40	5	27	41	25
Lead	mg/kg	11	2	16	22	30
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Nickel	mg/kg	47	1	25	28	63
Zinc	mg/kg	130	3	78	110	62

Acid Extractable metals in soil				
Our Reference		378301-22	378301-23	378301-24
Your Reference	UNITS	BD1/20250325	BH02 - [TRIPLICATE]	BH06 - [TRIPLICATE]
Depth		-	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025
Arsenic	mg/kg	5	<4	100
Cadmium	mg/kg	0.6	<0.4	<0.4
Chromium	mg/kg	7	5	6
Copper	mg/kg	41	46	23
Lead	mg/kg	15	4	17
Mercury	mg/kg	<0.1	<0.1	0.1
Nickel	mg/kg	51	59	45
Zinc	mg/kg	260	49	60

Moisture						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Moisture	%	13	12	13	1.3	6.7

Moisture						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Moisture	%	7.0	12	4.8	7.4	8.2

Moisture		
Our Reference		378301-22
Your Reference	UNITS	BD1/20250325
Depth		-
Date Sampled		25/03/2025
Type of sample		Soil
Date prepared	-	16/04/2025
Date analysed	-	17/04/2025
Moisture	%	14

Asbestos ID - soils						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Sample mass tested	g	Approx. 50g	Approx. 60g	Approx. 60g	Approx. 55g	Approx. 65g
Sample Description	-	Grey fine-grained soil & rocks	Grey fine-grained soil & rocks	Brown coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Sample mass tested	g	Approx. 80g	Approx. 65g	Approx. 80g	Approx. 70g	Approx. 80g
Sample Description	-	Brown coarse-grained soil & rocks	Brown sandy soil	Brown coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - materials		
Our Reference		378301-17
Your Reference	UNITS	BH05-FC
Depth		1.1
Date Sampled		25/03/2025
Type of sample		Material
Date analysed	-	17/04/2025
Mass / Dimension of Sample	-	80x70x4mm
Sample Description	-	White plastic-like material
Asbestos ID in materials	-	No asbestos detected
Trace Analysis	-	No asbestos detected

Misc Inorg - Soil			
Our Reference		378301-3	378301-13
Your Reference	UNITS	BH01	BH04
Depth		0.5-0.6	0.4-0.5
Date Sampled		25/03/2025	25/03/2025
Type of sample		Soil	Soil
Date prepared	-	22/04/2025	22/04/2025
Date analysed	-	22/04/2025	22/04/2025
pH 1:5 soil:water	pH Units	6.9	9.4

CEC			
Our Reference		378301-3	378301-13
Your Reference	UNITS	BH01	BH04
Depth		0.5-0.6	0.4-0.5
Date Sampled		25/03/2025	25/03/2025
Type of sample		Soil	Soil
Date prepared	-	23/04/2025	23/04/2025
Date analysed	-	23/04/2025	23/04/2025
Exchangeable Ca	meq/100g	2.3	13
Exchangeable K	meq/100g	0.4	0.3
Exchangeable Mg	meq/100g	1.1	2.2
Exchangeable Na	meq/100g	0.2	0.7
Cation Exchange Capacity	meq/100g	3.9	16

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stochiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date Extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date Analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
trans-1,2-Dichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1-Dichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	118	[NT]
cis-1,2-Dichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Bromochloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chloroform	mg/kg	1	Org-023	<1	8	<1	<1	0	122	[NT]
2,2-Dichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	107	[NT]
1,1,1-Trichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	126	[NT]
1,1-Dichloropropene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Carbon Tetrachloride	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	8	<0.2	<0.2	0	109	[NT]
Dibromomethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Trichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	117	[NT]
Bromodichloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	127	[NT]
trans-1,3-Dichloropropene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
cis-1,3-Dichloropropene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1,2-Trichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	8	<0.5	<0.5	0	112	[NT]
1,3-Dichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Dibromochloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	128	[NT]
1,2-Dibromoethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Tetrachloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	112	[NT]
1,1,1,2-Tetrachloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	116	[NT]
Bromoform	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
m+p-Xylene	mg/kg	2	Org-023	<2	8	<2	<2	0	114	[NT]
Styrene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1,2,2-Tetrachloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
o-Xylene	mg/kg	1	Org-023	<1	8	<1	<1	0	118	[NT]
1,2,3-Trichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Isopropylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Bromobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
n-Propylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
2-Chlorotoluene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
4-Chlorotoluene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,3,5-Trimethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
tert-Butylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2,4-Trimethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,3-Dichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
sec-Butylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,4-Dichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
4-Isopropyltoluene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
n-Butylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dibromo-3-chloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2,4-Trichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2,3-Trichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	105	8	114	102	11	99	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	103	8	97	98	1	110	[NT]
Surrogate Toluene-d_8	%		Org-023	100	8	102	99	3	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	100	8	101	99	2	100	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date Extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date Analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trans-1,2-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
cis-1,2-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromochloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloroform	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
2,2-Dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,1-Trichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Carbon Tetrachloride	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Dibromomethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Trichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromodichloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trans-1,3-Dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
cis-1,3-Dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,2-Trichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
1,3-Dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Dibromochloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dibromoethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Tetrachloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,1,2-Tetrachloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromoform	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-Xylene	mg/kg	2	Org-023	[NT]	19	<2	<2	0	[NT]	[NT]
Styrene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,2,2-Tetrachloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,3-Trichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Isopropylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
n-Propylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
2-Chlorotoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
4-Chlorotoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,3,5-Trimethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
tert-Butylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,4-Trimethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,3-Dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
sec-Butylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,4-Dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
4-Isopropyltoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
n-Butylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dibromo-3-chloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,4-Trichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,3-Trichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	19	100	108	8	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	19	106	108	2	[NT]	[NT]
Surrogate Toluene-d_8	%		Org-023	[NT]	19	99	101	2	[NT]	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	[NT]	19	99	100	1	[NT]	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	8	<25	<25	0	91	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	8	<25	<25	0	91	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	8	<0.2	<0.2	0	109	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	8	<0.5	<0.5	0	112	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	116	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	8	<2	<2	0	114	[NT]
o-Xylene	mg/kg	1	Org-023	<1	8	<1	<1	0	118	[NT]
Naphthalene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	103	8	97	98	1	110	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	19	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	19	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	19	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	19	106	108	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	8	<50	<50	0	103	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	8	<100	<100	0	92	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	8	<100	<100	0	100	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	8	<50	<50	0	103	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	8	<100	<100	0	92	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	8	<100	<100	0	100	[NT]
Surrogate o-Terphenyl	%		Org-020	107	8	109	108	1	114	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	19	103	103	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	102	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	90	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	94	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	98	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	106	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	120	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	8	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	8	<0.05	<0.05	0	96	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	110	8	113	110	3	126	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	19	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	19	112	107	5	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	106	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	100	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	92	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	110	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	104	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	118	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	90	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	80	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	128	8	118	119	1	137	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	19	121	133	9	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	120	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	108	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	115	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	124	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
Fenthion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	109	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
Phosalone	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	128	8	118	119	1	137	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	19	121	133	9	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	85	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	121	8	117	117	0	137	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	19	117	116	1	[NT]	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			16/04/2025	3	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			24/04/2025	3	24/04/2025	24/04/2025		24/04/2025	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	3	<5	<5	0	88	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
Arsenic	mg/kg	4	Metals-020	<4	8	<4	<4	0	117	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	8	<0.4	<0.4	0	105	[NT]
Chromium	mg/kg	1	Metals-020	<1	8	5	5	0	108	[NT]
Copper	mg/kg	1	Metals-020	<1	8	24	46	63	108	[NT]
Lead	mg/kg	1	Metals-020	<1	8	2	3	40	106	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	8	<0.1	<0.1	0	120	[NT]
Nickel	mg/kg	1	Metals-020	<1	8	62	61	2	106	[NT]
Zinc	mg/kg	1	Metals-020	<1	8	27	45	50	106	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	19	170	220	26	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	19	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	19	6	5	18	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	19	25	20	22	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	19	30	21	35	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	19	0.2	0.1	67	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	19	63	110	54	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	19	62	54	14	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/04/2025	[NT]	[NT]	[NT]	[NT]	22/04/2025	[NT]
Date analysed	-			22/04/2025	[NT]	[NT]	[NT]	[NT]	22/04/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/04/2025	3	23/04/2025	23/04/2025		23/04/2025	[NT]
Date analysed	-			23/04/2025	3	23/04/2025	23/04/2025		23/04/2025	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	3	2.3	2.2	4	102	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	3	0.4	0.4	0	109	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	3	1.1	1.0	10	101	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	3	0.2	0.2	0	103	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:
-The laboratory RPD acceptance criteria has been exceeded for 378301-8 for Cu and Zn. Therefore a triplicate result has been issued as laboratory sample number 378301-23.
-The laboratory RPD acceptance criteria has been exceeded for 378301-19 for Ni.
Therefore a triplicate result has been issued as laboratory sample number 378301-24.

MISC_INORG_DRY: pH
Samples were out of the recommended holding time for this analysis.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.
Note: Samples requested for asbestos testing were sub-sampled from bags provided by the client.

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	86230.01	**Suburb:**	St Leonards	**To:**	Envirolab Services
Project Manager:	Paul.Gorman	**Order Number:**		**Sampler:**	JDS
Email:	Paul.Gorman@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.com
Prior Storage:	☐ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☐ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

	Sample ID			Date Sampled	Sample Type	Container Type	Analytes											Notes/ Preservation/ Additional Requirements
	Location / Other ID	Depth From	Depth To		S - soil W - water M - Material	G - glass P - plastic	Combo 8a	Combo 3a	VOC	pH, CEC	BTEX	Combo 3	Asbestial material					
BH01 1		0.15	0.16	25/03/25	S	G,P												HOLD
BH01 2		0.28	0.35	25/03/25	S	G,P												HOLD
BH01 3		0.5	0.6	25/03/25	S	G,P	x			x								
BH01 4		0.9	1	25/03/25	S	G,P												HOLD
BH01 5		1.4	1.5	25/03/25	S	G,P		x	x									
BH01 6		1.9	2	25/03/25	S	G,P												HOLD
BH02 7		0.13	0.2	25/03/25	S	G,P		x										
BH02 8		0.4	0.5	25/03/25	S	G,P	x		x									
BH02 9		0.9	1	25/03/25	S	G,P												HOLD
BH03 10		0.15	0.2	25/03/25	S	G,P												HOLD
BH03 11		0.4	0.5	25/03/25	S	G,P	x											
BH04 12		0.15	0.2	25/03/25	S	G,P												HOLD
BH04 13		0.4	0.5	25/03/25	S	G,P	x		x	x								
BH05 14		0.15	0.2	25/03/25	S	G,P		x										

ENVIROLAB group

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 378301
Date Received: 15/4/25
Time Received: 1210
Received By: JW
Temp: Cool/Ambient
Cooling: Ice/Icepack 12°C
Security: Intact/Broken/None

Metals to analyse:			**LAB RECEIPT**
Number of samples in container:	**Transported to laboratory by:**		**Lab Ref. No:** 378301
Send results to:	Douglas Partners Pty Ltd		**Received by:** Katy Wayne
Address:	96 Hermitage Road, West Ryde NSW 2114	**Phone:** (02) 9809 0666	**Date & Time** 15/4/25 1210
Relinquished by: JZ	**Date:** 15/3/25	**Signed:**	**Signed:**

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	86230.01	**Suburb:** St Leonards	**To:** Envirolab Services
Project Manager:	Paul.Gorman		**Dispatch date:** 0/01/1900

	Sample ID			Date Sampled	Sample Type	Container Type	Analytes											Notes/ Preservation/ Additional Requirements
	Location / Other ID	Depth From	Depth To		S - soil W - water M - Material	G - glass P - plastic	Combo 8a	Combo 3a	VOC	pH, CEC	BTEX	Combo 3	Asbestial material					
BH05 15		0.4	0.5	25/03/25	S	G,P	x											
BH05 16		0.9	1	25/03/25	S	G,P		x	x									
BH05-FC 17		1.1		25/03/25	S	P							x					
BH06 18		0.15	0.2	25/03/25	S	G,P												HOLD
BH06 19		0.4	0.5	25/03/25	S	G,P	x		x									
TB/TC 20/	21			25/03/25	S	G					x							
BD1/20250325	22			25/03/25	S	G						x						#378301 15/4 lw

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.01, St Leonards
Envirolab Reference	378301
Date Sample Received	15/04/2025
Date Instructions Received	15/04/2025
Date Results Expected to be Reported	24/04/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	21 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBs in Soil	Misc Soil - Inorg	Acid Extractable metalsin soil	Asbestos ID - soils	Asbestos ID - materials	Misc Inorg - Soil	CEC	On Hold
BH01-0.15-0.16														✓
BH01-0.28-0.35														✓
BH01-0.5-0.6		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
BH01-0.9-1														✓
BH01-1.4-1.5	✓	✓	✓	✓					✓	✓				
BH01-1.9-2														✓
BH02-0.13-0.2		✓	✓	✓					✓	✓				
BH02-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH02-0.9-1														✓
BH03-0.15-0.2														✓
BH03-0.4-0.5		✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH04-0.15-0.2														✓
BH04-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
BH05-0.15-0.2		✓	✓	✓					✓	✓				
BH05-0.4-0.5		✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH05-0.9-1	✓	✓	✓	✓					✓	✓				
BH05-FC-1.1											✓			
BH06-0.15-0.2														✓
BH06-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
TB		✓												
TS		✓												
BD1/20250325		✓	✓	✓					✓					

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 378301-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.01, St Leonards**
Number of Samples	Additional analysis
Date samples received	15/04/2025
Date completed instructions received	28/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	05/05/2025
Date of Issue	05/05/2025

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Results Approved By
Giovanni Agosti, Group Technical Manager

Authorised By
Nancy Zhang, Laboratory Manager

Metals from Leaching Fluid pH 2.9 or 5			
Our Reference		378301-A-8	378301-A-19
Your Reference	UNITS	BH02	BH06
Depth		0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025
Type of sample		Soil	Soil
Date extracted	-	01/05/2025	01/05/2025
Date analysed	-	01/05/2025	01/05/2025
pH of soil for fluid# determ.	pH units	9.0	8.9
pH of soil TCLP (after HCl)	pH units	1.9	1.8
Extraction fluid used		1	1
pH of final Leachate	pH units	5.1	5.2
Arsenic	mg/L	[NA]	<0.05
Nickel	mg/L	0.07	0.2

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439. Please note that the mass used may be scaled down from default based on sample mass available. Samples are stored at 2-6oC before and after leachate preparation.
Metals-020	Determination of various metals by ICP-AES following buffer determination as per USEPA 1311 and hence AS 4439.3. Extraction Fluid 1 refers to the pH 5.0 buffer and Extraction Fluid 2 is the pH 2.9 buffer. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.

QUALITY CONTROL: Metals from Leaching Fluid pH 2.9 or 5					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	378301-A-8
Date extracted	-			01/05/2025	[NT]	[NT]	[NT]	[NT]	01/05/2025	01/05/2025
Date analysed	-			01/05/2025	[NT]	[NT]	[NT]	[NT]	01/05/2025	01/05/2025
Arsenic	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	119	[NT]
Nickel	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	101	99

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

Anna Bui

From: Greta Petzold
Sent: Monday, 28 April 2025 10:38 AM
To: Paul Gorman; Envirolab Sydney Sample Receipt
Subject: RE: Results for Registration 378301 86230.01, St Leonards

No worries, Paul

@Envirolab Sydney Sample Receipt A- job please

ELS ref: 378301-A

TAT: STANDARD

DUE: 5/5/25

AB

Kind Regards,

Greta Petzold | Operations Manager | Envirolab Services

Great Science. Great Service.

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Samples will be analysed per our T&C's.

From: Paul Gorman <paul.gorman@douglaspartners.com.au>
Sent: Monday, 28 April 2025 10:02 AM
To: Greta Petzold <GPetzold@envirolab.com.au>
Subject: RE: Results for Registration 378301 86230.01, St Leonards

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Thanks Greta.

Can I please request TCLP testing on a standard turnaround as follows:

8 BH02/0.4-0.5 TCLP nickel
9 BH06/0.4-0.5 TCLP arsenic, nickel

Thanks

Paul Gorman | Principal

02 8878 0632 +61 427 949 878 Paul.Gorman@douglaspartners.com.au

www.douglaspartners.com.au 96 Hermitage Road, West Ryde
NSW 2114 | Wallumedegal Country
PO Box 472, West Ryde, NSW 1685

Douglas PARTNERS | GROUNDED EXPERTISE

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Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
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customerservice@envirolab.com.au
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SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.01, St Leonards
Envirolab Reference	378301-A
Date Sample Received	15/04/2025
Date Instructions Received	28/04/2025
Date Results Expected to be Reported	05/05/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	Additional analysis
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
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Sample ID	pH of soil for fluid#determ.	pH of soil TCLP (after HCl)	Extraction fluid used	pH of final Leachate	Arsenic	Nickel	On Hold
BH01-0.15-0.16							✓
BH01-0.28-0.35							✓
BH01-0.5-0.6							✓
BH01-0.9-1							✓
BH01-1.4-1.5							✓
BH01-1.9-2							✓
BH02-0.13-0.2							✓
BH02-0.4-0.5	✓	✓	✓	✓		✓	
BH02-0.9-1							✓
BH03-0.15-0.2							✓
BH03-0.4-0.5							✓
BH04-0.15-0.2							✓
BH04-0.4-0.5							✓
BH05-0.15-0.2							✓
BH05-0.4-0.5							✓
BH05-0.9-1							✓
BH05-FC-1.1							✓
BH06-0.15-0.2							✓
BH06-0.4-0.5	✓	✓	✓	✓	✓	✓	
TB							✓
TS							✓
BD1/20250325							✓
BH02 - [TRIPLICATE]-0.4-0.5							✓
BH06 - [TRIPLICATE]-0.4-0.5							✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 378866

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.01, St Leonards**
Number of Samples	6 Water
Date samples received	23/04/2025
Date completed instructions received	23/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	01/05/2025
Date of Issue	01/05/2025

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Loren Bardwell, Development Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water				
Our Reference	UNITS	378866-1	378866-2	378866-3
Your Reference		BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date Extracted	-	24/04/2025	24/04/2025	24/04/2025
Date Analysed	-	28/04/2025	28/04/2025	28/04/2025
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	3	32	<1
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	<1	5	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1

VOCs in water				
Our Reference		378866-1	378866-2	378866-3
Your Reference	UNITS	BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Bromoform	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	105	106	105
Surrogate Toluene-d8	%	100	100	99
Surrogate 4-Bromofluorobenzene	%	97	98	96

vTRH(C6-C10)/BTEXN in Water						
Our Reference		378866-1	378866-2	378866-3	378866-4	378866-5
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417	TS
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	28/04/2025	28/04/2025	28/04/2025	28/04/2025	28/04/2025
TRH C_6 - C_9	µg/L	<10	27	<10	<10	[NA]
TRH C_6 - C_{10}	µg/L	<10	30	<10	<10	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	30	<10	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1	117%
Toluene	µg/L	<1	<1	<1	<1	108%
Ethylbenzene	µg/L	<1	<1	<1	<1	105%
m+p-xylene	µg/L	<2	<2	<2	<2	95%
o-xylene	µg/L	<1	<1	<1	<1	118%
Naphthalene	µg/L	<1	<1	<1	<1	[NA]
Surrogate Dibromofluoromethane	%	105	106	105	106	103
Surrogate Toluene-d8	%	100	100	99	100	102
Surrogate 4-Bromofluorobenzene	%	97	98	96	96	101

vTRH(C6-C10)/BTEXN in Water		
Our Reference		378866-6
Your Reference	UNITS	TB
Date Sampled		17/04/2025
Type of sample		Water
Date extracted	-	24/04/2025
Date analysed	-	28/04/2025
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	104
Surrogate Toluene-d8	%	100
Surrogate 4-Bromofluorobenzene	%	97

svTRH (C10-C40) in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50
Surrogate o-Terphenyl	%	106	102	119	117

PAHs in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	124	115	108	127

Organochlorine Pesticides in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
HCB	µg/L	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2
Mirex	ug/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	114	110	107	115

OP Pesticides in Water					
Our Reference	UNITS	378866-1	378866-2	378866-3	378866-4
Your Reference		BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
Dichlorvos	µg/L	<0.2	<0.2	<0.2	<0.2
Mevinphos	µg/L	<0.2	<0.2	<0.2	<0.2
Phorate	µg/L	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2	<0.2
Disulfoton	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion-Methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2	<0.2
Fenthion	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2
Methidathion	µg/L	<0.2	<0.2	<0.2	<0.2
Fenamiphos	µg/L	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2
Phosalone	µg/L	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2	<0.2
Coumaphos	µg/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	114	110	107	115

PCBs in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
Aroclor 1016	µg/L	<2	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2	<2
Surrogate 2-Fluorobiphenyl	%	112	110	104	114

HM in water - total					
Our Reference	UNITS	378866-1	378866-2	378866-3	378866-4
Your Reference		BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	28/04/2025	28/04/2025	28/04/2025	28/04/2025
Date analysed	-	28/04/2025	28/04/2025	28/04/2025	28/04/2025
Arsenic-Total	µg/L	3	6	5	6
Cadmium-Total	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Total	µg/L	<1	2	9	11
Copper-Total	µg/L	13	24	36	33
Lead-Total	µg/L	2	2	8	10
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	130	22	28	33
Zinc-Total	µg/L	270	59	110	100

HM in water - dissolved				
Our Reference	UNITS	378866-1	378866-2	378866-3
Your Reference		BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date prepared	-	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	24/04/2025	24/04/2025	24/04/2025
Arsenic-Dissolved	µg/L	<1	2	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	3	<1	3
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	100	17	15
Zinc-Dissolved	µg/L	120	28	41

Metals in Waters - Acid extractable				
Our Reference		378866-1	378866-2	378866-3
Your Reference	UNITS	BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date prepared	-	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	28/04/2025	28/04/2025	28/04/2025
Phosphorus - Total	mg/L	<0.05	0.06	2.9

Miscellaneous Inorganics				
Our Reference		378866-1	378866-2	378866-3
Your Reference	UNITS	BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date prepared	-	23/04/2025	23/04/2025	23/04/2025
Date analysed	-	23/04/2025	23/04/2025	23/04/2025
pH	pH Units	5.3	6.7	6.3
Oil & Grease (LLE)	mg/L	16	<5	7
Sulphate, SO4	mg/L	120	55	71
Chloride, Cl	mg/L	250	56	66
Ammonia as N in water	mg/L	0.012	<0.005	0.012
Nitrate as N in water	mg/L	<0.005	<0.005	<0.005
Nitrite as N in water	mg/L	<0.005	<0.005	<0.005
NOx as N in water	mg/L	<0.005	<0.005	<0.005
Total Nitrogen in water	mg/L	0.1	0.3	0.1
TKN in water	mg/L	0.1	0.3	0.1
Organic Nitrogen as N	mg/L	<0.2	0.3	<0.2
Phosphate as P in water	mg/L	<0.005	<0.005	0.01

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-003	Oil & Grease - determine gravimetrically following extraction with Hexane, in accordance with APHA latest edition, 5520-B.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stochiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date Extracted	-			24/04/2025	1	24/04/2025	28/04/2025		24/04/2025	[NT]
Date Analysed	-			28/04/2025	1	28/04/2025	29/04/2025		28/04/2025	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	3	3	0	99	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	108	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	109	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	117	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	98	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	103	1	105	102	3	102	[NT]
Surrogate Toluene-d8	%		Org-023	99	1	100	97	3	101	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	1	97	95	2	100	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			24/04/2025	1	24/04/2025	28/04/2025		24/04/2025	[NT]
Date analysed	-			28/04/2025	1	28/04/2025	29/04/2025		28/04/2025	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	97	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	97	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	98	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	103	1	105	102	3	102	[NT]
Surrogate Toluene-d8	%		Org-023	99	1	100	97	3	101	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	1	97	95	2	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	120	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	77	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	109	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: Organochlorine Pesticides in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
HCB	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	77	[NT]
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	78	[NT]
delta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	89	[NT]
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	76	[NT]
Dieldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	86	[NT]
Endrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	84	[NT]
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mirex	ug/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	97	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Mevinphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phorate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Disulfoton	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion-Methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	74	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Malathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	81	[NT]
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	78	[NT]
Fenthion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	71	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methidathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fenamiphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	74	[NT]
Phosalone	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Coumaphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	97	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
Aroclor 1016	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Aroclor 1260	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	91	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	378866-3
Date prepared	-			24/04/2025	1	28/04/2025	28/04/2025		28/04/2025	28/04/2025
Date analysed	-			28/04/2025	1	28/04/2025	28/04/2025		28/04/2025	28/04/2025
Arsenic-Total	µg/L	1	Metals-022	<1	1	3	3	0	98	91
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	95	96
Chromium-Total	µg/L	1	Metals-022	<1	1	<1	<1	0	99	102
Copper-Total	µg/L	1	Metals-022	<1	1	13	13	0	101	99
Lead-Total	µg/L	1	Metals-022	<1	1	2	2	0	99	94
Mercury-Total	µg/L	0.05	Metals-021	<0.05	1	<0.05	[NT]		120	[NT]
Nickel-Total	µg/L	1	Metals-022	<1	1	130	130	0	101	102
Zinc-Total	µg/L	1	Metals-022	<1	1	270	270	0	95	94

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	378866-2
Date prepared	-			24/04/2025	1	24/04/2025	24/04/2025		24/04/2025	24/04/2025
Date analysed	-			24/04/2025	1	24/04/2025	24/04/2025		24/04/2025	24/04/2025
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	89	94
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	86	88
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	87	90
Copper-Dissolved	µg/L	1	Metals-022	<1	1	3	3	0	89	92
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	92	89
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	[NT]		107	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	100	98	2	88	92
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	120	120	0	87	94

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	24/04/2025	24/04/2025		[NT]	[NT]
Date analysed	-			[NT]	3	24/04/2025	24/04/2025		[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	[NT]		[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	3	<0.1	[NT]		[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	[NT]		[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	3	3	[NT]		[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	[NT]		[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	3	<0.05	<0.05	0	[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	3	15	[NT]		[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	3	41	[NT]		[NT]	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	378866-2
Date prepared	-			24/04/2025	1	24/04/2025	24/04/2025		24/04/2025	24/04/2025
Date analysed	-			28/04/2025	1	28/04/2025	28/04/2025		28/04/2025	28/04/2025
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	1	<0.05	<0.05	0	107	115

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	378866-3
Date prepared	-			23/04/2025	1	23/04/2025	23/04/2025		23/04/2025	23/04/2025
Date analysed	-			23/04/2025	1	23/04/2025	23/04/2025		23/04/2025	23/04/2025
pH	pH Units		Inorg-001	[NT]	1	5.3	5.2	2	101	[NT]
Oil & Grease (LLE)	mg/L	5	Inorg-003	<5	1	16	[NT]		80	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	120	[NT]		105	73
Chloride, Cl	mg/L	1	Inorg-081	<1	1	250	[NT]		98	72
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.012	[NT]		92	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		102	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		101	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		102	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.1	0.1	0	120	122
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	0.1	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	<0.2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	[NT]		93	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	23/04/2025	23/04/2025		[NT]	[NT]
Date analysed	-			[NT]	3	23/04/2025	23/04/2025		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	3	6.3	[NT]		[NT]	[NT]
Oil & Grease (LLE)	mg/L	5	Inorg-003	[NT]	3	7	[NT]		[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	3	71	[NT]		[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	3	66	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	3	0.012	0.016	29	[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	<0.005	0	[NT]	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	<0.005	0	[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	0.005	0	[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	[NT]	3	0.1	[NT]		[NT]	[NT]
TKN in water	mg/L	0.1	Inorg-062	[NT]	3	0.1	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	[NT]	3	<0.2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	3	0.01	0.01	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

CHAIN OF CUSTODY DESPATCH SHEET

Douglas PARTNERS

Project No:	86230.01	**Suburb:**	St Leonards	**To:**	Envirolab Services
Project Manager:	Alex Gibson / Paul Gorman	**Order Number:**		**Sampler:** ZW	12 Ashley St, Chatswood NSW 2067
Email:	Paul.Gorman@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.cor
Prior Storage	☐ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☐ No ☐ Yes (If YES, handle, transport, store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Combo 6*	8 HM ** (dissolved)	VOC	pH	oil & grease	sulfate	chloride	nutrient suite	BTEX			Notes/ Preservation/ Additional Requirements
1	BH01			17.04.25	W	G/P	X	X	X	X	X	X	X	X				* total metals, low level
2	BH03			17.04.25	W	G/P	X	X	X	X	X	X	X	X				** low level
3	BH06			17.04.25	W	G/P	X	X	X	X	X	X	X	X				
4	BD1/250417				W	G/P	X											
5	TS														X			
6	TB														X			

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 378866
Date Received: 23/4/25
Time Received: 1300
Received By: ST
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:

Number of samples in container:

Transported to laboratory by:

Send results to: Douglas Partners Pty Ltd

Address: 96 Hermitage Road, West Ryde NSW 2114 **Phone:** (02) 9809 0666

Relinquished by: **Date:** **Signed:**

LAB RECEIPT

Lab Ref. No: 378866

Received by: Shann ToC

Date & Time 23/4/25 1300

Signed: ST

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.01, St Leonards
Envirolab Reference	378866
Date Sample Received	23/04/2025
Date Instructions Received	23/04/2025
Date Results Expected to be Reported	01/05/2025

Sample Condition

Samples received in appropriate condition for analysis	Holding time exceedance
No. of Samples Provided	6 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Please contact the laboratory within 24 hours if you wish to cancel the aformentioned testing. Otherwise testing will proceed as per the COC and hence invoiced accordingly.

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
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Sample ID	VOCs in water	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	HM in water - total	HM in water - dissolved	Metals in Waters -Acid extractable	pH	Oil & Grease (LLE)	Sulphate, SO4	Chloride, Cl	Ammonia as N in water	Nitrate as N in water	Nitrite as N in water	NOx as N in water	Total Nitrogen in water	TKN in water	Organic Nitrogen as N	Phosphate as P in water
BH01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BD1/250417		✓	✓	✓	✓	✓	✓	✓														
TS		✓																				
TB		✓																				

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Appendix I

Quality Assurance and Quality Control

Table QA1: Relative Percentage Difference Results – Soil Sampling

Lab Report No	Sample ID	Depth	Sample Date	Sample Type	Units	Priority metals						
						Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel
378301	BH01	0.5 - 0.6 m	25/03/25	Soil	mg/kg	**6**	**0.9**	**6**	**41**	**18**	<0.1	**45**
378301	BD1/20250325	0 m	25/03/25	Soil	mg/kg	**5**	**0.6**	**7**	**41**	**15**	<0.1	**51**
			Difference		mg/kg	1	0.3	1	0	3	0	6
			RPD		%	18%	**40%**	15%	0%	18%	0%	13%

Table QA1: Relative Percentage Difference Results – Soil Sampling

Lab Report No	Sample ID		Priority PAH				PA					
		Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(g,h,i)perylene	Chrysene
378301	BH01	**370**	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
378301	BD1/20250325	**260**	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		110	0	0	0	0	0	0	0	0	0	0
		35%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1: Relative Percentage Difference Results – Soil Sampling

Lab Report No	Sample ID	AH						Priority TRH				
		Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)
378301	BH01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<25	<50	<100
378301	BD1/20250325	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<25	<50	<100
		0	0	0	0	0	0	0	0	0	0	0
		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1: Relative Percentage Difference Results – Soil Sampling

Lab Report No	Sample ID		TRH		BTEX				ditional PhysChem
		F4 (>C34-C40)	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Moisture
378301	BH01	<100	<25	<50	<0.2	<0.5	<1	<1	**130,000**
378301	BD1/20250325	<100	<25	<50	<0.2	<0.5	<1	<1	**140,000**
		0	0	0	0	0	0	0	10,000
		0%	0%	0%	0%	0%	0%	0%	7%

Table QA2: Trip Blank Results - Soil Sampling

Sample ID	Sample Date	Media Being Sampled	Sample Type	Units	BTEX				Lab Report No
					Benzene	Toluene	Ethylbenzene	Total Xylenes	
TB	25/03/25	Soil	Soil	mg/kg	<0.2	<0.5	<1	<1	378301

Table QA3: Trip Spike Results – Soil Sampling (% Recovery)

Sample ID	Sample Date	Media Being Sampled	Sample Type	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Lab Report No
TS	25/03/25	Soil	Soil	88	87	88	88	89	378301

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	Sample Type	Units	Metals & Metalloids							
					Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc
378866	BH06	17/04/25	Water	µg/L	**5**	<0.1	**9**	**36**	**8**	<0.05	**28**	**110**
378866	BD1/250417	17/04/25	Water	µg/L	**6**	<0.1	**11**	**33**	**10**	<0.05	**33**	**100**
		Difference		µg/L	1	0	2	3	2	0	5	10
		RPD		%	18%	0%	20%	9%	22%	0%	16%	10%

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	TRH				BTEX						PAH		
			F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes	Acenaphthene	Acenaphthylene	Anthracene
378866	BH06	17/04/25	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1
378866	BD1/250417	17/04/25	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1
		Difference	0	0	0	0	0	0	0	0	0	0	0	0	0
		RPD	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	PAH												
			Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (B(a)P)	Benzo(b,j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	Sum of detected PAH
378866	BH06	17/04/25	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
378866	BD1/250417	17/04/25	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
		Difference	0	0	0	0	0	0	0	0	0	0	0	0	0
		RPD	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	OCP												
			DDE	DDT	DDD	Aldrin	Dieldrin	Aldrin + Dieldrin (calculated)	alpha-chlordane	gamma-Chlordane	Endosulfan I	Endosulfan II	Endosulfan Sulphate	Endrin	Endrin Aldehyde
378866	BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
378866	BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
		Difference	0	0	0	0	0	0	0	0	0	0	0	0	0
		RPD	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	OCP										OPP	
			Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Methoxychlor	Mirex	alpha-BHC	beta-BHC	delta-BHC	Lindane	Sum of detected OCP	Azinphos methyl (Guthion)	Bromophos-ethyl
378866	BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
378866	BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
		Difference	0	0	0	0	0	0	0	0	0	0	0	0
		RPD	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	OPP													
			Chlorpyrifos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Ronnel (fenchlorphos)	Fenitrothion	Fenthion	Malathion	Parathion	Parathion-methyl	Methidathion	Fenamiphos
378866	BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
378866	BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
		Difference	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RPD	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1W: Relative Percentage Difference Results – Water Sampling

Lab Report No	Sample ID	Sample Date	OPP	PCB							
			Sum of detected OPP	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Aroclor 1260	Sum of detected PCB
378866	BH06	17/04/25	<0.2	<2	<2	<2	<2	<2	<2	<2	<2
378866	BD1/250417	17/04/25	<0.2	<2	<2	<2	<2	<2	<2	<2	<2
		Difference	0	0	0	0	0	0	0	0	0
		RPD	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA2W: Trip Blank Results - Water Sampling

Sample ID	Sample Date	Media Being Sampled	Sample Type	Units	BTEX						Lab Report No
					Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes	
TB	17/04/25	Water	Water	µg/L	<1	<1	<1	<1	<2	<1	378866

Table QA3W: Trip Spike Results – Water Sampling (% Recovery)

Sample ID	Sample Date	Media Being Sampled	Sample Type	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Lab Report No
TS	17/04/25	Water	Water	117	108	105	118	95	378866

Douglas PARTNERS

GROUNDED EXPERTISE

Remediation Action Plan

Proposed Mixed Use Residential Development

601 Pacific Highway, St Leonards NSW

Prepared for Stockland Development Pty Limited

Project 86230.03

18 March 2026

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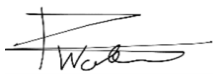
The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature		Date
Author		18 March 2026
Reviewer		18 March 2026

FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

Douglas PARTNERS | GROUNDED EXPERTISE

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Remediation Action Plan
Proposed Mixed Use Residential Development
601 Pacific Highway, St Leonards NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has prepared this remediation action plan (RAP) for a proposed mixed use residential development at 601 Pacific Highway, St Leonards NSW. The RAP was commissioned by Hee-Jung Yoon of Stockland Development Pty Limited and was undertaken in accordance with Douglas' proposal by Aconex dated 22 October 2025. This RAP has been prepared by Douglas and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of the SSDA (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site). Further details on the proposed development are provided in Section 2.

Stockland Development (Stockland) submitted an EOI for an SSDA and concurrent rezoning proposal on 17 January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19 February 2025, the HDA recommended to the Minister that the applicant's project be declared SSD, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).

A request for SEARs was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This report has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs) set out in the Table 1 below.

Table 1: Secretary's Environmental Assessment Requirements relevant to this report

SEARs	Report Reference (how addressed)
13. Contamination and Remediation In accordance with Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021, assess and quantify and soil and groundwater contamination and demonstrate that the site is suitable (or will be made suitable after remediation) for the development.	Report as a whole presents the remediation action plan (RAP) which demonstrates that the site can be made suitable for the development following completion of remediation, specifically the following: Section 6: Summary of previous investigations / contamination status and risks; Section 7: Conceptual site model of contamination risks; Section 11: Remediation methodology to address contamination risks. This RAP also references and summarised a preliminary site investigation (PSI) report. A detailed site investigation (DSI) report has been prepared by Douglas to address the data gaps identified in this RAP. No long term management plan is considered to be required.

The following key guidelines were consulted in the preparation of this report:

- NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM] (NEPC, 2013);
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020); and
- CRC CARE *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives* (CRC CARE, 2019a).

The remediation objectives, devised in accordance with CRC (2019a), are to:

- Address potentially unacceptable risks to relevant environmental values from contamination; and
- Render the site suitable, from a contamination perspective, for the proposed development.

This RAP provides details of the work that will be required at the site to meet the remediation objectives.

This RAP presents the procedures and plans which provide the means by which site remediation can be achieved. The Remediation Contractor must base their detailed work methodologies around the requirements of this RAP.

This report must be read in conjunction with all appendices.

2. Proposed development

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NSLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.
- Demolition of the existing 14 storey commercial office building that is currently on the site.
- Site excavation, remediation and other preparatory works.
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m2), comprising:
  - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
  - A contribution of 5% of the residential GFA toward Affordable Housing.
  - Retail and commercial land uses at the ground and podium levels.
  - Internal and external residential amenities provided throughout the building.
  - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
- Vehicular access to the basement via Atchison Street.
- Landscaping and Public Domain works.

- Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

3. Scope of work

The scope of work for the RAP comprised:

- Summarise the findings of previous investigations used to inform the status of contamination and contamination risk at the site;
- Present a conceptual site model (CSM) to list potential and likely contamination source, pathway and receptor linkages to address potentially unacceptable risks to human health and relevant environmental values from contamination;
- Define the anticipated extent of remediation;
- Assess potentially suitable remediation options to render the site suitable for its proposed use, and which will minimise potentially unacceptable risk to human health and/or the environment, and which includes the consideration of the principles of ecologically sustainable development;
- Identify the preferred remediation option;
- Establish the remediation acceptance criteria (RAC) to be adopted for validation of remediation;
- Identify how successful implementation of the RAP will be demonstrated / validated;
- Outline waste classification, handling and tracking requirements;
- Outline environmental safeguards required to complete the remediation works; and
- Include contingency plans and an unexpected finds protocol.

4. Site description

Site address	601 Pacific Highway, St Leonards NSW
Legal description	Lot 71 in DP749690
Area	2,844 m^2
Zoning	E2 – Commercial Centre
Local council area	North Sydney Council
Current use	The site is occupied by a 14-storey commercial building in the eastern portion of the site, and single level mixed-use retail in the western portion.

Surrounding uses	North – Beyond Aitchson Street to the north is mixed use buildings with residential zoning roughly 200m to the north and beyond. East – Mitchell Street and beyond is mixed use zoning. Residential zoning can be seen roughly 200m to the east and beyond. South – The SP2 zoned Pacific Highway is situated directly south, with Mixed use and commercia centre zoning beyond. West – bounded by a 7-storey commercial building to the west with SP2 zoning on Christie Street and mixed-use zoning beyond.

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844 m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400 m (walking distance) from the Crows Nest Metro station.

The site is zoned as E2 – Commercial Centre. The surrounding landscape has combination of commercial E2, MU1 mixed use and both R2 low density and R4 high density residential zoning.

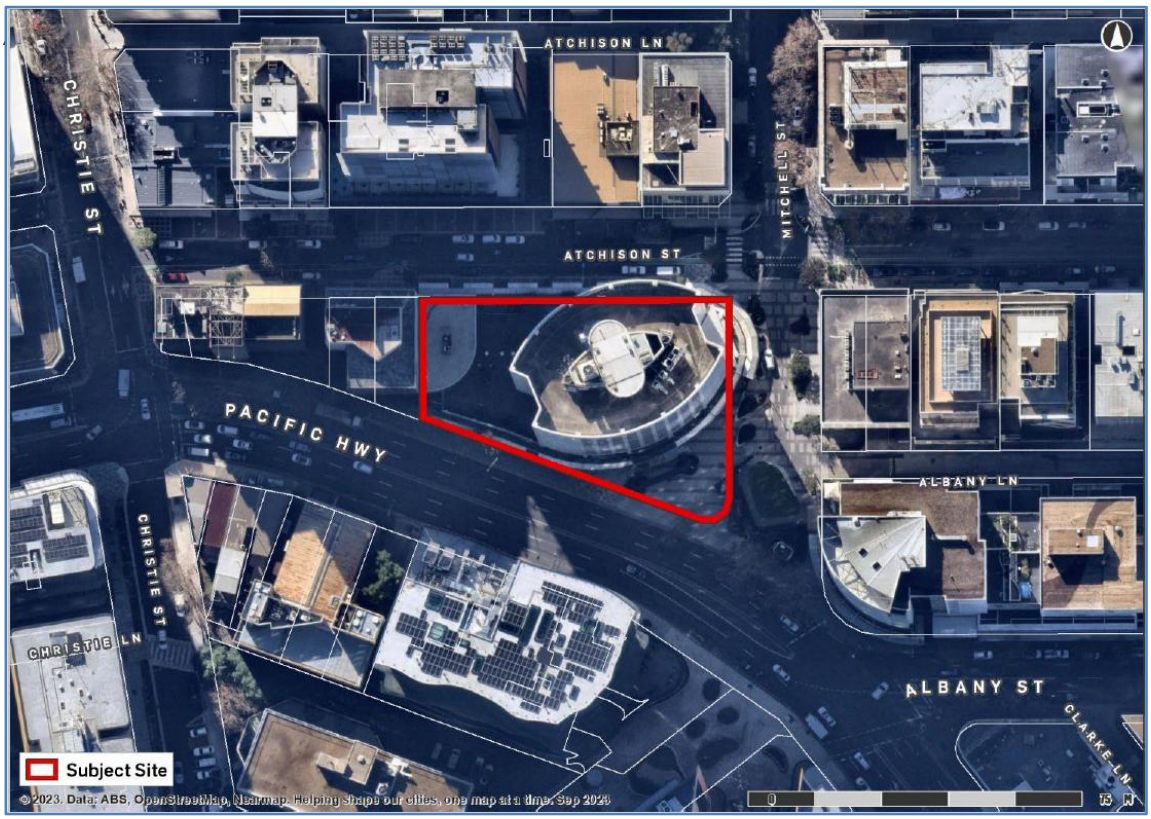


Figure 1. Site Location and Boundary

5. Environmental setting

Regional topography	The site is located on the western side of a ridge that peaks at roughly RL 92 m (Australian Height Datum, AHD). The topography surrounding the site slopes down to the south-west towards Smoothey Park and Berry's Creek which is a tributary of the Parramatta River.
Site topography	Based on the available 'NSW 2 m Elevation Contours'; the site topography generally slopes down towards the west, with surface levels of approximately RL 93 m in the east, falling to RL 88 m in the west, relative to Australian Height Datum.
Soil landscape	Reference to the Sydney 1:100,000 Soils Landscape Sheet indicates that the site is underlain by the Blacktown soil landscape which is characterised by gently undulating rises on Wianamatta Group shales and Hawkesbury shale. Local relief to 30 m, slopes are usually <5%, but up to 10%. Broad rounded crests and ridges with gently inclined slopes. Soils are a residual soil comprising yellow podzolic soils and slolths (150-300 m) on lower slopes and in areas of poor drainage; shallow to moderately deep (<100 m) red and brown podzolic soils on crests, upper slopes and well drained areas. The limitations associated with this classification are moderately reactive highly plastic subsoil with low fertility, and poor soil drainage.
Geology	Reference to the Sydney 1:100 000 Seamless Geology Sheet indicates that the site is underlain by the Ashfield Shale of the Wianamatta Group, described as black to dark-grey shale and laminite. Below the Ashfield Shale is the Hawkesbury Sandstone which typically comprises medium to coarse grained quartz sandstone with some shale and laminite bands or lenses. The Mittagong Formation is a transitional unit often found between the Ashfield Shale and Hawkesbury Sandstone and typically includes laminite and fine-grained sandstone of variable strength, ranging in thickness from about 2 m to 10 m.
Acid sulfate soils	Reference to the published national Acid Sulfate Soil (ASS) mapping and regional ASS Risk map, indicates the site is mapped as an area with 'Extremely Low Probability of Occurrence' of ASS.

Surface water	Surface water is anticipated to follow the general regional topography and drain into the local stormwater system which is likely to discharge adjacent to Greenwich at the Parramatta River located approximately 1.3 km south-west of the site.
Groundwater	One Water NSW registered groundwater bore with a current license is located approximately 420 m north of the site with a recorded standing groundwater level of 35 m depth or RL 37 m, referring to the available 'NSW 2 m Elevation Contours'. Shallower perched seepage may occur along the clay and rock surface and at strata boundaries and in defects in the rock mass. It should be noted that groundwater levels may vary over time due to climatic and human influences and will temporarily rise following periods of prolonged rainfall.

6. Summary of previous investigations

6.1 Previous reports

The following previous reports are relevant to this RAP.

6.1.1 Golder (2021)

This investigation encompasses a non-intrusive Preliminary Site Investigation (PSI) undertaken to gain a better understanding of the potential environmental risk at the site, with a focus on the potential for ground contamination to support the Planning Proposal.

The PSI involved the following key tasks:

- Review readily available on-line records held by the NSW Environmental Protection Authority (EPA);
- A search of the SafeWork NSW files for records relating to historical storage of hazardous chemicals at the site;
- Review of published maps and databases with Site coverage to establish likely surface and subsurface conditions (including geology, hydrogeology, soil landscape, topography and likelihood of acid sulfate soils);
- Review of historical certificates of title (COT) for the site;
- A review of historical aerial photographs;
- A summary of a third party (Lotsearch) report on various searches; and
- A site walkover and interview with relevant Stockland and/or Stockland management agent completed on 6 March 2017.

No intrusive investigation works were completed as part of the PSI.

The site walkover identified that the site has been used for professional services since the current building opened with tenants such as IBM occupying multiple floors. The site formerly had a café located in a separate building on the western portion of the site. A grease trap was reported to be present however this was not sighted during the inspection. In the lowest basement level an underground storage tank (UST) was identified which was used to store diesel fuel for the backup power generator. The UST was located within a separate room and the tank was accessed via two concrete floor panels. The UST was not sighted during the 2017 inspection.

The pipework for this UST was visible within the lower basement room and at ground level where the fill point is located. The UST is refuelled by gravity via above ground pipework. There was no evidence of staining on the concrete hardstand at the fill point nor in the UST lower basement room at the time of the site inspection, however, it was noted that there was no form of secondary containment located at the fill point.

The UST failed an integrity test (Premo 2017) where it was concluded that a leak (via nitrogen decay) existed in the return line weld. The risk of contamination from this leak is elevated however from a review of photographs within the integrity test report (Premo 2017) it appeared that the weld where the leak exists is above ground and that any leaks would migrate onto the concrete hardstand within the UST access room. In addition, the condition of the UST was classified as fair by SGA in 2013 and water ingress into the UST chamber was observed. The results of a subsequent integrity test (Premo 2019) indicated that the leak had been rectified. Historical leakage had the potential, albeit low, to migrate into the surrounding bedrock and present a risk to groundwater and a vapour intrusion risk. Given that the UST passed a more recent integrity test (Premo 2019) it was considered there is a lower potential for hydrocarbons to migrate to surrounding bedrock and pose a risk to groundwater or vapour intrusion risk to site occupants. As such, the ongoing risk from the UST was assessed as low.

Groundwater underlying the site was considered to flow in a south to south-westerly direction towards Sydney Harbour based on the topography of the area, however this was not confirmed.

The NSW EPA's register for contaminated land notices under the Contaminated Land Management Act 1997 (the CLM Act) performed in 2017 and 2021 did not identify any premises within 500 m of the site as being subject to current or prior notices.

The NSW EPA maintains a "List of NSW contaminated sites notified to the EPA" under Section 60 of the CLM Act. The searches performed in 2017 and 2021 indicated that there are no premises within 500 m of the site that have been identified as a contaminated site.

The NSW EPA maintains a public register of premises subject to an Environment Protection Licence (EPL) under the Protection of the Environment Operations Act 1997 (the POEO Act). The searches performed in 2017 and 2021 indicated that there was one premise currently operating under an EPL within 500 m of the site, being the North Shore rail line which was not considered to present a contamination risk to the site.

A search of the SafeWork NSW files for records relating to historical storage of hazardous chemicals at the site was requested by Golder. The results of this search indicate SafeWork NSW did not locate records of hazardous chemicals being stored at the site.

The report presented a preliminary conceptual site model (PCSM) which documented potential contamination sources comprising the UST, a former Shell service station use in part of the site (prior to existing basement excavation), diesel day tanks storage, historical demolition (including fill), and various surrounding historical commercial and industrial activities.

The report considered that the site is suitable for ongoing commercial land use. However, there was considered to be a potential that the consent authority for the proposed redevelopment may request a detailed site investigation (DSI) to confirm site suitability for the intended mixed use residential land uses. The report also states that the proposed redevelopment of the site includes excavation of additional basement levels. The UST below the lowest basement slab should be decommissioned in accordance with regulatory requirements prior to future development in accordance with the Planning Proposal.

The report mentions that as the proposed redevelopment includes enlarging the basement, the development and implementation of an unexpected finds protocol (UFP) would facilitate the management of the potential contamination sources.

6.1.2 **Douglas (2025)**

Douglas prepared a due diligence contamination testing report which documented the observations and results of opportunistic soil and groundwater testing from six boreholes constructed across the site for geotechnical investigation purposes. The results were presented in Douglas (2025).

The scope of work comprised:

- Recovery of soil samples from the drilling augers at each of the six boreholes (BH01 to BH06, refer Drawing 2, Appendix A) constructed below the lower basement concrete slab, and at regular depth intervals until fill penetration and/or auger refusal; and
- PID screening of soil samples for potential volatiles.
- Analysis of soil samples at a National Association of Testing Authorities (NATA) accredited laboratory for a combination of commonly encountered contaminants, including:
    - Eight priority heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc);
    - Polycyclic aromatic hydrocarbons (PAH);
    - Total recoverable hydrocarbons (TRH);
    - Benzene, toluene, ethylbenzene and xylenes (BTEX);
    - Total phenols;
    - Organochlorine pesticides (OCP);
    - Organophosphorus pesticides (OPP);
    - Polychlorinated biphenyls (PCB);
    - Asbestos identification; and
    - Toxicity characteristic leaching procedure (TCLP) testing for metals for preliminary waste classification purposes.

- Sampling of groundwater from three groundwater monitoring wells installed in Boreholes BH01, BH03 and BH06 using low-flow minimal drawdown sampling methods following collection of stabilised field parameters for pH, temperature, redox, electrical conductivity (EC) and turbidity;
- Analysis of groundwater samples at a NATA accredited laboratory for heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB and VOC testing. QA/QC testing included an intra-laboratory replicate, trip spike and blank; and
- Comparison of the analytical data against the applicable assessment criteria published in the national guidelines NEPC (2013), plus any other relevant guidelines. The site assessment criteria (SAC) adopted applied to a residential land use with minimal soil access opportunities.

The investigation and screening levels applied comprise levels adopted for a generic Residential B land use scenario (as an initial conservative screen), notwithstanding that the proposed development is a mixed use with multiple basement levels. The adopted SAC are listed on the summary analytical results tables in Appendix B.

The borehole logs for BH01 to BH06 are included in Appendix B. The logs recorded the following general sub-surface soil profile.

Pavement:	BH01 and BH02 comprised of a double concrete slab, 250mm and 180mm deep respectively with binding sand separating the layers. BH03-BH06 comprised of a single 150mm thick concrete slab.
Fill:	Fill materials comprised of gravels / sand to maximum depths between 0.25 m and 1.0 m bgl. Sandy clays are observed below this layer maximum depth of between 0.7 m and 2.60 m bgl. BH04 contained no clay layer and consisted of solely gravels / sands to a depth of 0.6 m bgl.
Residual soils:	No residual soil observed.
Ashfield Shale:	Typically, very low to low strength, highly weathered siltstone encountered at depths between 0.6 m and 4.8 m; overlying
Mittagong Formation:	Interbedded and interlaminated siltstone and fine-grained sandstone, of very low to high strength, at depths between 4.05 m and 14.6 m; overlying
Hawkesbury Sandstone:	Medium to coarse grained Hawkesbury Sandstone, encountered at depths of between 12.0 m and 31.5 m, typically medium to high strength. No Hawkesbury sandstone was encountered in BH03, BH05 and BH06.

Visual anthropogenic inclusions were noted in BH05 as “trace PVC fragments”. No olfactory evidence of potential contamination was observed during the drilling.

During groundwater sampling (after well development), groundwater levels were measured at 10.83 m below slab level (bsl) for BH01, 6.73 m bsl for BH03 and 3.4 m bsl for BH06 (82.4 m AHD, 82.4 m AHD and 81.3 m AHD respectively). It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time.

Based on the field and testing results presented in the report, the following comments were made:

- The soils within the site, at the tested locations (boreholes) do not exceed the SAC applicable to a Residential B land use;
- The testing focussed on fill soils at the borehole locations. The test results suggest that the fill at the boreholes preliminarily classifies as general solid waste (non putrescible) under the NSW EPA (2014) waste classification guidelines; and
- Groundwater below the site is not considered to present a risk of harm or exposure to occupants and workers at the site. However, given the marginally elevated metals, nutrients, anion and cation concentrations, it was considered likely that some form of pre-treatment will be required to reduce these concentrations prior to disposal of water collected through a dewatering scheme. It was envisaged that would be captured in a dewatering management plan. reference should also be made to the Douglas *Groundwater Impact Assessment* report.

7. Conceptual site model

The data collected during previous investigations, as summarised in Section 6, generally confirmed that for certain potential contaminant sources outlined in the PCSM in (Golder, 2021), potentially complete exposure pathways to the identified receptors exist, whereas for others, they do not. No other sources of contamination have been identified as a result of the testing reported in Douglas (2025), noting however that the report does not constitute a DSI.

The source (and associated contaminants of potential concern (CoPC)), pathway and receptor linkages are summarised in the following Tables 2, 3 and 4.

Table2: Summary of potential sources

Potential sources and associated CoPC
On-site sources
S1: Fill: fill of unknown origin was found in all six boreholes as part of Douglas (2025). All test results were below SAC, however additional sampling and testing is proposed to fill data gaps in the borehole numbers and layout: CoPC include heavy metals, TRH, BTEX, PAH, PCB, OCP, OPP, phenols and asbestos **S2:** Current buildings (noting that a previous hazardous materials management plan identified asbestos in lift friction pads, synthetic mineral fibres (SMF) in in some building materials, and PCB in light fittings: CoPC include asbestos, SMF, lead (in paint) and PCB **S3:** Below ground UST and associated infrastructure: CoPC include heavy metals, TRH, BTEX and PAH

The following potential human and environmental receptors, along with relevant potential pathways, have been identified and summarised in Table 3.

Table3: Summary of potential receptors and pathways

Potential human receptors
HR1: Current users [office workers, retail staff, residents and customers] **HR2:** Construction and maintenance workers **HR3:** End users [residents, retail staff and customers] **HR4**: Adjacent users [residents, retail staff and customers]
Potential environmental receptors
ER1: Surface water **ER2:** Groundwater
Potential pathways to human receptors
HP1: Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours
Potential pathways to environmental receptors
EP1: Surface water run-off **EP2:** Leaching of contaminants and vertical migration into groundwater **EP3:** Lateral migration of groundwater providing base flow to water bodies

A summary of the potentially complete exposure pathways for the proposed land use is shown in Table 4 below.

Table 4: Summary of potentially complete exposure pathways (proposed land use)

Source and CoPC	Exposure pathway	Receptor	Recommended action
S1: Fill beneath the slab	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR2:** Construction and maintenance workers	Current test results show concentrations below SAC. Data gap investigation recommended to complete fill testing to the NSW EPA (2022) sampling guidelines. All fill to be removed for planned basement excavation works, so formal waste classification to be undertaken to inform off-site disposal.
	EP1: Surface water run-off. **EP3:** Lateral migration of groundwater providing base flow to water bodies.	**ER1:** Surface water **HR2**: Construction and maintenance workers	
	EP2: Leaching of contaminants and vertical migration into groundwater.	**ER2:** Groundwater **HR2**: Construction and maintenance workers **HR3:** End users	

Source and CoPC	Exposure pathway	Receptor	Recommended action
S2: Hazardous building materials	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2**: Construction and maintenance workers	All hazardous building materials to be removed and a building clearance by a qualified occupational hygienist issued prior to bulk demolition. Ground surface clearance by occupational hygienist post building demolition.
S3: UST and associated infrastructure	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2**: Construction and maintenance workers **HR3:** End users	UST and associated infrastructure to be removed and validated in accordance with this RAP
	EP1: Surface water run-off. **EP3:** Lateral migration of groundwater providing base flow to water bodies.	**ER1:** Surface water **HR2**: Construction and maintenance workers	
	EP2: Leaching of contaminants and vertical migration into groundwater.	**ER2:** Groundwater **HR2**: Construction and maintenance workers **HR3:** End users	

8. Data gap assessment

Douglas (2025) comprised opportunistic soil and groundwater sampling from six (6) boreholes drilled in the lower basement for geotechnical investigation purposes. The sampling and testing did not identify contaminants in soil or groundwater warranting specific remediation. However, these boreholes were not positioned to target specific contamination risks (i.e. UST) listed in the Golder PSI report, nor adequate site coverage.

The NSW EPA (2022) sampling design guidelines recommend for a site area of 2,844 m^2 a minimum of eight (8) sampling locations for characterisation assuming no point sources of contamination. Given the presence of the UST, however noting limited opportunity for pre-removal nearby intrusive investigations, the data gap assessment will comprise an additional

three (3) boreholes strategically positioned for site coverage and to target proximate to the UST (where possible).

The scope of the data gap assessment is as follows:

- Review and incorporation of the scope and outcomes of Golder (2021) and Douglas (2025);
- The existing concrete slab will be cored at three (3) strategically positioned borehole locations;
- Progressing the borehole at each of the three locations using hand tools, through the fill into natural soils or refusal;
- Recovery of soil samples at regular depth intervals until full fill penetration and/or auger refusal;
- PID screening for potential volatiles;
- Analysis of recovered soil samples for a range of contaminants of concern based on Golder (2021) and Douglas (2025), including metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols, asbestos and VOC;
- Inclusion of quality control samples comprising replicate samples, trip spike and trip blank samples;
- Comparison of the analytical data against the adopted SAC; and
- Preparation of a DSI report with reference to the NSW EPA (2020) reporting guidelines.

A detailed site investigation (DSI) has been undertaken and reported by Douglas to address these data gaps. The DSI report will be submitted as part of the application.

9. Remediation extent

The extent of remediation based on current data comprises:

- Remediation Area 1: The UST (located underneath the lowest basement level at the site) is to be decommissioned, removed and validated. The extent of excavation to be confirmed upon removal. Any identified contaminated soils around the UST are to be waste classified to inform off-site disposal.

10. Remediation options assessment

Given that the site is proposed for deeper excavation to accommodate additional basement levels, the only viable remediation option for the UST is decommissioning and removal from site. As such, an assessment of the suitability of other remediation options has not been undertaken.

11. Remediation methodology

11.1 Sequence of remediation

The general sequence of remediation shall be determined by the Remediation Contractor with the aim of minimising the potential for cross contamination of 'clean' areas / soils with contaminated soils. This should include avoiding, wherever possible transporting or placing contaminated soil over 'clean' areas separating stockpiles of different origin / contamination profile and validating the complete removal of any contaminated material placed / potentially impacting 'clean' areas.

The general sequence of remediation will consider the following recommended sequence:

- Decommissioning of the UST (including disposal of contents);
- Excavation of UST backfill soils, stockpiling for waste classification;
- Excavation, removal and disposal of the UST and associated infrastructure (collectively the underground petroleum storage system – UPSS);
- Further excavation of any hydrocarbon impacted soils or bedrock within the planned basement excavation as determined by the Environmental Consultant, with such material waste classified for off-site disposal; and
- Validation of completion of remediation prior to bulk excavation around the location.

Roles and responsibilities are outlined in the site management plan (Appendix C).

11.2 Regulations and guidance

UPSS removal works should be conducted with reference to the following:

- NSW *State Environmental Planning Policy (Resilience and Hazards) 2021* (the 'SEPP').
- NSW *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019* (UPSS Regulation).
- EPA *Underground Petroleum Storage Systems Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019* (EPA, 2020) (UPSS Guidelines).
- EPA *Decommissioning an underground petroleum storage tank or system*, Fact Sheet, September 2021 (EPA, 2021).
- EPA *Sampling Design, Part 1: Application* and *Part 2: Interpretation,* August 2022 (EPA, 2022).
- EPA *Contamination Assessment of Service Station Sites, Minimum Sampling Requirements*, July 2023. (EPA, 2023).
- SafeWork NSW *Notifications for Schedule 11 Hazardous Chemicals and Abandoned Tanks – Guidance Material*, Catalogue No. SW08219 (SafeWork SW08219).
- SafeWork NSW safety alert WC01188, *Potential risks when removing underground storage tanks*.
- Standards Australia *Safety in welding and allied processes - Fire precautions (*AS 1674.1) [Standard], 1997. (AS 1674.1).

- Standards Australia *The Storage and Handling of Flammable and Combustible Liquids* (AS 1940–2017) [Standard], 2017. (AS 1940–2017).
- Standards Australia *The Removal and Disposal of Underground Petroleum Storage Tanks* (AS 4976–2008) [Standard], 2008. (AS 4976–2008).

11.3 Consent and notifications prior to decommissioning

The following consent / notifications are required prior to decommissioning:

- Notification of Council and SafeWork NSW.
- The UPSS Guidelines recommend that consultation be undertaken with the local council for any requirements and/or approvals necessary for the proposed UPSS removal and/or remediation works. The below standard requirements apply for remediation work, and should apply to the works at the site:
    - The UPSS Regulation requires the person responsible for the storage system to advise the relevant local council at least 30 days prior to the proposed decommissioning of the UPSS.
    - The SEPP provides requirements for consent or notification of Category 1 and Category 2 remediation. The remediation category should be confirmed by an appropriately qualified planner in accordance with Chapter 4 of the SEPP. In brief:
        - Category 1: A person must not carry out Category 1 remediation work except with the consent of the consent authority.
        - Category 2: A person may carry out Category 2 remediation work without the consent of the consent authority. Notification must be provided at least 30 days before the commencement of the work.

11.4 Work health and safety (WHS)

Any residual flammable vapour in a tank can be ignited resulting in fire and explosion. Contaminants can present a risk to people through inhalation, ingestion, or dermal contact. This is in addition to general construction / demolition hazards associated with the physical removal works.

To manage these risks the following controls must be implemented:

- The contactor must be suitably qualified and experienced in UPSS removal. They must hold an unrestricted demolition licence with chemical demolition authorisation as per (SafeWork, SW08219). The person holding the unrestricted licence must be on-site supervising during the removal work.
- The Contractor is to develop appropriate safety controls, including safe work method statements (SWMS), or similar.
- The works area is to be controlled to prevent unauthorised access during removal works.
- All workers are to be inducted and made aware of the WHS controls.
- Management and monitoring of explosive gas concentrations in accordance with AS 4976–2008.

- Management of the stability of the excavation and its backfilling (if required), including protection of adjacent structures. Engineering advice should be sought as required.
- No smoking on the site.
- No food consumption is to occur at the site. Drink containers should be stored appropriately to prevent their contact with potentially contaminated soil or liquids.
- No-one is to enter the tank; potentially unstable excavations or any excavation greater than 1.5 m deep.
- Appropriate personal protective equipment (PPE) must be worn. This should include clothing and gloves to minimise physical contact with potentially contaminated soils and water.
- All potentially contaminated soils and water should be managed to prevent its off-site migration, which could result in exposure to people and the environment off the site.

11.5 **UPSS decommissioning and removal**

Decommissioning of the UPSS by a suitably qualified Contractor by the following process:

- Review by the Contractor of any relevant drawings showing location of the UPSS, including the UST and associated pipework (if these become available).
- Undertake site investigation by the Contractor to identify the location and extent of the UPSS (including pipework) and potential underground services within the excavation area as required to assist in planning for the works.
- Pumping out of all fluids from the tank and disposal to an appropriately licensed liquid waste facility.
- Purging vapours from the UPSS in accordance with AS 4976–2008, for example by the water displacement method or eduction with an inert gas such as nitrogen until readings with a calibrated gas meter are less than 5% of the lower explosive limit (LEL).
- Continue monitoring for flammable gases during any cutting or removal of the tank, air monitoring should be undertaken to assess whether any potential flammable / explosive vapours are within or near to the tank. Work is to cease if gas is recorded at or above 5% of the LEL, and is only to recommence when appropriate action has been undertaken to reduce gas levels to below this level.
- Removal of UPSS pipework and other infrastructure, this should be removed prior to the tank being removed unless there is certainty that it can be reached after tank removal.
- Planning for safe removal of the tank. Given the access restrictions it may not be possible for the tank to be removed in one piece, in which case it will require cutting prior to removal. Considerations at planning stage include:
    - If the UST is to be cut, the method to be used, and the need for a hot works permit (e.g. if the cutting method presents a potential spark risk). Note AS 1940 specified information required in a work permit.
    - If the tank is proposed to be removed in one piece, checking to ensure it can withstand lifting / transport prior to removal.
- Removal of the tank (e.g. using chains or lifting lugs), destruction and appropriate off-site disposal with reference to AS 4976 (2008).

- Inspection and photographing of the tank and pipework to record their condition.
- If the tank is to be cut and/or cleaned on-site all removed solids and liquids must be captured for off-site disposal.
- A competent person should scrap the tank and issue a tank scrapping certificate (tank cannot be set to a metal recyclers).

11.6 Excavation and validation testing of tank pit

The following steps are to be undertaken for the excavation of soils and validation of the tank pit:

- Inspection by the Environmental Consultant of all UPSS infrastructure.
- Excavation by the Contractor of backfill from the tank pit, which typically comprises a sandy fill used to support the tank. Placement of excavated spoil onto the concrete slab, into a skip or a designated, plastic lined stockpile area with appropriate erosion controls.
- Assessment for apparent signs of gross contamination (such as free product, strong odours or soil / rock with high photoionization detector (PID) results) by the Environmental Consultant comprising:
    - Inspection by the Environmental Consultant of the tank pit and the collection of samples from the base, various depths on the walls and below the pipework recovered with the assistance of the Contractor's plant.
    - Screening of soil samples collected from various locations in the excavation by the Environmental Consultant using a calibrated PID to assess for potential gross impact.
    - The Environmental Consultant should advise the Contractor of any signs of gross contamination which may trigger additional excavation prior to validation sampling.
- Further excavation of materials with apparent signs of gross contamination by the Contractor if considered necessary and practicable.

If signs of gross contamination, such as free product, strong odours, or soil / rock with high PID results are recorded, further excavation and stockpiling of the impacted materials should be considered. The Contractor should assess their ability to conduct the further excavation based on site restrictions and discuss with the Environmental Consultant and Principal's representative:

- If water with signs of gross contamination is present in the tank pit it should be sampled by the Environmental Consultant and then pumped out by the Contractor and disposed of to an appropriately licensed liquid waste facility.
- Collection and analysis of validation samples by the Environmental Consultant in accordance with Section 13 with the assistance of the Contractor (note sample(s) collected as part of the assessment for signs of gross contamination above may be used for this purpose subject to them meeting the validation sampling requirements and no further excavation having occurred at their source location).
- Assessment by the Environmental Consultant of laboratory results relative to the SAC, and advising their client of the results.
- If practicable, excavation of soil / rock in which contamination is recorded above the SAC, either immediately or following backfill of the excavation.

- Continue validation sampling, and if necessary, excavation of the tank pit until either all results are less than the SAC, or the target waste classification criteria, or limits of excavation are reached.
- Sampling and analysis of the stockpiled (or if preferred in situ) soil / rock by the Environmental Consultant as follows:
  - Sampling frequency: generally one sample per 25 m^3 of spoil, or in accordance with the NSW EPA (2022) sampling guidelines.
  - Analytes: metals, TRH, BTEX, PAH, VOC.
  - Quality control (QC): replicate samples as required to provide the overall frequency in accordance with Section 13.
- Preparation of a formal waste classification report to facilitate disposal of the excavated spoil.
- Disposal to a nominated landfill under the waste classification designated.

12. Assessment criteria

12.1 Remediation and excavation works

The remediation works are to be validated by the Environmental Consultant by means of visual inspection, field screening, recovery and analysis of samples and review of any available plans as set out in this report.

All fill / soil tested as part of the validation process is proposed to be excavated and disposed off-site to accommodate the proposed basement deepening. Therefore, all testing of fill and other soils will be to facilitate off-site disposal. The following table provides a summary of the criteria against which test data will be assessed.

Table 2: Assessment Criteria

Item	Assessment criteria
Existing fill or identified contaminated soils (such as backfill around the UST), sampled in situ or in stockpile form.	Waste classification criteria as per the NSW EPA (2014) waste classification guidelines.
Existing natural soils and bedrock, not considered impacted with contaminants, sampled in situ or in stockpile form.	Assessed against the POEO Act (VENM definition) and typical background concentrations for a VENM classification. Alternatively, assessment against an applicable NSW EPA Resource Recovery Order (RRO).

12.2 Site assessment criteria

The SAC will apply to the assessment of analytical results for the data gap investigation.

The SAC to be applied are informed by the proposed land use and development intentions which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The investigation and screening levels to be applied comprise levels adopted for a generic Residential B land use scenario (as an initial conservative screen), notwithstanding that the proposed development is a mixed use with multiple basement levels. The derivation of the SAC is in Appendix D, and these are consistent with the SAC adopted in Douglas (2025).

13. Validation plan

13.1 Data quality objectives

The data quality objectives (DQO) for the validation plan are included in Appendix E.

13.2 Validation assessment requirements

The following site validation work will be required:

- Field assessment by the Environmental Consultant comprising:
  - Visual inspection, including taking photographs for record purposes;
  - Collecting validation samples from excavations resulting from the removal of contaminated soils, including contaminated soil stockpile footprints (if relevant); and
  - Collecting validation / characterisation samples from the tank pit.
- Laboratory analysis of validation samples at a NATA accredited laboratory for:
  - The CoPC relevant to the remediation area; and
  - Quality control (QC) samples.
- Comparison by the Environmental Consultant of the laboratory results with the SAC and/or other assessment criteria as discussed in Section 12; and
- Preparation by the Environmental Consultant of a validation report detailing the methods and results of the remediation works and validation assessment.

13.3 Visual inspections

All areas to be assessed and validated will first be subject to a visual inspection by the Environmental Consultant.

13.4 Validation / VENM sampling

The sampling frequency will depend on the volume or area to be assessed and the previous results. The following approximate sampling frequencies will be adopted but may be modified by the Environmental Consultant to consider previous results, where applicable, and findings from the visual inspections.

Small to medium excavations (base <500 m^2) (i.e. the UST excavation):

- Base of excavation: one sample per 25 m^2 or part thereof, with a minimum of three samples where the base of the excavation is fill rather than natural soils;
- Sides of excavation: one sample per 10 m to 20 m length or part thereof with a minimum of one sample per wall. Additional samples will be collected at depths of concern where there is more than one depth of concern, with a minimum of one sample per 1.5 m depth in fill; and
- Fuel lines associated with the UST: one sample per 5 m (linear).

For other contaminated materials encountered and managed under the unexpected finds protocol (Section 16.3) the frequency can be modified, as considered appropriate by the Environmental Consultant.

Where contaminated soils are stored or treated on bare soils, the footprint of the stockpile will require validation following removal of the contaminated soils.

Validation samples will be analysed by a NATA accredited laboratory for the relevant CoPC relevant to the remediation area.

Validation sample test results will be compared to the assessment criteria discussed in Section 12. Where the criteria are considered to have not been met, the remediation excavation(s) may be expanded to 'chase-out' impacted material, as advised by the Environmental Consultant, with the validation sampling then continuing into the extended excavation.

It is envisaged that at the completion of fill, UST and associated infrastructure removal, and validation results meeting the SAC, the natural bedrock can be assessed against virgin excavated natural material (VENM) criteria defined by the NSW EPA. The validation sampling can be utilised as part of the assessment process, supplemented with additional sampling and testing where needed. Once a VENM classification is reported, all deeper excavated materials are considered to be covered by the VENM classification report.

In the event that contamination extends beyond site boundaries or in areas that can't be practically chased out (e.g. under buildings), validation samples will be taken at the limit of excavation. Notwithstanding that there may be residual contamination present. Advice may need to be obtained from a qualified geotechnical or structural engineer regarding excavation and/or structure stability if excavations approach site boundaries and/or existing structures.

14. **Waste disposal**

Disposal of waste must be to an appropriately licensed waste facility, as per *Protection of the Environment Operations Act 1997* NSW (POEO Act) and the *Protection of the Environment (Waste) Regulation 2014* NSW. For the purpose of this RAP, waste comprises all excavated soils and bedrock that do not meet the definition of VENM.

Any waste disposed off-site must be initially classified by the Environmental Consultant in accordance with:

- NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, 2014a);
- NSW EPA *Waste Classification Guidelines, Part 2: Immobilisation of Waste* (NSW EPA, 2014b);
- NSW EPA *Waste Classification Guidelines, Part 4: Acid Sulfate Soils* (NSW EPA, 2014c); and
- NSW EPA *Addendum to the Waste Classification Guidelines (2014) - Part 1: Classifying Waste* (NSW EPA, 2016) [addendum for per- and poly-fluoroalkyl substances (PFAS)].

Samples will be collected from stockpiles / in situ fill at various depths to characterise the full depth of the material. The frequency is to be determined by the Environmental Consultant based on the risk of contamination and heterogeneity of the material.

For stockpiles comprising similar materials and a:

- Volume up to 200 m^3: a recommended minimum frequency of one sample per 25 m^3, with a minimum of three per stockpile (NSW EPA, 2022); or
- Volume greater than 200 m^3: a recommended minimum frequency of one sample per 25 m^3, with a minimum of 12 samples OR a minimum of 10 samples and calculation of the 95% upper confidence limit of the arithmetic mean for all applicable analytes (NSW EPA, 2022). Note that this does not apply to stockpiles impacted, or potentially impacted, by asbestos. For stockpiles greater than 200 m^3 which are impacted, or potentially impacted, by asbestos the Environmental Consultant shall provide guidance in accordance with NSW EPA (2022).

It may be possible to classify excavated soil / fill for reuse on another site under a relevant NSW EPA resource recovery order (RRO) so that it can be used on other sites under the requirements of the corresponding NSW EPA resource recovery exemption (RRE). For this option, the frequency of sampling should be in accordance with the relevant RRO and the contaminants to be analysed will be determined by the Environmental Consultant. The Environmental Consult will provide a report confirming the suitability of the spoil for reuse under a RRO, or otherwise.

All waste must be tracked by the Remediation Contractor from 'cradle to grave'. Copies of all consignment notes / disposal dockets (or similar) and environment protection licences for receipt and disposal of the materials must be maintained by the Remediation Contractor as part of the site log and must be provided to the Environmental Consultant for inclusion in the validation report.

15. Quality assurance and quality control

Field quality assurance and quality control (QA/QC) testing will include the following:

- 10 % sample intra-laboratory analysis, analysed for the same suite as primary sample;
- Rinsate samples (where re-useable sampling equipment is used), analysed for the suite of analytes analysed by the majority of the primary samples; and
- Trip spike and trip blank samples (analysed for BTEX) (approximately one per batch of samples where volatile contaminants are CoPC).

The laboratory will undertake analysis in accordance with its NATA accreditation, including in-house QA/QC procedures:

- The QC analytical results will be assessed using the following criteria:
  - Sampling location rationale met the sampling objective;
  - Standard operating procedures (SOP) are followed;
  - Appropriate QA/QC samples are collected / prepared and analysed;
  - Samples are stored under secure, temperature-controlled conditions;
  - Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory;
  - Conformance with specified holding times;
  - Accuracy of spiked samples within the laboratory's acceptable range (typically 70-130% for inorganic contaminants and greater for some organic contaminants);
  - Field and laboratory duplicate, and replicate samples will have a precision average of +/- 30% relative percentage difference (RPD); and
  - Rinsate samples will show that the sampling equipment (if used) is free of introduced contaminants, i.e. the analytes show that the rinsate sample is within the normal range for deionised water.

16. Management and responsibilities

16.1 Site management plan

A general site management plan for the operational phase of site remediation is included in Appendix CD. The management plan includes soil, noise, dust, work health safety (WHS), remediation schedule, hours of operation and incident response. The Remediation Contractor is to implement the general site management plan for the duration of remediation works by incorporating the plan into their over-arching construction environmental management plan (CEMP).

16.2 Site responsibilities

The site management plan (Appendix C) provides a summary of the general program management and associated responsibilities. Contact details for key utilities are also included in the event of needing to respond to any incidents.

16.3 Contingency plan and unexpected finds protocol

Plans for contingency situations (e.g. encountering asbestos in fill), along with an unexpected finds protocol for dealing with unexpected finds during remediation work / earthworks, are included in Appendix F.

17. Validation reporting

17.1 Documentation

The following documents will need to be collated and reviewed by the Environmental Consultant as part of the validation assessment (including those items that are prepared by the Environmental Consultant):

- Any licences and approvals required for the remediation works (Remediation Contractor);
- Waste classification report(s) (Environmental Consultant);
- Transportation Record: comprising a record of all truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g. general site raising, service trenches, etc.) (Remediation Contractor);
- Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site (Remediation Contractor). Note: A record of the building materials disposed off-site is also to be kept and provided to the Principal, on request;
- Records relating to any unexpected finds and contingency plans implemented (Remediation Contractor);
- Laboratory certificates and chain-of-custody documentation;
- Inspections records from the Environmental Consultant; and
- Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities (Remediation Contractor).

17.2 Reporting

A validation assessment report will be prepared by the Environmental Consultant in accordance with NSW EPA (2020).

The validation report shall describe the remediation approach adopted, methodology, results and conclusion of the assessment and make a statement regarding the suitability of the site for the proposed mixed-use commercial and residential development.

18. Discussion

In support of the pending SSDA and pursuant to recent discussions, preparation of a Detailed Site Investigation (DSI) report is recommended, incorporating the scope of the data gap investigation outlined herein. As stated herein a DSI is currently being undertaken by Douglas.

19. Conclusions

As stated in Sections 6 and 7, Douglas has demonstrated that the site is not significantly impacted by soil contamination and there is no evidence of groundwater contamination. As a result, it is considered that the site can be made suitable for the proposed mixed-use residential development subject to implementation of this RAP.

On the basis of the information presented in this report and the DSI report, Douglas considers that a long-term environmental management plan is not required for the site, as any identified contamination associated with the sources identified in the CSM will be removed as part of proposed basement excavation.

20. References

CRC CARE. (2019a). *Remediation Action Plan: Development - Guideline on Establishing Remediation Objectives*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

CRC CARE. (2019b). *Remediation Action Plan: Development - Guideline on Performing Remediation Options Assessment*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

Douglas. (2025). *Report on Contamination Testing - 601 Pacific Highway, St Leonards, NSW*. Reference 86230.01.R.002.Rev1 Dated 24 October 2025.

Douglas. (2025). *Report on Geotechnical Investigation - 601 Pacific Highway, St Leonards, NSW*. Reference 86230.01.R.001.Rev1 Dated 24 October 2025.

EPA. (2014). *Waste Classification Guidelines*. NSW Environment Protection Authority.

EPA. (2021). *Decommissioning an underground petroleum storage tank or system, Fact Sheet*. September 2021: NSW Environment Protection Authority.

EPA. (2022). *Sampling Design, Part 1: Application; Part 2: Interpretation*. NSW Environment Protection Authority.

EPA. (2023). *Contamination Assessment of Service Station Sites, Minimum Sampling Requirements*. NSW Environment Protection Authority.

Golder. (2021). *Preliminary Site Investigation - 601 Pacific Highway, St Leonards, NSW*. Reference 1792109-002-R-Rev1 Dated 24 June 2021.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (2014a). *Waste Classification Guidelines, Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2014b). *Waste Classification Guidelines, Part 2: Immobilisation of Waste*. NSW Environment Protection Authority.

NSW EPA. (2014c). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW Environment Protection Authority.

NSW EPA. (2014d). *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014*. NSW Environment Protection Authority.

NSW EPA. (2016). *Addendum to the Waste Classification Guidelines (2014) - Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

NSW EPA. (2022). *Sampling Design, Part 1: Application; Part 2: Interpretation*. NSW Environment Protection Authority.

Standards Australia. (2008). *The removal and disposal of underground petroleum storage tanks*. (AS 4976) [Standard].

Sydney Metro. (2021). *Sydney Metro Underground Corridor Protection Technical Guideline*. April 2021.

21. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at 601 Pacific Highway, St Leonards NSW in line with Douglas' proposal dated 22/10/2025 and acceptance received from Hee-Jung Yoon of Stockland Development Pty Limited dated 22/10/2025. The work was carried out as A variation has been procured under Douglas Partners' main Geotechnical contract. This report is provided for the exclusive use of Stockland Development Pty Limited for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

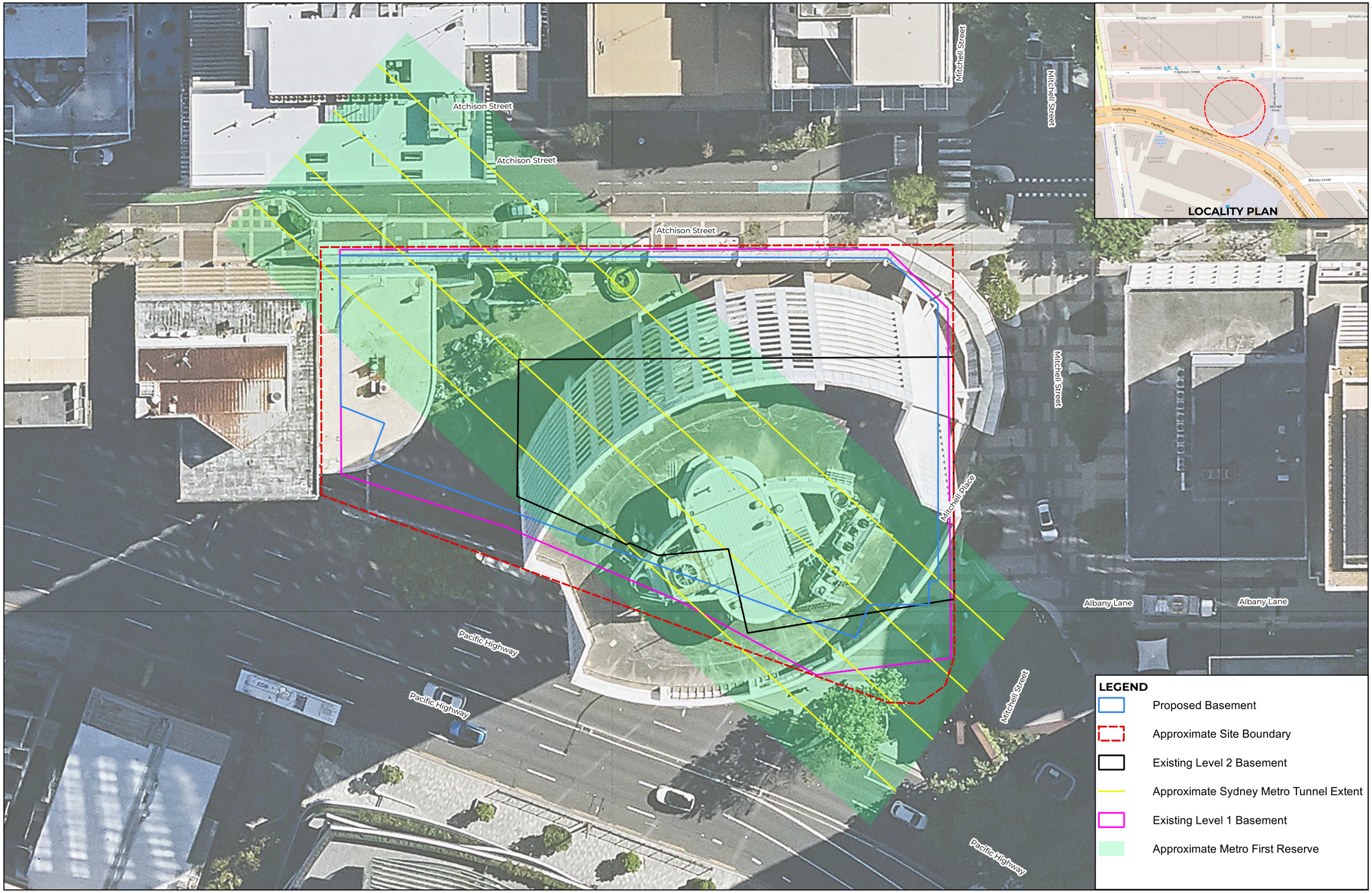
This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Drawings

About this Report



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	28.10.2025	PW

SCALE: 0 4 8 12 16 20 m — 1:400 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Stockland Development Pty Limited

NOTE:
1: Basemap from Metromap (Dated 13.03.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Proposed Mixed Use Residential Building

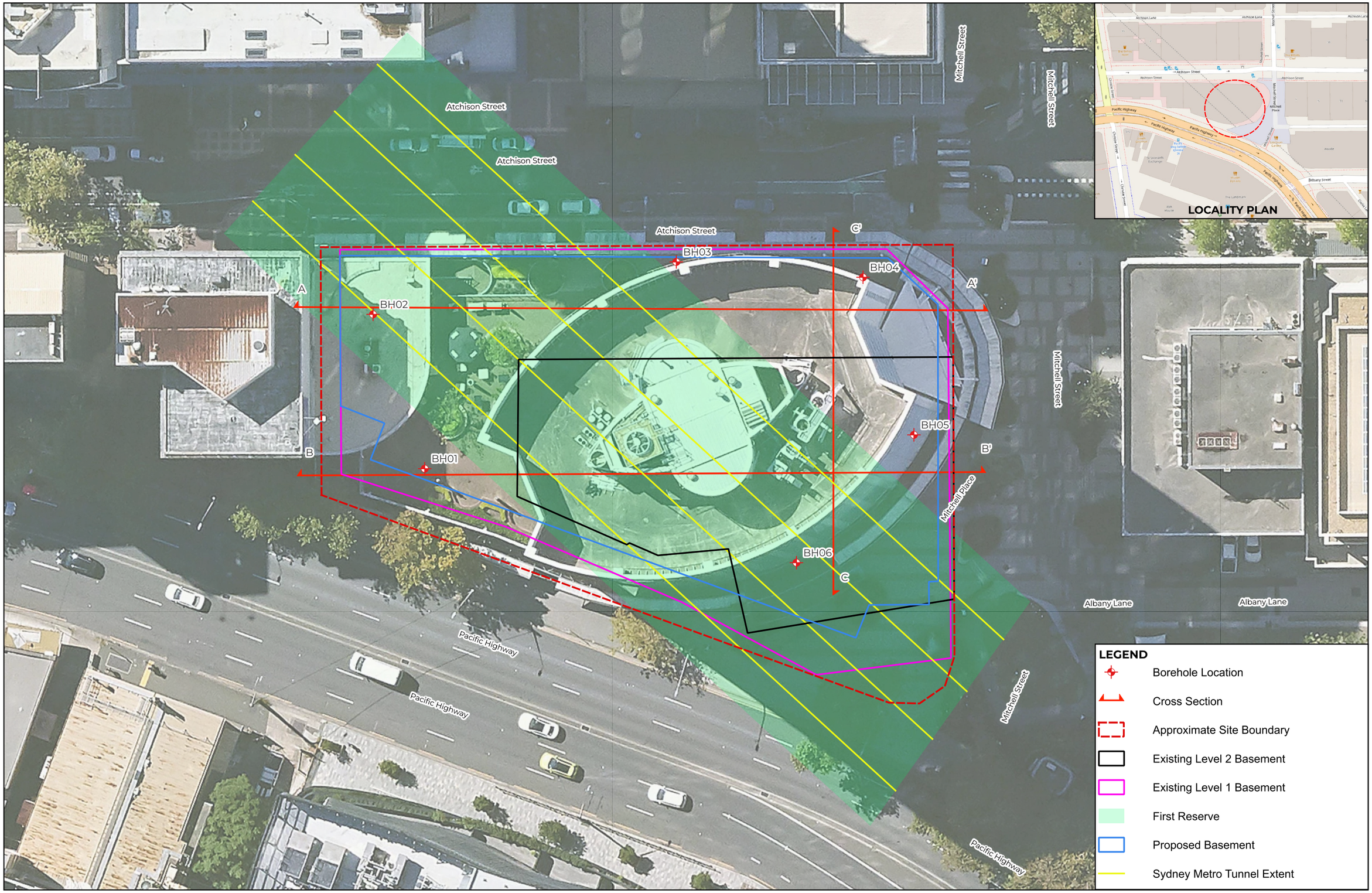
PROJECT ADDRESS:
601 Pacific Highway, St Leonards NSW

DRAWING TITLE:
Site Layout

PROJECT NO: **86230.03**

DRAWING NO: **1**

REVISION: **0**



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0	INITIAL ISSUE	15.04.2025	EC

SCALE: 0 4 8 12 16 20 m
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Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Stockland Commercial Property

NOTE:
1: Basemap from Metromap (Dated 13.03.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Residential Development

PROJECT ADDRESS:
601 Pacific Highway, St Leonards

DRAWING TITLE:
Test Location Plan

PROJECT NO: **86230.01**
DRAWING NO: 2
REVISION: **0**

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix B

Previous Investigation Information

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING AND REMARKS: TEST TYPE	TESTING AND REMARKS: RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0.25	CONCRETE; reinforcement 8mm, 2 slabs 130mm thick and 90mm thick (low), second slab has no reinforcement observable, 10mm blinding sand separating slabs.		FILL	NA	NA		D	0.40 – 0.50					
		0.35	FILL / GRAVEL: dark grey; fine to medium, angular, igneous.						D						
	81	1	FILL / CLAY trace sand: dark grey; low to medium plasticity; fine sand.		FILL	PC	w<PL		D	0.90 – 1.00					
			2.00m: very poor compaction						D	1.40 – 1.50				Bentonite	
	80	2							D	1.90 – 2.00				Gravel	
		2.60	Continued as rock log												
	79	3									3				
	78	4									4				
	77	5									5				
	76	6									6				
	75	7									7				
	74	8									8				
	73	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW [HW, MW, SW], FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0			Bentonite	
	81	1													1				
	80	2													2				
		2.60	SILTSTONE: dark grey, indistinct, bedded; (horizontal). Ashfield Shale.			2.60		100	100		2.87m: JT, 70°, PR, CN, SM 3.23m: JT, 70°, PR, CN, SM,				3	PLT	PL(A)=0.62MPa		
	79	3						100	100		3.00m: Very minimal water loss				3	PLT	PL(A)=0.78MPa		
		4					M	100	100		3.72m: JT, 70°, PR, CN, SM,				4	PLT	PL(A)=0.65MPa		
	78	4.54													4	PLT	PL(A)=0.62MPa		
		4.54	SANDSTONE: grey, fine to medium grained, indistinct bedding; siltstone ~5 - 10%. Mittagong Formation.		FR						4.09m: JT, 30°, PR, CN, SM,					PLT	PL(A)=0.98MPa		
		5				5.00	L	100	100		4.70m: Water loss ~20%				5	PLT	PL(A)=0.28MPa		
	77					5.60													
		6					H	95	100		5.70m: Water loss ~30-40%				6	PLT	PL(A)=1.1MPa		
	76	6.65														PLT	PL(A)=1.2MPa	Gravel	
		6.70				6.70													
		7					L	100	90		7.30m: Water loss 80-100% recovering to ~40%				7	PLT	PL(A)=1.1MPa		
	75					7.65					7.55-7.65m: B, 5°, PR, CN, RF, x3								
		8					H	100	93		8.03m: B, 10°, PR, CN, RF 8.25m: B, 10°, PR, CN, RF 8.40m: B, 10°, PR, CN, RF				8	PLT	PL(A)=1.6MPa		
	74				FR	8.60					8.62-8.70m: B, 0°, PR, RF, x4								
						8.65													
		9					M	100	100		8.90m: Water loss 60-90% 9.10m: Water loss ~10-20%				9	PLT	PL(A)=0.73MPa		
	73							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, MW, SW, FR; DW)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.2, 0.6, 2.0)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11					M	100	100		10.80m: Water loss ~20-30%				11	PLT	PL(A)=0.76MPa	Gravel	
	71					11.50		100	100							PLT	PL(A)=0.74MPa		
		12.00	SANDSTONE: grey, medium to coarse grained, indistinct bedding. Hawkesbury Sandstone.		FR										12				
	70						H	100	100							PLT	PL(A)=1.1MPa		
	69	13													13	PLT	PL(A)=1.1MPa		
	68	14				14.20		100	100						14				
						14.25	H - VH									PLT	PL(A)=3.1MPa		
	67	15	Borehole discontinued at 14.80m depth. Target depth reached.																
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 2



2.60-7.00 m depth



7.00-12.00 m depth

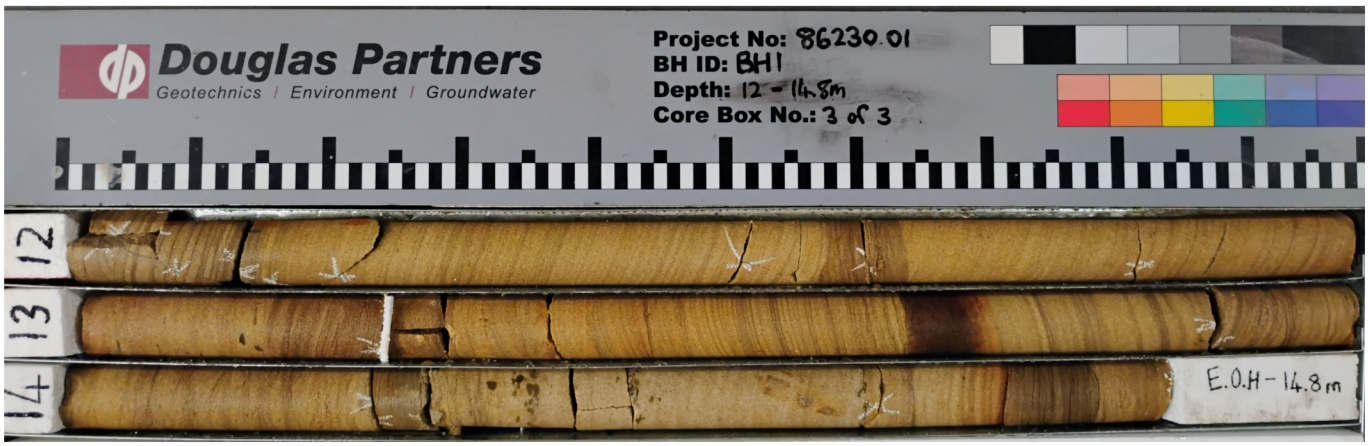
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 2



12.00-14.80 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
		0.18	CONCRETE; 2 layers reinforcement 8mm and 4mm.			NA	NA						
	82	0.40	FILL / Gravelly SAND with clay: brownish-grey; fine to medium; medium, sub-angular, igneous gravel.		FILL	ND	M						
		0.90	FILL / Clayey SAND trace gravel: dark grey; fine to medium; low to medium plasticity clay; fine to medium, angular, igneous gravel.		FILL		D						
		1.10	FILL / CLAY trace sand trace gravel: dark grey; low to medium plasticity.		FILL		w<PL						
	81		Continued as rock log								1		
	80										2		
	79										3		
	78										4		
	77										5		
	76										6		
	75										7		
	74										8		
	73										9		

28/03/25 No free groundwater observed whilst augering

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 28/03/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
82	0	Continued from soil log												0				
	1	SILTSTONE: dark grey, indistinct bedding. Ashfield Shale.		FR	1.10	L	100	100		1.33m: JT, 40°, PR, CN, SM				1	PLT	PL(A)=0.12MPa		
81	2				2.00		100	100						2	PLT	PL(A)=0.14MPa		
	2.50														PLT	PL(A)=0.32MPa		
80	2.63				2.63					2.50m - 3.60m: Water loss <10%					PLT	PL(A)=0.60MPa		
	3			SW		M	88	100		3.27m: JT, 45°, PR, CN, SM				3	PLT	PL(A)=0.66MPa		
79	4						100	100		3.90m: CZ, 0°, PR, Clay, SM, ~5mm 4.25m: CZ, 0°, PR, Clay, SM, ~5mm 4.62-4.67m: CZ, 5°, PR, Clay				4	PLT	PL(A)=0.87MPa PL(A)=0.54MPa		
78	4.72	SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation. 5.50m-5.80m: rip up clasts			5.30										PLT	PL(A)=0.48MPa		
77	5			FR										5	PLT	PL(A)=0.37MPa		
	6				6.00	H	100	100						6	PLT	PL(A)=1.2MPa		
76	7				7.60	M	100	100						7	PLT	PL(A)=1.3MPa		
75	8				8.05					8.56m: CZ, 20mm				8	PLT	PL(A)=1.4MPa		
74	9					H	100	90						9	PLT	PL(A)=1.1MPa		
73							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72		[CONT] SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.			10.00	M												
		11				10.40		100	100		10.60m CZ, 20mm				11				
	71										11.10m - 14.10m: Water loss <10%					PLT	PL(A)=0.49MPa		
		12			FR			100	100						12	PLT	PL(A)=1.4MPa		
	70						H									PLT	PL(A)=1.8MPa		
		13													13				
	69	13.37	SANDSTONE: pale grey, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					87	87							PLT	PL(A)=1.1MPa		
		13.90													14				
	68		Borehole discontinued at 14.10m depth. Target depth reached.																
		15																	
	67																		
		16																	
	66																		
		17																	
	65																		
		18																	
	64																		
		19																	
	63																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 2



10.00-14.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick.			NA			D		0.15			Bentonite	
		0.25	FILL / Gravelly SAND: yellow and grey; medium; fine to coarse, igneous, concrete gravel.		FILL	ND	w<PL		D		0.20				
		0.70	FILL / Sandy CLAY trace gravel: dark grey; low to medium plasticity; fine to coarse sand; fine gravel; shale.								0.40				
	81	1	Continued as rock log								0.50				
	80	2									1				
	79	3									2				
	78	4									3				
	77	5									4			Sand	
	76	6									5				
	75	7									6				
	74	8									7				
	73	9									8				
											9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0	Continued from soil log																
	81	1	SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.		SW	0.70 1.00		100	100		0.75m: JT, 35°, PR, SN Fe 0.92m: JT, 85°, PR, SN Fe 0.70m - 1.80m: Water loss <10%				1	PLT	PL(A)=1.3MPa		
	80	2						100	100						2	PLT	PL(A)=0.80MPa		
	79	3						100	100						3	PLT	PL(A)=0.61MPa		
	78	4					M H	100	100		3.30m - 4.00m: Water loss ~10% 4.13-4.15m: CZ, 0°, PR, SN Clay		SPT		3.30	PLT	PL(A)=0.91MPa		
	77	4.80 5	SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding. Mittagong Formation.		FR			100	100						3.75	PLT	PL(A)=0.70MPa		
	76	6						100	100		6.08m: B, ~5°, PR, CN, RF 6.49m: JT, 15°, PR, CN, RF				4	PLT	PL(A)=0.67MPa		
	75	7				7.00	H	100	90		7.28m: B, 10°, PR, RF 7.30m: B, 5°, PR, HE 7.35m: B, 50°, PR Clay 6 mm 7.41m: B, ~20°, UN, RF 7.50m: JT, 70°, PR, HE 7.62m: JT, 85°, UN, HE 7.75m: JT, 20°, UN, Clay, ~5mm				4.75	PLT	PL(A)=0.67MPa		
	74	8						100	100		8.46m: B, 5°, ST, Clay, ~2 mm 8.79m: JT, 70°, PR, CN, RF				5 5.20	PLT	PL(A)=0.86MPa	Sand	
	73	9				9.40	M	100	84		9.45m: JT, 80-90°, CU, Clay, 1-3mm 9.60m: B, ~50°, PR, Clay, PO, 1-2mm				6	PLT	PL(A)=1.1MPa		
															7	PLT	PL(A)=0.77MPa		
															8	PLT	PL(A)=2.4MPa		
															9	PLT	PL(A)=1.5MPa		
																PLT	PL(A)=0.37MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding. Mittagong Formation.		FR		M	100	84						11	PLT	PL(A)=0.92MPa	Sand	
	71							100	100		11.55m: JT, 40°, PR, VNR Clay, RF 11.63m: CS, 30mm					PLT	PL(A)=0.84MPa		
		12									12.06m: JT, 80°, PR, CN, SM				12				
	70		Borehole discontinued at 12.10m depth. Target depth reached.																
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 2



0.70-5.00 m depth



5.00-10.00 m depth

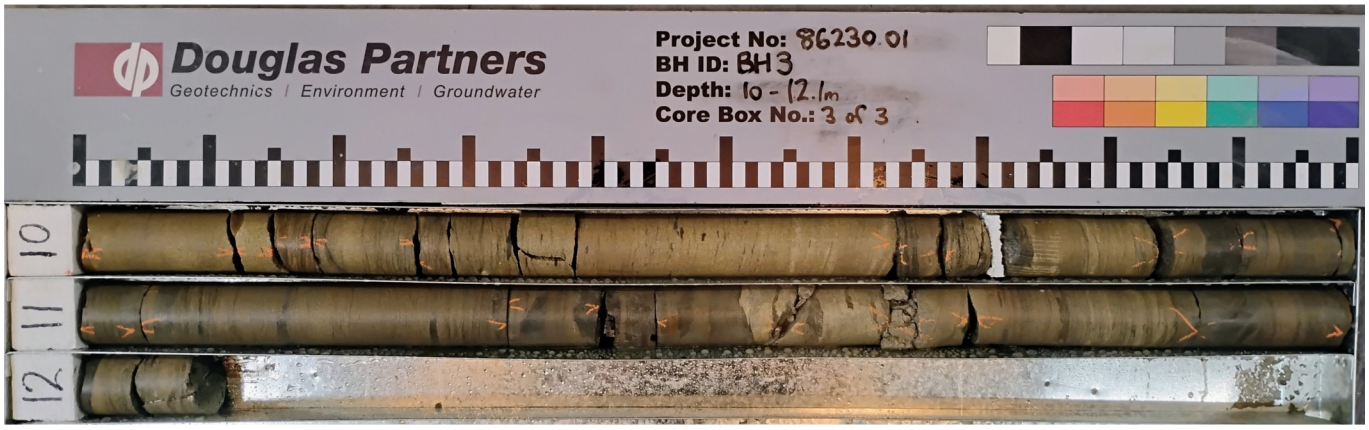
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 2



10.00-12.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 5

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
07/04/25 Water level measured at 25.2m BGL.	82	0.15	CONCRETE; 150mm thick; one layer bidirectional reinforcement (SL82).			NA	NA		D	0.15 - 0.20	0.15		
		0.23	FILL / SAND: grey; medium.		FILL	ND	M				0.20		
		0.60	FILL / Sandy GRAVEL: dark grey; fine to medium, sub-angular, igneous; fine to coarse sand.		FILL		M / W		D	0.40 - 0.50	0.40		
			Continued as rock log								0.50		
	81	1									1		
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
07/04/25 Water level measured at 25.2m BGL.	82	0	Continued from soil log												0	PLT	PL(A)=1.1MPa		
			SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			0.60		100	100							PLT	PL(A)=1.0MPa		
	81	1													1				
		2					H	100	100		1.91m: JT, 50°, PR, CN, SM				2	PLT	PL(A)=1.2MPa		
	80															PLT	PL(A)=0.68MPa		
		3									2.86m: JT, 60°, PR, CN, SM				3	PLT	PL(A)=0.75MPa		
						3.40		100	100							PLT	PL(A)=1.3MPa		
	79	4					M				3.70m: Water loss 10-20%				4	PLT	PL(A)=0.56MPa		
	4.15		SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.			4.10	L				4.15m: JT, ~70°, PR, CN, RF					PLT	PL(A)=0.22MPa		
						4.20		100	100		4.20m: Water loss <10%					PLT	PL(A)=0.85MPa		
	78	5													5				
					FR		H	100	100							PLT	PL(A)=1.2MPa		
	77	6													6				
								100	99		6.70m - 8.20m: Water loss 10%					PLT	PL(A)=1.7MPa		
	76	7				7.50	L				7.60m: JT, 70°, CU, CN, RF				7				
						7.90	M				7.66m: B, 0°, PR, RF 7.68m: B, 0°, PR, RF					PLT	PL(A)=0.13MPa		
	75	8				8.10									8				
							H									PLT	PL(A)=2.2MPa		
	74	9				9.00		100	87		8.72-8.92m: B, 0-10°, PR, RF, 7x				9				
							M				9.00-9.70m: JT, 85°, CU, CN, RF								
	73					9.90		100	100							PLT	PL(A)=0.73MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10.00	SANDSTONE: grey, pale grey, and pale brown, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.					100	100						11	PLT	PL(A)=1.1MPa		
	71	11						100	100						12	PLT	PL(A)=0.99MPa		
	70	12						100	100						13	PLT	PL(A)=0.83MPa		
	69	13					M - H	100	100						14	PLT	PL(A)=0.89MPa		
	68	13.05	SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		13.81m: B, 5-10°, PR, VNR Clay, RF				15	PLT	PL(A)=0.80MPa		
	67	14	From 14.30m: pale grey		FR			100	92		15.54m: B, 0°, PR, VNR Clay, RF 15.67m: B, 10°, PR, VNR, RF				16	PLT	PL(A)=0.73MPa		
	66	15						100	100						17	PLT	PL(A)=1.1MPa		
	65	16				17.00		100	100						18	PLT	PL(A)=1.3MPa		
	64	17					H	100	100		19.57m: B, 10°, PR, RF, iron clay 19.80m: Water loss ~20%				19	PLT	PL(A)=1.0MPa		
	63	18						100	100							PLT	PL(A)=1.1MPa		
		19																	

NOTES: [H] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	62	20	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		20.77m: CS, 10mm				20	PLT	PL(A)=1.0MPa		
	61	21									21.20m: B, ~5°, PR, Clay 2mm, RF				21	PLT	PL(A)=1.3MPa		
											21.40m: Water loss ~10%								
	60	22						100	100						22	PLT	PL(A)=1.1MPa		
	59	23					H	100	100						23	PLT	PL(A)=1.6MPa		
	58	24						100	100						24	PLT	PL(A)=1.5MPa		
	57	25			FR			100	100						25	PLT	PL(A)=1.7MPa		
	56	26				26.50	L	100	92		26.12m: JT, 90°, UN, CN, RF 26.20m: B, 5-10°, PR, Clay, RF, 3-4mm 26.26m: B, 0°, PR, Clay, RF, 1-2mm 26.57m: B, 15°, PR, Clay 1mm, RF 26.70m: B, 0°, PR, Clay 5mm, RF 26.75m: B, 0°, PR, Clay, RF, 1-2mm				26	PLT	PL(A)=0.34MPa		
	55	27				26.90					26.00m - 27.40m: Water loss 25%				27	PLT	PL(A)=0.59MPa		
	54	28					M	100	90		27.75m: CS, 10°, PR, Clay 40mm, RF 28.08m: CS, Clay 15mm 28.20m: JT, 20°, PR, Clay 4mm, RF 28.25m: B, 0°, PR, Clay, RF, 2-4mm				28	PLT	PL(A)=0.32MPa		
	53	29				29.50	M	100	76		28.70m: JT, 15°, PR, Clay 4mm, RF 28.94m: JT, 20°, PR, VNR Clay, RF 29.04-29.30m: B, 5°, PR, VNR, RF 29.36m: JT, 70°, PR, CN, RF 29.40m: JT, 15°, PR, VNR, RF 29.57-29.67m: CZ, 10°, PR 29.82m: JT, 5°, UN, VNR				29	PLT	PL(A)=0.43MPa		
																PLT	PL(A)=0.29MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 5 of 5

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	52	30	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.		FR	30.00	H	100	90		Clay, RF, 29.92m: JT, 25°, PR, Clay 6mm, RF 29.98m: JT, 15°, PR, Clay, RF, ~2mm 30.10m: Water loss 25% 30.29m: B, 5°, PR, Clay, RF, 2-4mm 30.34-30.39m: B, ~10°, UN, Clay, RF, 4-6mm 30.45m: B, 15°, UN, Clay, RF, ~2mm 30.48m: B, 10°, PR, Clay, RF, ~3mm				31	PLT	PL(A)=0.95MPa PL(A)=1.2MPa		
	51	31	Borehole discontinued at 31.50m depth.																	
	50	32																		
	49	33																		
	48	34																		
	47	35																		
	46	36																		
	45	37																		
	44	38																		
	43	39																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 4



0.60-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 4



10.00-15.00 m depth



15.00-20.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 4



20.00-25.00 m depth



25.00-30.00 m depth

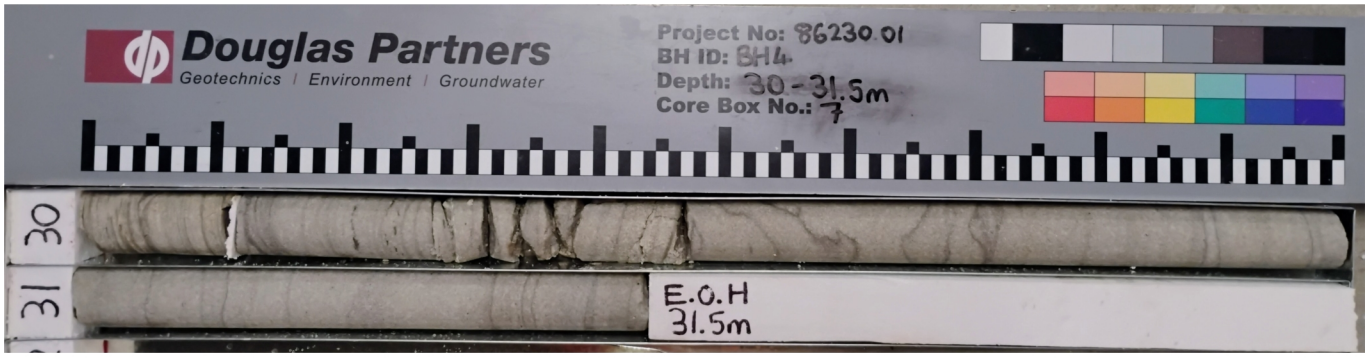
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 4



30.00-31.50 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick; one layer reinforcement 8mm (SL82).			NA	NA		D	0.15 - 0.20	0.15		
		0.25			FILL						0.20		
		0.30	FILL / SAND: yellow-grey; medium.						D	0.40 - 0.50	0.40		
			FILL / GRAVEL: grey; fine to medium, sub-angular, igneous.		FILL	ND	M				0.50		
	81	1							D	0.90 - 1.00	0.90		
		1.10	FILL / Sandy CLAY trace gravel: grey; low to medium plasticity; fine sand; fine, angular, siltstone gravel; trace PVC fragments.								1.00		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
CASING: HWT to 1m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW, PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	82	0													0				
	81	1	Continued from soil log			1.10									1				
		1.25	SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			1.25	M	81	81		1.80m: JT, 70°, PR, VNR M, SM,					PLT	PL(A)=0.77MPa		
	80	2				2.20	VL	100	80		1.90m - 3.00m: Water loss ~10%				2	PLT	PL(A)=1.5MPa		
						2.30	M - H				2.20-2.30m: CZ, M, fine to medium					PLT	PL(A)=2.3MPa		
	79	3				3.43	VL	100	60		2.76m: JT, 50-60°, PR, VNR M, SM 2.83m: JT, 50-60°, PR, VNR M, SM 2.88m: JT, 50-60°, PR, VNR M, SM 3.05-3.10m: CZ, M, medium 3.36m: B, PR, M, SM, fine to course				3	PLT	PL(A)=0.35MPa		
						3.65	L - M				3.43-3.65m: CZ, M, fine to course					PLT	PL(A)=0.16MPa		
						3.90	VL				3.75-3.78m: CZ, M, fine to course gravel					PLT	PL(A)=0.66MPa		
	78	4				4.00	L - M				4.30m - 5.90m: Water loss <10%				4	PLT	PL(A)=0.39MPa		
		4.75	SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.			4.71					3.90-4.00m: CZ, 6°, M, fine to medium					PLT	PL(A)=0.13MPa		
	77	5						100	86		4.09m: B, 0°, PR, M, 4mm 4.45m: JT, 35°, PR, VNR M, SM 4.53m: B, 0°, PR, M, SM, 1-2mm 4.67m: B, PR, M, SM, ~2mm 4.71m: B, PR, M, SM, ~2mm				5	PLT	PL(A)=1.0MPa		
				FR							5.90m - 7.50m: Water loss ~10%								
	76	6						100	100		4.74m: B, PR, M, SM, ~2mm 4.77m: B, PR, M, SM, ~2mm 5.33m: B, 5°, PR, SM 6.30m: JT, 70°, PR, CN, RF 6.56m: JT, 70°, PR, CN, RF 6.60m: B, 0°, PR, SM 6.82m: JT, 70°, PR, CN, RF 6.94m: B, 10°, PR, SM				6	PLT	PL(A)=0.69MPa		
	75	7					M - H				7.40m: B, 10°, PR, SM				7	PLT	PL(A)=1.4MPa		
	74	8						100	100						8	PLT	PL(A)=1.6MPa		
	73	9						100	100		9.23m: B, 5°, PR, SM				9	PLT	PL(A)=0.90MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.		FR	12.20	M-H	100	100		10.30m: No drilling muds, water loss ~20%				11	PLT	PL(A)=1.9MPa		
	71							100	92		10.55-1059m: CZ, Clay, coating, infill 6mm 10.66m: B, 15°, PR, Clay 10mm, SM					PLT	PL(A)=0.95MPa		
	70	12									11.57m: B, 10°, PR, M, SM				12				
	69	13				13.20	M	100	100						13	PLT	PL(A)=0.40MPa		
	68	14					H	100	95		13.40m: B, 5°, PR, Clay 1mm, SM 13.45m: JT, 80°, ST, CN, RF				14	PLT	PL(A)=1.0MPa		
											14.55m: B, PR, Clay 11mm					PLT	PL(A)=1.1MPa		
	67	15	Borehole discontinued at 14.60m depth. Target depth reached.																
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
CASING: HWT to 1m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

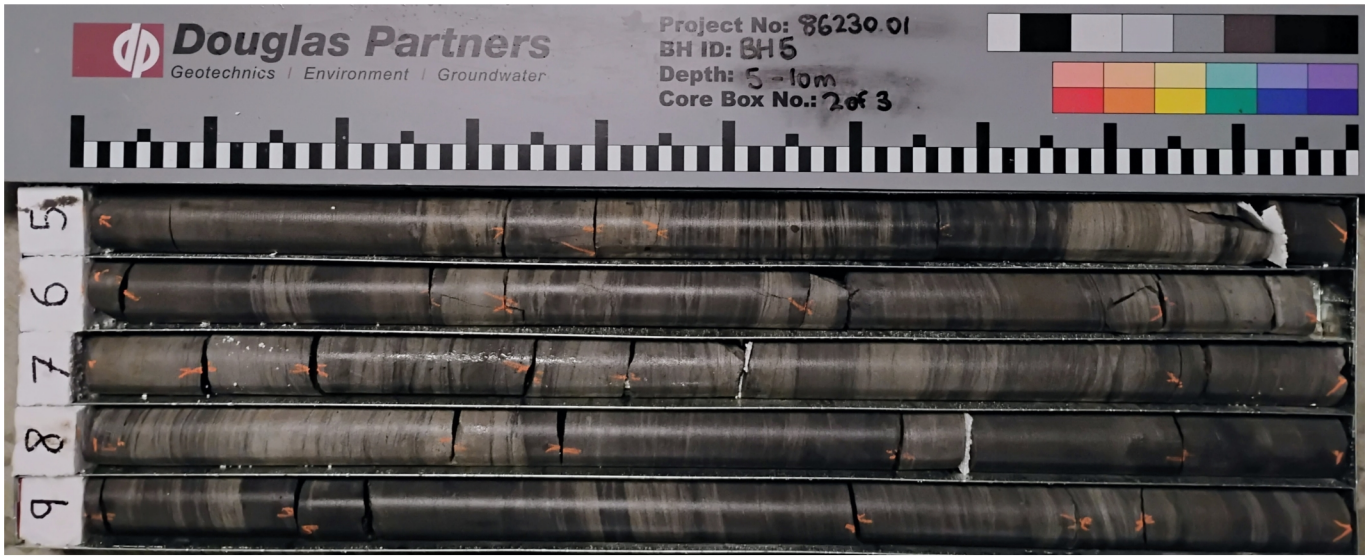
CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 2



10.00-14.60 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0.15	CONCRETE; 150m thick; one layer reinforcement (SL82).			NA	NA				0.15				
		0.25	FILL / SAND: grey-brown; medium.		FILL	ND	M		D		0.25				
		0.50	FILL / Sandy CLAY with gravel: dark grey; low to medium plasticity; fine to coarse sand; fine, siltstone gravel.		FILL		w=PL		D		0.40				
		0.65	SILTSTONE: dark grey. Ashfield Shale.								0.50				
	80	1	Continued as rock log								1			Bentonite	
	79	2									2				
	78	3									3				
	77	4									4				
	76	5									5				
	75	6									6			Sand	
	74	7									7				
	73	8									8				
	72	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 08/04/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS
81	0	Continued from soil log								
		SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			0.65		100	76		0.85m: B, 0°, PR, 1mm, SM, fines 1.15m: JT, 30°, PR, VNR, SM, fines 1.33m: JT, 30°, PR, VNR, SM, fines 1.35m: JT, 70°, PR, CN, SM 1.42m: CZ, 40mm 1.70m: Water loss <10%. no drilling mud added.
80	1						100	100		
79	2					M				
78	3						100	95		3.00m: CZ, 40mm 3.75m: CZ, 20mm 3.98m: CZ, 20mm
77	4				4.50					
	4.05	SANDSTONE: grey and pale grey, fine to medium grained, indistinct, bedded; siltstone laminations and bedding. Mittagong Formation.		FR			100	100		
76	5									
75	6						100	93		6.21m: CZ, 20mm 6.31m: CZ, 20mm
74	7					H				
73	8						100	100		
72	9						100	91		

SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
			0	PLT	PL(A)=0.94MPa	Bentonite	
			1	PLT	PL(A)=1.8MPa		
				PLT	PL(A)=0.72MPa		
			2	PLT	PL(A)=0.95MPa		
				PLT	PL(A)=0.80MPa		
			3	PLT	PL(A)=0.75MPa		
				PLT	PL(A)=0.88MPa		
			4	PLT	PL(A)=0.70MPa		
				PLT	PL(A)=0.93MPa		
			5	PLT	PL(A)=1.0MPa		
						Sand	
			6	PLT	PL(A)=2.0MPa		
				PLT	PL(A)=2.3MPa		
			7	PLT	PL(A)=1.4MPa		
			8				
			9	PLT	PL(A)=1.5MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	71	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, indistinct, bedded; siltstone laminations and bedding. Mittagong Formation.		FR		H	100	91		9.97m: CZ, 80mm 10.10m: B, 10°, PR, Clay 10mm, RF				11	PLT	PL(A)=1.3MPa	Sand	
	70	12	Borehole discontinued at 11.05m depth. Target depth reached.					100	100										
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	
	62																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 1



0.50-5.00 m depth



5.00-11.05 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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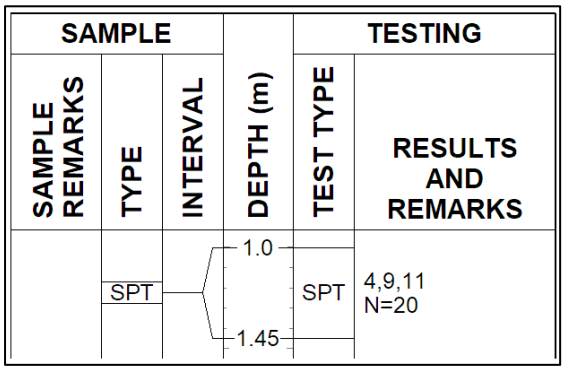
Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =*x* blows for *y* mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150
Dynamic probe super heavy, followed by blow count penetration increment in mm	DPSH/100

Groundwater Observations

	water seepage/inflow
	water seepage/outflow
	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Table E1: Summary of Laboratory Results – Priority metals, Priority PAH, Priority TRH, BTEX

			Priority metals								Priority PAH				Priority TRH						BTEX			
			Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	Total Xylenes
		PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	25	50	25	50	100	100	0.2	0.5	1	1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	**6**	**0.9**	**6**	**41**	**18**	<0.1	**45**	**370**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BD1/20250325	0 m	25/03/25	**5**	**0.6**	**7**	**41**	**15**	<0.1	**51**	**260**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH01	1.4 - 1.5 m	25/03/25	**11**	**0.5**	**4**	**37**	**20**	<0.1	**55**	**260**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	NL -	- -	4 -	400 -	- -	- -	70 -	240 -	- -	- -	0.5 -	220 -	NL -	60 -
BH02	0.13 - 0.2 m	25/03/25	<4	<0.4	**4**	**15**	**3**	<0.1	**27**	**18**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH02	0.4 - 0.5 m	25/03/25	<4	<0.4	**5**	**24**	**2**	<0.1	**62**	**27**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH03	0.4 - 0.5 m	25/03/25	**11**	<0.4	**9**	**38**	**22**	<0.1	**36**	**190**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	**120**	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH04	0.4 - 0.5 m	25/03/25	**4**	<0.4	**13**	**40**	**11**	<0.1	**47**	**130**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05	0.15 - 0.2 m	25/03/25	<4	<0.4	**2**	**5**	**2**	<0.1	**1**	**3**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05	0.4 - 0.5 m	25/03/25	<4	<0.4	**9**	**27**	**16**	<0.1	**25**	**78**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05	0.9 - 1 m	25/03/25	**5**	<0.4	**8**	**41**	**22**	<0.1	**28**	**110**	<1	<0.05	<0.5	<0.05	<25	**56**	<25	**56**	**130**	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06	0.4 - 0.5 m	25/03/25	**170**	<0.4	**6**	**25**	**30**	**0.2**	**63**	**62**	<1	<0.05	<0.5	<0.05	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	45 -	110 -	- -	- -	0.5 -	160 -	55 -	40 -
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	<4	<0.4	**5**	**46**	**4**	<0.1	**59**	**49**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	**100**	<0.4	**6**	**23**	**17**	**0.1**	**45**	**60**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Lab result

HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

HIL = Health investigation level HSL = Health screening level (excluding DC) EIL = Ecological investigation level ESL = Ecological screening level EGV = Environmental Guideline Value ML = Management Limit DC = Direct Contact HSL

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Site Assessment Criteria (SAC):

SAC based on generic land use thresholds for Residential B with minimal opportunities for soil access

Refer to the SAC section of report for information of SAC sources and rationale. Summary information as follows:

HIL	HIL-B (NEPC, 2013 or HEPA, 2025 (PFAS only))	ML	Residential, Parkland and Public Open Space (NEPC, 2013)
HSL (vapour intrusion)	HSL-A/B (NEPC, 2013)		
DC	Direct contact HSL B Residential (High density) (CRC CARE, 2011)		

Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		Metals								Metals - Dissolved								TRH				BTEX					
		Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes
	PQL	1	0.1	1	1	1	0.05	1	1	1	0.1	1	1	1	0.05	1	1	10	50	100	100	1	1	1	1	2	1
ANZG (2018) 95% LOP Fresh		13	0.2	1	1.4	3.4	**0.06**	11	8	13	0.2	1	1.4	3.4	**0.06**	11	8					950	180	80	350	75	
NEPC (2013) HSL 2-4m																		1000	1000			800	NL	NL			NL
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	**3**	<0.1	<1	**13**	**2**	<0.05	**130**	**270**	<1	<0.1	<1	**3**	<1	<0.05	**100**	**120**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1
BH03	17/04/25	**6**	<0.1	**2**	**24**	**2**	<0.05	**22**	**59**	**2**	<0.1	<1	<1	<1	<0.05	**17**	**28**	**30**	<50	<100	<100	<1	<1	<1	<1	<2	<1
BH06	17/04/25	**5**	<0.1	**9**	**36**	**8**	<0.05	**28**	**110**	<1	<0.1	<1	**3**	<1	<0.05	**15**	**41**	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1
BD1/250417	17/04/25	**6**	<0.1	**11**	**33**	**10**	<0.05	**33**	**100**	-	-	-	-	-	-	-	-	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1

Notes:

- No criterion / not defined / not tested / not applicable
- * QA/QC replicate of sample listed directly below the primary sample
- NL Not limiting
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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		PAH																									
		Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (BaP)	Benzo(b+j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	Sum of detected PAH	DDE	DDT	DDD	Aldrin	Dieldrin	Aldrin + Dieldrin (calculated)	alpha-chlordane	gamma-Chlordane	Endosulfan I	Endosulfan II
	PQL	0.1	0.1	0.1	0.1	1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh				**0.01**		16	**0.1**					**1**			**0.6**				**0.006**		**<u>0.001</u>**	**<u>0.01</u>**					
NEPC (2013) HSL 2-4m						NL																					
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH03	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH06	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/250417	17/04/25	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		OCP													OPP																	
		Endosulfan Sulphate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Methoxychlor	Mirex	alpha-BHC	beta-BHC	delta-BHC	Lindane	Sum of detected OCP	Azinphos methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Ronnel (fenchlorphos)	Fenitrothion	Fenthion	Malathion	Parathion	Parathion-methyl	Methidathion	Fenamiphos	Sum of detected OPP
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh			**0.01**		**0.01**		0.1	**0.005**	**0.04**				0.2		0.02		**0.00004**		0.01		0.15			0.2		0.05	0.004				
NEPC (2013) HSL 2-4m																																
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH03	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

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Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		PCB																																
		Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arodor 1260	Sum of detected PCB	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,2-trichloroethane	1,1,2-trichloroethylene	1,1-dichloroethane	1,1-Dichloroethene	1,2-dichloropropane	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethyl benzene	1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3,5-trimethyl benzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-chlorotoluene
	PQL	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ANZG (2018) 95% LOP Fresh					**0.3**		**0.01**				270	400	70	6,500	330		700		**3**		**85**			160	1,900	900		260	1,100	60		
NEPC (2013) HSL 2-4m																																		
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH03	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH06	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BD1/250417	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		VOC (excluding BTEX)																														
		4-chlorotoluene	4-isopropyl toluene	Bromobenzene	Bromochloromethane	Bromodichloroethane	Bromoform	carbon tetrachloride	Chloroethane	Vinyl Chloride	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Isopropylbenzene (cumene)	Cyclohexane	dibromochloroethane	Dibromomethane	Dichlorodifluoromethane	1,2-dibromoethane	hexachlorobutadiene	Bromomethane	Monochlorobenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene (vinylbenzene)	Tert-butyl benzene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane	Sum of detected VOC
	PQL	1	1	1	1	1	1	1	10	10	1	10	1	1	1	1	1	1	10	1	1	10	1	1	1	1	1	1	1	1	10	1
ANZG (2018) 95% LOP Fresh								240		100	770				30								55									
NEPC (2013) HSL 2-4m																																
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<1	<1	<1	<1	<1	<1	<1	<10	<10	**3**	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**3**
BH03	17/04/25	<1	<1	<1	<1	**5**	<1	<1	<10	<10	**32**	<10	<1	<1	<1	<1	<1	**1**	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**38**
BH06	17/04/25	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
BD1/250417	17/04/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table E2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC (excluding BTEX), Nutrients, Anions & Cations

		Nutrients								Anions & Cations	
		Nitrogen	Ammonia as N	TKN in water	Nitrate as N	Nitrite as N	NOx as N	Organic Nitrogen as N	Phosphorous	Chloride	Sulphate
	PQL	100	5	100	5	5	5	200	50	1000	1000
ANZG (2018) 95% LOP Fresh			900		1,100						
NEPC (2013) HSL 2-4m											
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	**100**	**12**	**100**	<5	<5	<5	<200	<50	**250,000**	**120,000**
BH03	17/04/25	**300**	<5	**300**	<5	<5	<5	**300**	**60**	**56,000**	**55,000**
BH06	17/04/25	**100**	**12**	**100**	<5	<5	<5	<200	**2,900**	**66,000**	**71,000**
BD1/250417	17/04/25	-	-	-	-	-	-	-	-	-	-

Notes:

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Table E3: Summary of Laboratory Results – Waste Classification

			Metals								TRH		BTEX				PAH		Phenols	OCP				
			Total Arsenic	TCLP Total Arsenic	Cadmium	Total Chromium	Lead	Mercury (inorganic)	Nickel	TCLP Nickel	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo(a)pyrene (B(a)P)	Total PAH	Total Phenolics	Scheduled Chemical Waste (standard)	Chlordane	Total Endosulfan	Total Analysed OCP	Mirex
		PQL	4	0.05	0.4	1	1	0.1	1	0.02	25	50	0.2	0.5	1	1	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Sample ID	Depth	Sample Date	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	**6**	-	**0.9**	**6**	**18**	<0.1	**45**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/20250325	0 m	25/03/25	**5**	-	**0.6**	**7**	**15**	<0.1	**51**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	**11**	-	**0.5**	**4**	**20**	<0.1	**55**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH02	0.13 - 0.2 m	25/03/25	<4	-	<0.4	**4**	**3**	<0.1	**27**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH02	0.4 - 0.5 m	25/03/25	<4	-	<0.4	**5**	**2**	<0.1	**62**	**0.07**	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	0.4 - 0.5 m	25/03/25	**11**	-	<0.4	**9**	**22**	<0.1	**36**	-	<25	**110**	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH04	0.4 - 0.5 m	25/03/25	**4**	-	<0.4	**13**	**11**	<0.1	**47**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	0.15 - 0.2 m	25/03/25	<4	-	<0.4	**2**	**2**	<0.1	**1**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH05	0.4 - 0.5 m	25/03/25	<4	-	<0.4	**9**	**16**	<0.1	**25**	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	0.9 - 1 m	25/03/25	**5**	-	<0.4	**8**	**22**	<0.1	**28**	-	<25	**140**	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06	0.4 - 0.5 m	25/03/25	**170**	<0.05	<0.4	**6**	**30**	**0.2**	**63**	**0.2**	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	<4	-	<0.4	**5**	**4**	<0.1	**59**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	**100**	-	<0.4	**6**	**17**	**0.1**	**45**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Summary Statistics																								
Min			4	0.05	0.4	2	2	0.1	1	0.07	25	50	0.2	0.5	1	1	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Max			170	0.05	0.9	13	30	0.2	63	0.2	25	140	88	87	88	177	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Mean			26	0.05	0.5	6	14	0.1	42	0.14	25	64	7	7.2	8	15	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1
Waste Classification Criteria [f]																								
CT1			100	-	20	100	100	4	40	-	-	10,000	10	288	600	1000	0.8	200	288	<50	-	60	-	-
SCC1			500	-	100	1,900	1,500	50	1,050	-	-	10,000	18	518	1,080	1,800	10	200	518	<50	-	108	-	-
TCLP1			-	5	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2			400	-	80	400	400	16	160	-	-	40,000	40	1,152	2,400	4,000	3.2	800	1,152	<50	-	240	-	-
SCC2			2,000	-	400	7,600	6,000	200	4,200	-	-	40,000	72	2,073	4,320	7,200	23	800	2,073	<50	-	432	-	-
TCLP2			-	20	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorpyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table E3: Summary of Laboratory Results – Waste Classification

			OPP	PCB	VOC														Asbestos				
			Total Analysed OPP	Total PCB	Tetrachloromethane (carbon tetrachloride / CT)	Monochlorobenzene	Trichloromethane (chloroform / TCM)	1,2-dichlorobenzene	1,4-dichlorobenzene	1,2-dichloroethane	1,1-Dichloroethene	Styrene (vinylbenzene)	1,1,1,2-tetrachloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene (PCE)	1,1,1-trichloroethane	1,1,2-trichloroethane	Trichloroethene (TCE)	Chloroethene (vinyl chloride / VC)	Asbestos ID in materials	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos Comment	Asbestos Summary
		PQL	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-	-	
BH01	0.5 - 0.6 m	25/03/25	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BD1/20250325	0 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH02	0.13 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH02	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH03	0.4 - 0.5 m	25/03/25	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH04	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH05	0.15 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH05	0.4 - 0.5 m	25/03/25	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH05	0.9 - 1 m	25/03/25	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	NAD	-	-
BH06	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Summary Statistics																								
Min			0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
Max			0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
Mean			0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-
Waste Classification Criteria [f]																								
CT1			4	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCC1			7.5	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TCLP1			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2			16	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SCC2			30	<50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TCLP2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

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Notes:

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
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CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Appendix C

Site Management Plan

1. Introduction

This general site management plan (SMP) has been developed to minimise potentially adverse impacts on the environment, and worker and public health as a result of the proposed remediation works.

The Remediation Contractor must have in place a construction environmental management plan (CEMP) (or similar) which is specific to the equipment used for the remediation and the proposed methods to be adopted by the Remediation Contractor. This SMP has been prepared to augment the Remediation Contractor's CEMP and contains general details for aspects of the work, as per reporting requirements for a remediation action plan (RAP) under NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

Apart from the management principles outlined in this SMP, the Remediation Contractor must also ensure compliance with all relevant environmental legislation and regulations, including (but not limited to) the following:

- Contaminated Land Management Act 1997 NSW (CLM Act);
- Protection of the Environment Operations Act 1997 NSW (POEO Act);
- Protection of the Environment Legislation Amendment Act 2011 NSW;
- Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008 NSW;
- Environmentally Hazardous Chemicals Act 1985 NSW;
- Environmental Offences and Penalties Act 1989 NSW;
- Pesticide Act 1999 NSW and Pesticides Regulation 2017; and
- Work Health and Safety Act 2017 NSW (WHS Act) and Work Health and Safety Regulations 2017 NSW.

2. Roles and responsibilities

2.1 Principal

The Principal is responsible for the environmental performance of the proposed remediation works, including implementation of acceptable environmental controls during remediation works. The Principal will retain the overall responsibility for ensuring this RAP is appropriately implemented. The Principal is to nominate a representative (the Principal's Representative), who is responsible for overseeing the implementation of this RAP. The actual implementation of the RAP will, however, be conducted by the Remediation Contractor on behalf of the Principal.

The Principal is responsible for providing appropriate information to the Remediation Contractor to allow them to safely plan the required works. This includes the asbestos register for the site and this RAP.

The Principal is also responsible for implementing an appropriate communications plan.

2.2 **Remediation contractor**

The Remediation Contractor will be the party responsible for daily implementation of this RAP and shall fulfil the responsibilities of the Remediation Contractor as defined by SafeWork NSW. It is noted that the Remediation Contractor may appoint appropriately qualified sub-contractors or sub-consultants to assist in fulfilling the requirements of the procedures. The Remediation Contractor will appoint a Site Manager.

In addition to the implementation of the RAP it will be the Remediation Contractors responsibility to:

- Obtain / ensure relevant sub-contractors obtain specific related approvals as necessary to implement the earthworks including permits for removal of asbestos-containing material, SafeWork NSW notification etc.;
- Develop or request and review any site plans to manage the works to be conducted; and
- Ensure that all remediation works and other related activities are undertaken in accordance with this RAP.
- Maintain all site records related to the implementation of this RAP including but not limited to:
    - Tracking of all movement of soil within the site, on to site and off-site from cradle to grave;
    - Transportation Record: comprising a record of all truckloads of soil (including aggregate) entering the site, including truck identification (e.g. registration number), date, time, source site, load characteristics (e.g. type of material, i.e. quarried aggregate, etc.), approximate volume, use (e.g. general site raising, service trenches, etc.);
    - Disposal dockets: for any soil disposed off-site including transportation records, spoil source, spoil disposal location, receipt provided by the receiving waste facility / site;
    - Imported materials records: records for any soil imported onto the site, including source site, classification reports, inspection records of soil upon receipt at site and transportation records;
    - Records relating to any unexpected finds and contingency plans implemented; and
    - Photographic records by all contractors and consultants of the works undertaken within their purview of responsibilities.
- Ensure sufficient information is provided to engage or direct all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Remediation Contractor;
- Manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- Inform, if appropriate, the relevant regulatory authorities of any non-conformances with the procedures and requirements of the RAP in accordance with the procedures outlined in this document;
- Retain records of any contingency actions;
- On completion of the project, to review the RAP records for completeness and update as necessary; and

- Recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

2.3 Sub-contractors

All sub-contractors will be inducted onto the site, informed of their responsibilities in relation to this RAP and sign their agreement to abide by the RAP requirements. Where necessary, sub-contractors will also be trained in accordance with the requirements of this document. All sub-contractors must conduct their operations in accordance with the RAP as well as all applicable regulatory requirements.

2.4 Environmental consultant

The Environmental Consultant will provide advice on implementing the RAP. The Environmental Consultant will be responsible for:

- Undertake any required assessments where applicable (e.g. waste classification, validation);
- Provide advice and recommendations arising from monitoring and/or inspections, including unexpected finds; and
- Notify the Client with any results of assessments, and any observed non-conformances.

2.5 Site workers

All workers on the site are responsible for observing the requirements of this RAP and other management plans. These responsibilities include the following:

- Being inducted on the site and advised of the general nature of the remediation / environmental issues at the site;
- Being aware of the requirements of this plan;
- Wearing appropriate personal protective equipment (PPE) as required by this plan;
- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g. safe work method statements (SWMS)).

3. Water management

3.1 Stormwater

Stormwater must be managed during the remediation works such that potential adverse impacts from surface runoff (e.g. cross contamination, mobilisation of contaminants in soil particles, etc.) are appropriately mitigated. Accordingly, the Remediation Contractor will take appropriate measures which may include:

- Construction, where necessary, of stormwater diversion channels, bunding and linear drainage sumps with catch pits in and around the remediation areas to divert stormwater from the contaminated areas;
- Provision of appropriately located sediment traps including geotextiles; and

- Discharge of excess water in excavations / low points on a regular basis to limit the potential for flooding.

3.2 Dewatering of excavations

Management of dewatering effluent must be in accordance with the project dewatering management plan (DMP) which Douglas is preparing. Long-term groundwater level monitoring is ongoing and a DMP will be required for the proposed excavation following completion of the long-term monitoring.

4. Soil management plan

The Remediation Contractor will develop a plan to mitigate cross contamination as part of the CEMP to be implemented throughout the works.

4.1 Stockpiling of contaminated material

Contaminated material shall be excavated and stockpiled at a suitably segregated location(s) away from sensitive areas (e.g. water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- An impermeable membrane such as plastic sheeting should be provided at the surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary;
- All stockpiles of contaminated material shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight);
- Stockpiles impacted, or potentially impacted, with asbestos must be covered by geotextile or similar cover to prevent dust generation;
- Measures should be taken by the Remediation Contractor to prevent the migration of stockpile materials (i.e. perimeter bunds, hay bales, silt fences, etc.); and
- A record of stockpile locations (stockpile register), dimensions, descriptions, environmental controls, etc. should be maintained by the Remediation Contractor.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

4.2 Stockpiling imported material

Imported material (if any) shall be stockpiled at a suitably segregated location(s) away from sensitive areas (e.g. water bodies, drainage lines, stormwater pits, etc.) and ongoing excavations, and in a manner that will not cause nuisance to the neighbouring properties. Soil stockpiles are to be managed as follows:

- Imported material should not be stockpiled within un-remediated areas of the site. If this is unavoidable an impermeable membrane such as plastic sheeting should be provided at the

surface by the Remediation Contractor prior to stockpiling. Plastic sheeting should be taped at joins, as necessary;

- All stockpiles shall be surrounded by star pickets and marking tape or other suitable material to clearly delineate their boundaries;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight); and
- A record of stockpile locations (stockpile register), dimensions, descriptions, environmental controls, etc. should be maintained by the Remediation Contractor.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

4.3 Transport of material off-site and on to site

Transport of contaminated material from the site and imported material to the site (if any) shall be via a clearly delineated haul route(s) and this route shall be used exclusively for entry and egress of vehicles used to transport contaminated materials within and away from the site, and onto and within the site. The proposed transport route(s) (to be determined by the Remediation Contractor) will be notified to Council and truck dispatch shall be logged and recorded by the Remediation Contractor for each load leaving or arriving the site. A record of the truck dispatch will be provided to the Environmental Consultant.

All haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site should be selected to meet the following objectives:

- Comply with all road traffic rules;
- Minimise noise, vibration and dust to adjacent premises; and
- Use State roads and minimise use of local roads as far as practicable.

The remediation work will be conducted such that all vehicles:

- Conduct deliveries of soil, materials, equipment or machinery only during the specified hours of remediation;
- Have securely covered loads to prevent any dust or odour emissions during transportation; and
- Exit the site in a forward direction.

In addition, measures will be implemented to ensure no contaminated material is spilled onto public roadways or tracked off-site on vehicle wheels. Roadways will be kept clean throughout the remediation works and will be broomed, if necessary, to achieve a clean environment.

All loads will be securely covered and may be lightly wetted, if required, to ensure that no materials or dust are dropped or deposited outside or within the site. Prior to exiting the site each truck should be inspected by Remediation Contractor personnel and either noted as clean (wheels and chassis) or broomed prior to leaving the site. Any soil spilled onto surrounding streets will be cleaned by mechanical or hand methods, on a daily basis.

Removal of waste materials from the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to dispose the waste materials according to the waste classification and with the appropriate approvals obtained from the EPA, were required.

Materials imported onto the site shall only be carried out contractors holding the appropriate license(s), consent or approvals to transport the materials with the appropriate approvals obtained from the EPA, were required.

All movement of soil within the site is to be tracked by the Remediation Contractor, from cradle to grave. Copies of tracking records must be provided to the Environmental Consultant.

5. Noise and vibration control plan

All equipment and machinery should be operated in an efficient manner to minimise the emission of noise. The use of any plant and/or machinery should not cause unacceptable vibrations to nearby properties and should meet Council requirements.

6. Dust control plan

Dust emissions must be confined within the site boundary as far as is practicable. The following example dust control procedures could be employed to comply with this requirement, as necessary:

- Erection of dust screens around the perimeter of the site (as applicable);
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Stockpiles shall be lightly conditioned by sprinkler or covered by geotextile or similar cover to prevent dust generation (if remaining overnight);
- Stockpiles impacted, or potentially impacted, with asbestos must be covered by geotextile or similar cover to prevent dust generation;
- Include wheel wash (if applicable); and
- Keeping excavation and stockpile surfaces moist.

Regular checking of the fugitive dust issues is to be undertaken. Remedial measures are to be undertaken to rectify any cases of excessive dust.

7. Odour control plan

No odours should be detected at any boundary of the site during remediation works by an authorised Council Officer relying solely on sense of smell. The following example procedures could be employed to comply with this requirement as necessary:

- Use of appropriate covering techniques such as plastic sheeting, polythene or geotextile membranes to cover excavation faces or stockpiles;

- Fine spray of water and/or hydrocarbon mitigating agent on impacted areas / stockpiles or loads to lightly condition the material;
- If required, restrict uncovered stockpiles to appropriate sizes to minimise odour generation;
- Ceasing works during periods of inclement weather such as high winds or heavy rain;
- Regular checking of the fugitive dust and odour issues to ensure compliance. Undertake immediate remediation measures to rectify any cases of excessive dust or odour (e.g. use of misting sprays or odour masking agent); and
- Adequate maintenance of equipment and machinery to minimise exhaust emissions.

8. Work health and safety plan

8.1 General

It is the Remediation Contractor's responsibility to devise a SWMS[1] (or series thereof, for various respective tasks) and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment. This RAP and SMP does not relieve the Remediation Contractor or other contractors of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the 'remediation' workspace. This RAP and SMP sets out general procedures and the minimum standards and guidelines for remediation that will need to be used in preparing the safe work method statement.

This work health safety plan (WHSP) has been prepared with refence to CRC CARE *Remediation Action Plan: Implementation - Guideline on Health and Safety* (CRC CARE, 2019). The requirements of this WHSP must be incorporated into the Remediation Contractor's SWMS.

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. To attain this the SWMS developed by the Remediation Contractor must comply with policies specified in the Work Health and Safety Regulation 2011.

All appropriate permits, licences and notifications required for the remediation activities must be obtained prior to the commencement of remediation works.

8.2 Site access

Appropriate fencing and signage must be installed around and within the site to prevent unauthorised access and restrict access to remediation areas and/or deep excavations. Access restrictions and administrative arrangements for management of entry of workers or related personnel on site is the responsibility of the Remediation Contractor.

Any existing pits or unstable areas on site that may generate potential safety, or operational risk should be demarcated and taped off, with appropriate rectification action undertaken (e.g. backfilling of pits).

[1] Either a SWMS or construction environmental management plan (CEMP), or other equivalent document incorporating health and safety aspects of the proposed remedial works.

8.3 Personnel and responsibilities

Before undertaking works on site, all personnel will be made aware of the officer responsible for implementing WHS procedures. All personnel must read and understand this WHSP and over-arching SWMS prior to commencing site works and sign a statement to that effect. Contractors employed at the site will be responsible for ensuring that their employees are aware of, and comply with, the requirements of this WHSP and Remediation Contractor's SWMS.

8.4 Chemical contamination hazards

Chemical compounds or substances that may be present in the soils at the site include the key CoPC heavy metals, TRH, BTEX, PAH and phenols. There is also a lower probability of other contaminants being present.

The risks associated with the identified contaminants to site personnel and workers involved in the remediation are considered to be low due to the concentrations within groundwater and soil vapour and limited exposure durations. These risks are associated with:

- Ingestion of contaminated soil and/or water;
- Dermal contact with contaminated soil and/or water; and
- Inhalation of dusts or vapours of the CoPC.

If asbestos is encountered in fill, this risk evaluation should be revised.

Personnel will endeavour, wherever possible, to avoid direct contact with potentially contaminated material. Workers must avoid the potential exposures listed above as far as is practicable. Appropriate personal protective equipment (PPE) must be used to mitigate potential risks.

8.5 Physical hazards

The following physical hazards are associated with conditions that may be created during remediation works:

- Heat exposure;
- Excavations;
- Buried services;
- Noise;
- Dust;
- Electrical equipment;
- Heavy equipment and truck operation; and
- Asbestos.

Safe work practices must be employed to manage the physical risks identified above. For the most part these risks can be managed through appropriate demarcation, access controls and the use of appropriate PPE.

8.6 Safe work practices

The appropriate safe work practices should be clearly defined by the Remediation Contractor in their SWMS. As a minimum, all personnel on site will be required to wear the following PPE:

- Steel-capped boots (mandatory);
- High visibility clothing / vest (mandatory);
- Safety glasses or safety goggles with side shields requirements (as necessary);
- Hard hat (as necessary);
- Appropriate respiratory and protective equipment for any works involving asbestos (as necessary); and
- Hearing protection when working in the vicinity of machinery or plant equipment if noise levels exceed exposure standards (as necessary).

Each item of PPE should meet the corresponding relevant Australian Standard(s).

Specific safe work practices will be adopted when working with asbestos (if any), in accordance with (but not limited to) the following codes of practice:

- SafeWork NSW *Code of Practice, How to Manage and Control Asbestos in the Workplace* (SafeWork NSW, 2019a);
- SafeWork *NSW Code of Practice, How to Safely Remove Asbestos* (SafeWork NSW, 2019b);
- WorkCover *NSW Managing Asbestos in or on Soil* (WorkCover NSW, 2014); and
- NOHSC *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed* (NOHSC, 2005).

9. Remediation schedule and hours of operation

The remediation works will be conducted within the days and hours specified in the development consent.

10. Response to incidents

The key to effective management of incidents is the timely action taken before any situation reaches a reportable or critical level. Therefore, surveillance activities are extremely important and should be conducted for the measures prescribed herein and any other measures prescribed in any additional environmental management plan developed subsequently. During construction activities on the site, the following inspection or preventative actions should be performed by the Remediation Contractor:

- Regular inspection of works;
- Completion of routine environmental checklists and follow-up of non-compliance situations;
- Maintenance and supervision on-site; and

- An induction process for site personnel involved in the remediation works that includes relevant information on the contamination status of the site, the remediation works being undertaken, worker health and environmental protection requirements and ensures that all site personnel are familiar with the site emergency procedures.

An emergency response plan will be in place for all aspects of site works. Any emergency will be reported immediately to the site office and/or the Site Manager (and Safety Officer), and the appropriate emergency assistance should be sought. The Site Manager should be responsible for initiating an immediate emergency response using the resources available on the site. Where external assistance is required, the relevant emergency services should be contacted. A table such as that below, containing contact details for key personnel who may be involved in an environmental emergency response should be completed and be readily available to personnel at all times. The table should be completed, and thereafter amended, as required.

The Remediation Contractor will be responsible for ensuring that site personnel are aware of the emergency services available and the appropriate contact details. A site Safety Officer should be contactable, or available, on-site during remediation and development works.

Contact details for key utilities are included in the event of needing to respond to incidents. Blank cells are 'to be confirmed' and should be completed prior to works commencing when all entities are confirmed.

Table 1: Summary of roles and contact details

Role	Personnel / contact	Phone contact details
Principal		
Principal's Representative		
Site Manager		
Remediation Contractor and Builder		
Site Office		
Environmental Consultant		
Consent Authority	NSW Planning Commission	
Regulator	NSW EPA (pollution line and general enquiries)	131 555
Utility Provider	Water (Sydney Water Corporation)	13 20 92
Utility Provider	Power (Ausgrid)	13 13 88
Utility Provider	Gas (Jemena Limited)	131 909
Utility Provider	Telecommunications (Telstra Corporation Limited)	13 22 03
Utility Provider	Telecommunications (Optus)	1800 505 777
Utility Provider	Telecommunications (NBN Co Limited)	1800 687 626

11. References

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2019). *Remediation Action Plan: Implementation - Guideline on Health and Safety*. National Remediation Framework: CRC for Contamination Assessment and Remediation of the Environment.

NOHSC. (2005). *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Ed*. Canberra, April 2005, NOHSC:3003: National Occupational Health and Safety Commission, Commonwealth of Australia.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

SafeWork NSW. (2019a). *Code of Practice, How to Manage and Control Asbestos in the Workplace*. August 2019.

SafeWork NSW. (2019b). *Code of Practice, How to Safely Remove Asbestos*. August 2019: SafeWork NSW, NSW Government.

WorkCover NSW. (2014). *Managing Asbestos in or on Soil*. March 2014: WorkCover NSW, NSW Government.

Appendix D

Site Assessment Criteria

1. Introduction

1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and/or derivation of the SAC:

- Land use: residential.
    - Corresponding to land use category 'B', residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats.
- Soil type: sand (sand has been adopted as a screening tool due to more conservative criteria however on-site soils present multiple fill layers ranging from coarse to fine soils).

2. Soils

2.1 Health investigation and screening levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and Table 2.

Table 1: Health investigation levels (mg/kg)

Contaminant	HIL-B
Metals	
Arsenic	500

Contaminant	HIL-B
Cadmium	150
Chromium (VI)	500
Copper	30 000
Lead	1200
Mercury (inorganic)	120
Nickel	1200
Zinc	60 000
PAH	
B(a)P TEQ	4
Total PAH	400
Phenols	
Phenol	45 000
Pentachlorophenol	130
OCP	
DDT+DDE+DDD	600
Aldrin and dieldrin	10
Chlordane	90
Endosulfan	400
Endrin	20
Heptachlor	10
HCB	15
Methoxychlor	500
OPP	
Chlorpyrifos	340
PCB	
PCB	1

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	HSL-A&B
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	0.5	0.5	0.5	0.5
Toluene	160	220	310	540
Ethylbenzene	55	NL	NL	NL

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	HSL-A&B
Xylenes	40	60	95	170
Naphthalene	3	NL	NL	NL
TRH F1	45	70	110	200
TRH F2	110	240	440	NL

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'
scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health screening levels for direct contact (mg/kg)

Contaminant	DC HSL-B	DC HSL-IMW
Benzene	140	1100
Toluene	21 000	120 000
Ethylbenzene	5900	85 000
Xylenes	17 000	130 000
Naphthalene	2200	29 000
TRH F1	5600	82 000
TRH F2	4200	62 000
TRH F3	5800	85 000
TRH F4	8100	120 000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
IMW intrusive maintenance worker

2.2 Asbestos in soil

Based on the CSM and/or current site access limitations, a detailed asbestos assessment was not considered to be warranted at this stage. However, due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted for this investigation / assessment as an initial screen.

2.3 Ecological investigation levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), have not been evaluated due to the construction of four basement levels at the site. There are not considered to be any environmental receptors as a result.

2.4 Ecological screening levels

The ESL's have not been evaluated due to the construction of four basement levels at the site. There are not considered to be any environmental receptors as a result.

2.5 Management limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards;
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

The adopted management limits are in Table 4.

Table 4: Management limits (mg/kg)

Contaminant	Soil type	ML-A-B-C
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	2500
TRH F4	Coarse	10 000
TRH F1	Fine	800
TRH F2	Fine	1000
TRH F3	Fine	3500
TRH F4	Fine	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML-A-B-C residential, parkland and public open space

3. Groundwater

3.1 Introduction

The groundwater investigation levels (GIL) used for interpretation of the groundwater data (as a Tier 1 assessment) have been selected for the purposes of a preliminary screening tool, the most conservative criteria for Residential B Land use has been adopted.

Table 5: Groundwater investigation level rationale

Receptor / beneficial use	GIL	Source	Comments / rationale
Aquatic ecosystem	DGV	ANZG (2018)	Freshwater 99% LOP for bioaccumulative contaminants

Receptor / beneficial use	GIL	Source	Comments / rationale
			95% LOP for non-bioaccumulative contaminants
Building occupants (vapour intrusion)	HSL	NEPC (2013)	2 m to <4 m, 4-8 m, and >8m based on measured depths to groundwater. Note that the four level basement is likely to sit within groundwater, and therefore the HSL do not apply. If concentrations exceed the laboratory PQL the report will recommend a site specific assessment of groundwater seepage risk into the new basement.

Notes: DGV default guideline value
% LOP percentage level of protection of species
HSL health screening level
GV guideline value
LTV long term value (up to 100 years)
STV short term value (up to 20 years)

3.2 Groundwater investigation levels for aquatic ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 6.

Table 6: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant	Freshwater DGV 95% LOP	Notes
Metals / metalloids		
Arsenic	24 / 13	Levels provided for As III / As IV respectively. Moderate reliability.
Cadmium	0.2	Very high reliability.
Chromium (VI)	1	Chromium VI levels adopted as initial screen for total chromium. Very high reliability.
Copper	1.4	Very high reliability.
Lead	3.4	Moderate reliability.
Mercury (inorganic)	0.06	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Nickel	11	Low reliability.
Zinc	8	Very high reliability.
BTEX		
Benzene	950	Moderate reliability.
Ethylbenzene	80	Unknown reliability.
m-Xylene	75	Unknown reliability.
o-xylene	350	Low reliability.
p-Xylene	200	Low reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Toluene	180	Unknown reliability.
PAH		
Anthracene	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Benzo(a)pyrene	0.1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Fluoranthene	1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Naphthalene	16	Low reliability.
Phenanthrene	0.6	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
OCP		
Aldrin	0.001	Unknown reliability and LOP.
Chlordane	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
DDT	0.006	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Dieldrin	0.01	Unknown reliability and LOP.
Endosulfan	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Endrin	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Heptachlor	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Methoxychlor	0.005	Unknown reliability and LOP.
OPP		
Chlorpyrifos	0.01	Moderate reliability.
Diazinon	0.01	Moderate reliability.
Dimethoate	0.15	Low reliability.
Fenitrothion	0.2	Moderate reliability.
Malathion	0.05	Moderate reliability.
Parathion	0.004	Moderate reliability.
PCB		
Aroclor 1242	0.3	99% LOP adopted as recommended due to potential for bioaccumulation. Low reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Aroclor 1254	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
VOC		
Tetrachloroethene (PCE)	70	Unknown reliability.
Trichloroethene (TCE)	330	Unknown reliability.
1,1-dichloroethene (DCE)	700	Unknown reliability.
Chloroethene (vinyl chloride / VC)	100	Unknown reliability.
Tetrachloromethane (carbon tetrachloride / CT)	240	Unknown reliability.
Trichloromethane (chloroform / TCM)	370	99% LOP adopted as recommended to protect key species from chronic toxicity. Unknown reliability.
Inorganics		
Ammonia	900	Very high reliability.

Notes: 95% LOP for non-bioaccumulative contaminants
99% LOP for bioaccumulative contaminants

3.3 Health screening levels for vapour intrusion

The HSL to evaluate potential vapour intrusion risks derived from NEPC (2013) are in Table 7. There are no generic HSL for groundwater within 2 m of the ground (or basement) level.

Table 7: Groundwater health screening levels for vapour intrusion (µg/L)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	Solubility limit
SAND	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**-**
Benzene	800	800	900	59 000
Toluene	NL	NL	NL	61 000
Ethylbenzene	NL	NL	NL	3900
Xylenes	NL	NL	NL	21 000
Naphthalene	NL	NL	NL	170
TRH F1	1000	1000	1000	9000
TRH F2	1000	1000	1000	3000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

4. References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australia and New Zealand Environment and Conservation Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater*. Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC, NRMMC. (2022). *Australian Drinking Water Guidelines 6 2011, Version 3.7*. Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

Appendix E

Data Quality Objectives

1. Introduction

The objective of the validation plan is to assess to assess the results of validation testing against the remediation acceptance criteria (RAC) stated within Section 11, assess the resultant suitability of the site for the intended land use, and to provide information on any environmental impacts which may have resulted from the works.

The validation assessment will be conducted with reference to the seven step data quality objectives process (DQO) as outlined in NEPC (2013), described below.

2. Data quality objectives

Table 1: Data quality objectives

Step	Summary
1: State the problem	The site requires remediation and validation of remediation in order to render it suitable for a mixed-use residential re-development (commercial / industrial land use category). The objective of the validation plan is to confirm the successful implementation of this remediation action plan. A conceptual site model (CSM) for the proposed development has been prepared (Section 7).
2: Identify the decisions / goal of the study	The CSM identifies the contaminants of potential concern (CoPC) and the likely impacted media. The key CoPC impacting the site are: • The UST, CoPC include TRH, BTEX and PAH. The validation sampling results will be compared against the RAC. The preferred remediation strategy outlined in the RAP is excavation, removal and validation of the UST excavation. The success of the remediation and subsequent validation will be based on a comparison of the analytical results for all CoPC to the adopted RAC.
3: Identify the information inputs	Relevant inputs to the decision include: • The CSM identifying CoPC and affected media; • Results analysed for the relevant CoPC using NATA accredited laboratories and methods, where possible; • Field and laboratory QA/QC data to assess the suitability of the environmental data for the validation assessment; and • Results compared with the RAC.
4: Define the study boundaries	The lateral boundaries of the site are shown on Drawing 1, Appendix A. The vertical boundaries are to the extent of contamination impact as determined from the site history assessment, site observations and previous investigations used to inform the RAP.
5: Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with RAC (i.e. as basement excavation progresses, the VENM and non-VENM soil / rock in the vicinity of the UST need to be segregated facilitating off-site disposal).

Step	Summary
6: Specify the performance or acceptance criteria	Complete removal of the UST and any hydrocarbon impacted fill / soil / rock. Appropriate classification of fill / soil / rock adjacent to the UST to facilitate off-site disposal.
7: Optimise the design for obtaining data	Sampling design as per Section 12.4.

3. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix F

Contingency Plan and Unexpected Finds Protocol

1. General

Where the site conditions are found to be different than that anticipated during the remediation works, the proposed remediation approach may not be appropriate for the contamination encountered. In such cases the Environmental Consultant is to re-assess the contamination and remediation approach. Where necessary the Environmental Consultant will prepare an addendum to, or revision of, this RAP.

2. Contingency plan

This contingency plan has been developed to provide guidance on processes to follow if contamination (or indicators of contamination), other than that included in the remediation strategy, (Section 10) is encountered during the remediation works. Any such finds shall be surveyed and the location documented.

Although the site has been subject to previous investigation(s), there remains a potential for soil contamination to be present between sampled locations. In the event that signs of soil contamination, other than that included in the remediation strategy, are encountered during remediation e.g. petroleum which wasn't previously identified, the following protocols will apply:

- The Site Manager is to be notified, and the affected area closed off by the use of barrier tape and warning signs;
- The Environmental Consultant is to be notified to inspect the area and assess the significance of the potential contamination and determine extent of remediation works (if deemed necessary) to be undertaken. An assessment report and management plan detailing this information will be compiled by the Environmental Consultant and provided to the Principal's Representative;
- The assessment results together with a suitable management plan shall be provided by the Principal's Representative to the Consent Authority (if required by the development consent);
- The agreed management / remedial strategy, based on the RAP and relevant guidelines (e.g. WA DoH (2021), for asbestos issues), shall be implemented; and
- All details of the assessment and remedial works are to be included in the site validation report.

3. Unexpected finds protocol

This unexpected finds protocol (UFP) has been developed to provide guidance on processes to follow if any unexpected find is encountered during the remediation or future civil and construction works. Any unexpected finds should be surveyed and the location documented.

All site personnel are to be inducted into their responsibilities under this (UFP), which should be included or referenced in the Remediation Contractors Environmental Management Plan.

All site personnel are required to report unexpected signs of environmental concern to the Site Manager if observed during the course of their works e.g. presence of potential unexploded ordinance, unnatural staining, potential contamination sources (such as buried drums or tanks) or chemical spills.

Should signs of concern be observed, the Site Manager, as soon as practical, will:

- Stop work in the affected area and ensure the area is barricaded to prevent unauthorised access;
- Notify authorities needed to obtain emergency response for any health or environmental concerns (e.g. fire brigade);
- Notify the Principal's Representative of the occurrence;
- Notify any of the authorities that the Remediation Contractor is legally / contractually required to notify (e.g. EPA, Council); and
- Notify the Environmental Consultant.

The Principal's Representative is to notify any of the authorities which the Principal is legally / contractually required to notify (e.g. EPA, Council). Where appropriate, the Principals Representative will also implement appropriate community consultation in accordance with the Communications Plan.

The Environmental Consultant will assess the extent and significance of the find and develop an investigation, remediation or management approach using (where possible) the principles and procedures already outlined in the RAP. Where a Site Auditor is involved, the proposed approach will be discussed and agreed with the Site Auditor prior to implementation.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

WA DoH. (2021). *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.* WA Department of Health.

Douglas PARTNERS

GROUNDED EXPERTISE

Report on Detailed Site (Contamination) Investigation

Proposed Mixed Use Residential Building

601 Pacific Highway, St Leonards NSW

Prepared for Stockland Development Pty Limited

Project 86230.03

18 March 2026

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature	Date
Author p.p.	18 March 2026
Reviewer	18 March 2026

FS604853

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

Executive Summary

Douglas Partners Pty Ltd (Douglas) has been engaged by Stockland Development Pty Limited (Stockland) to prepare this detailed site (contamination) investigation (DSI) report for a proposed mixed use residential building at 601 Pacific Highway, St Leonards NSW (the site).

The objective of the DSI is to assess the suitability of the site for the proposed development and whether further investigation and/or remediation / management of contamination is required. This DSI has been prepared by Douglas and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of the SSDA (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site). Further details on the proposed development are provided in Section 2.

Stockland submitted an EOI for an SSDA and concurrent rezoning proposal on 17th January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19th February 2025, the HDA recommended to the Minister that the applicant's project be declared SSDA, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).

A request for Secretary's Environmental Assessment Requirements (SEARs) was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This report has been prepared to address the following relevant SEARs set out in the Table 1 below.

Table 1: Secretary's Environmental Assessment Requirements relevant to this report

SEARs	Report Reference (how addressed)
13. Contamination and Remediation In accordance with Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021, assess and quantify and soil and groundwater contamination and demonstrate that the site is suitable (or will be made suitable after remediation) for the development.	Report as a whole presents the findings of a Detailed Site Investigation (DSI) which demonstrates that the site can be made suitable for the development following completion of the requirements in the RAP (Douglas, 2025b). This DSI references and summarises a preliminary site investigation (PSI) report (Golder, 2021). This DSI incorporates and references data from a previous contamination due diligence testing report undertaken at the site (Douglas, 2025a). No long-term management plan is considered to be required.

The proposal seeks consent to demolish the current 14 storey commercial building and redevelop the site with a new 52 storey mixed use building. The development seeks to amend the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.

The scope of works undertaken for this DSI included a review of previous reports by Golder (Golder, 2021) and Douglas (Douglas 2025a and 2025b), soil and groundwater sampling and testing, and assessment of all field and analytical data against appropriate site assessment criteria (SAC).

Three key potential contamination sources have been identified at the site, being: (1) fill of unknown origin; (2) previous and existing buildings with potential hazardous material; and (3) a below-ground diesel underground storage tank (UST) and associated infrastructure. The fieldwork targeted potential soil and groundwater risks associated with the potential sources and associated contamination of concern.

The investigation and screening levels (i.e. SAC) applied in the current investigation comprise levels adopted for a generic high density residential B land use land use scenario. The derivation of the SAC is in Appendix E, and the adopted SAC are listed on the summary analytical results tables in Appendix F.

Fieldwork results show that subsurface conditions beneath the concrete slabs of the lowest existing basement levels comprised gravelly, sandy and sandy clay fill to depths of between 0.25 m and 2.6 m below the slab, then natural shale / siltstone / sandstone. Groundwater levels were measured at 10.83 m (BH01), 6.73 m (BH03) and 3.4 m (BH06) below the slab level at each location.

The analytical results for all contaminants tested for the selected fill samples from the boreholes were below the SAC. No asbestos was detected in the analysed samples using the testing method implemented. The metals concentrations in the groundwater samples appear to be relatively consistent across the three wells, suggesting a diffuse and regional characteristic of the groundwater beneath the site. It is noted also that elevated concentrations of some nutrients, anions and cations were reported for the analysed groundwater samples. Whilst these do not constitute contaminants, they will need to be considered for dewatering purposes.

Based on the results of this DSI, the following conclusions and recommendations are made:

- The soils within the site, at the tested locations (boreholes) do not exceed the SAC applicable to a high density residential land use;
- Groundwater below the site is not considered to present a risk of harm or exposure to occupants and workers at the site. However, given the marginally elevated metals, nutrients, anion and cation concentrations discussed in Section 11.2, it is considered likely that some form of pre-treatment will be required to reduce these concentrations prior to disposal of water collected through a dewatering scheme. It is envisaged that would be captured in a dewatering management plan; and
- The test results suggest that the fill at the boreholes preliminarily classifies as general solid waste (non putrescible) under the NSW EPA (2014) guidelines.

It is therefore concluded that the site can be made suitable for the proposed mixed-use residential development subject to implementation of the remediation action plan (Douglas, 2025b). It is noted that this report already presents the results of the data gap investigation which is recommended in the remediation action plan.

Based on the proposal to extent the basement parking levels deeper, all fill and the UST will necessarily be removed from the site. As such, it is not envisaged that a long-term environmental management plan will be required for the site post remediation and construction.

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Report on Detailed Site (Contamination) Investigation
Proposed Mixed Use Residential Building
601 Pacific Highway, St Leonards NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has been engaged by Stockland Development Pty Limited (Stockland) to prepare this detailed site (contamination) investigation (DSI) report for a proposed mixed use residential building at 601 Pacific Highway, St Leonards NSW (the site). The site boundary and current above ground features are shown on Drawing 1, Appendix A.

The investigation was undertaken in accordance with Douglas' proposal 86230.03.P.001.Rev0 dated 22 October 2025.

The objective of the DSI is to assess the suitability of the site for the proposed development and whether further investigation and/or remediation / management of contamination is required. This DSI has been prepared by Douglas and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of the SSDA (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site). Further details on the proposed development are provided in Section 2.

Stockland submitted an EOI for an SSDA and concurrent rezoning proposal on 17th January 2025 through the Housing Delivery Authority Pathway (HDA). At its Briefing on 19th February 2025, the HDA recommended to the Minister that the applicant's project be declared SSDA, for the reason that it sufficiently satisfied the objectives and criteria of the HDA. The project was declared as SSD in the State Significant Development Declaration Order 2025 (No 2) (26 February 2025).

A request for Secretary's Environmental Assessment Requirements (SEARs) was lodged on the 6th of June 2025 with SEARS received on the 4th of July 2025.

This report has been prepared to address the following relevant SEARs set out in the Table 1 below.

Table 2: Secretary's Environmental Assessment Requirements relevant to this report

SEARs	Report Reference (how addressed)
13. Contamination and Remediation In accordance with Chapter 4 of the State Environmental Planning Policy (Resilience and Hazards) 2021, assess and quantify and soil and groundwater contamination and demonstrate that the site is suitable (or will be made suitable after remediation) for the development.	Report as a whole presents the findings of a Detailed Site Investigation (DSI) which demonstrates that the site can be made suitable for the development following completion of the requirements in the RAP (Douglas, 2025b). This DSI references and summarises a preliminary site investigation (PSI) report (Golder, 2021). This DSI incorporates and references data from a previous contamination due diligence testing report undertaken at the site (Douglas, 2025a). No long-term management plan is considered to be required.

This report must be read in conjunction with all appendices including the notes provided in Appendix B.

The following key guidelines were consulted in the preparation of this report:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013); and
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

2. Proposed development

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1.
- Demolition of the existing 14 storey commercial office building that is currently on the site.
- Site excavation, remediation and other preparatory works.
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880 m^2), comprising:
  - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
  - A contribution of 5% of the residential GFA toward Affordable Housing.
  - Retail and commercial land uses at the ground and podium levels.
  - Internal and external residential amenities provided throughout the building.
  - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
- Vehicular access to the basement via Atchison Street.
- Landscaping and Public Domain works.
- Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

3. Scope of work

The scope of works undertaken for this DSI is as follows:

- Review and summary of the PSI report (Golder 2021) and RAP (Douglas, 2025b);
- Incorporation of the scope and outcomes of the due diligence contamination testing reported in Douglas (2025a);
- Conduct soil sampling from an additional three (3) boreholes to supplement the sampling and testing reported in Douglas (2025a), such that total sampling numbers comply with the NSW EPA (2022) sampling guidelines, for a site of 2,800 m^2;

- Prior to sampling BYDA and other services plans were reviewed, and a qualified services locator was engaged to clear the proposed locations of buried services;
- The existing concrete slab was cored at each location;
- Progressing the borehole at each of the three locations using hand tools, to the full depth of observed fill or prior refusal;
- Recovery of soil samples at regular depth intervals until full fill penetration and/or auger refusal; and
- PID screening for potential volatiles.
- Analysis of a selection of soil samples for a range of contaminants of concern based on Golder (2021) and Douglas (2025a), including:
    - Priority heavy metals (arsenic, cadmium, chromium, copper, lead, nickel and zinc);
    - Polycyclic aromatic hydrocarbons (PAH);
    - Total recoverable hydrocarbons (TRH);
    - Benzene, toluene, ethylbenzene and xylenes (BTEX);
    - Total phenols;
    - Organochlorine pesticides (OCP);
    - Organophosphorus pesticides (OPP);
    - Polychlorinated biphenyls (PCB);
    - Asbestos identification; and
    - Toxicity characteristic leaching procedure (TCLP) testing for metals for preliminary waste classification purposes.
- Inclusion of quality control samples comprising two replicate samples, one trip spike and one trip blank sample;
- Comparison of the analytical data against the applicable assessment criteria published in the national guidelines NEPC (2013) and adopted in Douglas (2025a); and
- Preparation of a DSI report with reference to the NSW EPA (2020) reporting guidelines.

4. Site information

Site address	601 Pacific Highway, St Leonards NSW
Legal description	Lot 71 in DP749690
Area	2,844 m^2
Zoning	E2 – Commercial Centre
Local council area	North Sydney Council
Current use	The site is occupied by a 14-storey commercial building in the eastern portion of the site, and single level mixed-use retail in the western portion.

Surrounding uses	North – Beyond Aitchson Street to the north is MU1 mixed use buildings, R2 residential zoning begins roughly 200 m to the north and extends beyond. East – Beyond Mitchell Street to the east is MU1 mixed use zoning. R4 Residential zoning can be seen roughly 200 m to the east with MU1 mixed use past this and R2 Residential zoning beyond. South – The SP2 zoned Pacific Highway is situated directly south, with MU1 Mixed use and E2 commercial centre zoning beyond. West – bounded by a 7-storey commercial building to the west with SP2 infrastructure zoning on Christie Street and MU1 mixed-use zoning beyond.

The site boundary is shown on Drawing 1, Appendix A, and on Figure 1 below.

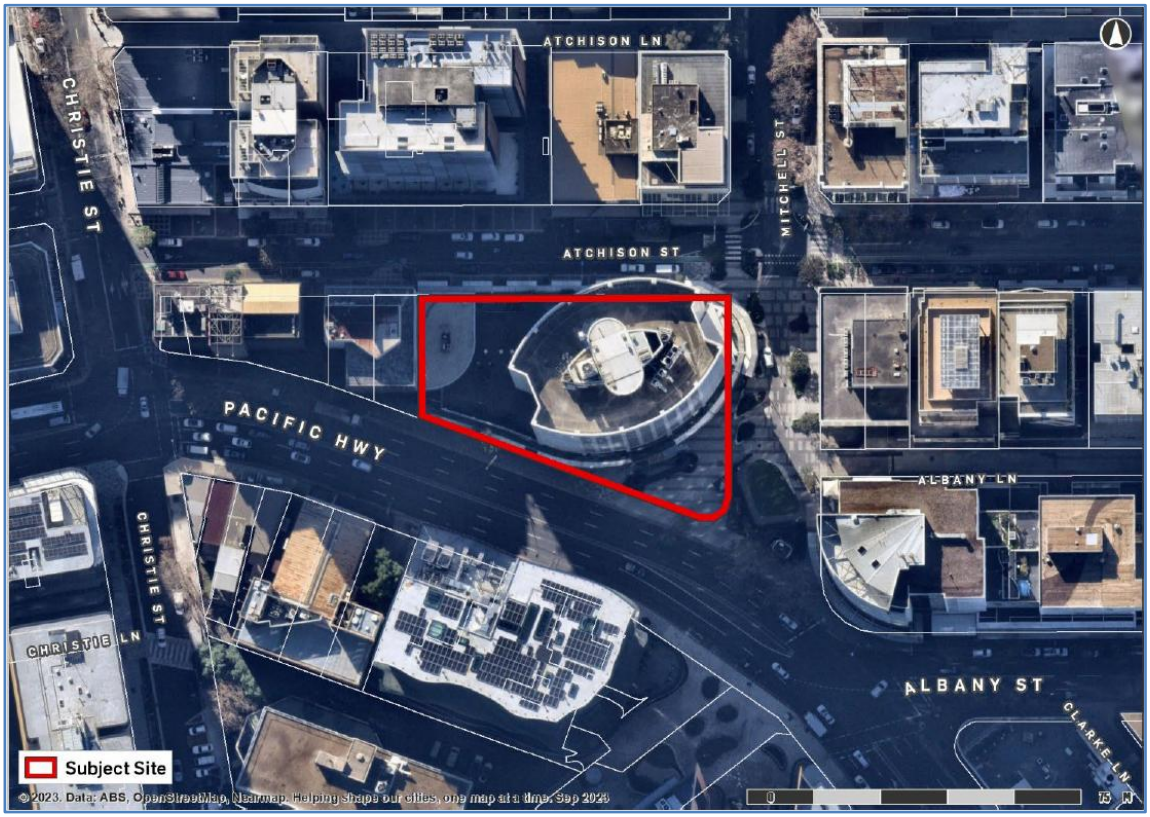

Figure 1. Site Location and Boundary

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844 m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400 m (walking distance) from the Crows Nest Metro station.

The site is zoned as E2 – Commercial Centre. The surrounding landscape has combination of commercial E2, MU1 mixed use and both R2 low density and R4 high density residential zoning.

5. Environmental setting

Regional topography	The site is located on the western side of a ridge that peaks at roughly RL 92 m (Australian Height Datum, AHD). The topography surrounding the site slopes down to the south-west towards Smoothey Park and Berry's Creek which is a tributary of the Parramatta River.
Site topography	Based on the available 'NSW 2 m Elevation Contours'; the site topography generally slopes down towards the west, with surface levels of approximately RL 93 m in the east, falling to RL 88 m in the west, relative to Australian Height Datum.
Soil landscape	Reference to the Sydney 1:100,000 Soils Landscape Sheet indicates that the site is underlain by the Blacktown soil landscape which is characterised by gently undulating rises on Wianamatta Group shales and Hawkesbury shale. Local relief to 30 m, slopes are usually <5%, but up to 10%. Broad rounded crests and ridges with gently inclined slopes. Soils are a residual soil comprising yellow podzolic soils and slolths (150-300 m) on lower slopes and in areas of poor drainage; shallow to moderately deep (<100 m) red and brown podzolic soils on crests, upper slopes and well drained areas. The limitations associated with this classification are moderately reactive highly plastic subsoil with low fertility, and poor soil drainage.
Geology	Reference to the Sydney 1:100 000 Seamless Geology Sheet indicates that the site is underlain by the Ashfield Shale of the Wianamatta Group, described as black to dark-grey shale and laminite. Below the Ashfield Shale is the Hawkesbury Sandstone which typically comprises medium to coarse grained quartz sandstone with some shale and laminite bands or lenses. The Mittagong Formation is a transitional unit often found between the Ashfield Shale and Hawkesbury Sandstone and typically includes laminite and fine-grained sandstone of variable strength, ranging in thickness from about 2 m to 10 m.
Acid sulfate soils	Reference to the published national Acid Sulfate Soil (ASS) mapping and regional ASS Risk map, indicates the site is mapped as an area with 'Extremely Low Probability of Occurrence' of ASS.
Surface water	Surface water is anticipated to follow the general regional topography and drain into the local stormwater system which is likely to discharge adjacent to Greenwich at the Parramatta River located approximately 1.3 km south-west of the site.

Groundwater	One Water NSW registered groundwater bore with a current license is located approximately 420 m north of the site with a recorded standing groundwater level of 35 m depth or RL 37 m, referring to the available 'NSW 2 m Elevation Contours'. Shallower perched seepage may occur along the clay and rock surface and at strata boundaries and in defects in the rock mass. It should be noted that groundwater levels may vary over time due to climatic and human influences and will temporarily rise following periods of prolonged rainfall. Based on regional topography and measurement of groundwater levels in wells installed at the site (refer Douglas, 2025a), the groundwater beneath the site (and around the site) is inferred to flow towards the south-west. However, given the presence of tunnels beneath the site, this flow direction cannot be confirmed.

6. Summary of previous reports

6.1 Previous reports

The following previous reports have been reviewed and summarised being relevant to the scope and outcomes of this DSI.

6.1.1 Golder (2021)

This investigation encompasses a non-intrusive Preliminary Site Investigation (PSI) undertaken to gain a better understanding of the potential environmental risk at the site, with a focus on the potential for ground contamination to support the Planning Proposal.

The PSI involved the following key tasks:

- Review readily available on-line records held by the NSW Environmental Protection Authority (EPA);
- A search of the SafeWork NSW files for records relating to historical storage of hazardous chemicals at the site;
- Review of published maps and databases with Site coverage to establish likely surface and subsurface conditions (including geology, hydrogeology, soil landscape, topography and likelihood of acid sulfate soils);
- Review of historical certificates of title (COT) for the site;
- A review of historical aerial photographs;
- A summary of a third party (Lotsearch) report on various searches; and
- A site walkover and interview with relevant Stockland and/or Stockland management agent completed on 6 March 2017.

No intrusive investigation works were completed as part of the PSI.

A site history assessment undertaken as part of (Golder, 2021) included the analysis of a review of historical aerial photographs, certificates of title, and business directories indicates that the Site has undergone several distinct phases of development and ownership, transitioning from early residential use to commercial and service station operations, and finally to its current commercial office configuration. The surrounding area has also evolved from a predominantly residential setting to a high-density commercial and mixed-use precinct over time.

Summary of the Certificates of Title Review

Historical title records indicated that the site was previously divided into three titles (Part Lots 1– 7 in Section 12 of DP 2872) prior to being consolidated into Lot 71 in DP 749690 in 1987.

Part Lots 4–7 (western portion): Owned by The Shell Company of Australia Ltd from 1962 until 1985, consistent with the operation of a service station on this portion of the site. Subsequent ownership transferred to the Public Authorities Superannuation Board in 1985 prior to consolidation.

Part Lots 1–3 (eastern portion): Owned by the Australian Bowling Corporation Pty Ltd from 1961, with basement leases to Inglis Electrix Pty Ltd (1962) and Simon Carpets Pty Ltd (1974), indicating office and/or commercial tenancy during that period. Ownership was later transferred to the Local Government Superannuation Board in 1983 and consolidated in 1987.

The then current title (Lot 71 in DP 749690) was registered to The Trust Company Limited as of 2017 (Edition 66), with no change in ownership noted at the time of reporting.

The title review therefore supports that the site was used for commercial and office purposes from at least 1961 and for fuel retailing / service station operations on the western portion between approximately 1962 and 1985, before consolidation and redevelopment into its current high density commercial precinct.

Summary of the Aerial Photograph Review

Historical aerial imagery dating from 1943–2021 was evaluated as part of Golder (2021) and their review is summarised as follows:

- 1943–1956: The site comprised three residential dwellings with gardens; the surrounding area was predominantly residential with limited commercial development along Pacific Highway.
- 1961–1982: The site underwent redevelopment, with the service station established on the western portion (identified by canopy-like structures) and larger commercial buildings constructed to the east. The surrounding area transitioned toward commercial and light industrial use, particularly along Pacific Highway.
- 1991 onwards: The site was redeveloped into the existing multi-storey office building by 1991. The surrounding area experienced progressive densification with multi-storey commercial and residential developments and major infrastructure works, including the Crows Nest Metro Station (post-2015).
- The site has remained in its current commercial configuration since 1991, with no apparent subsequent redevelopment.

Summary of the Historical Business Directory Review

A review of business directories (1950–1990) by Golder identified several historical industrial and commercial activities in the vicinity, including:

On-site activities:

Motor service station, tyre and tube dealers, welders-electric (1970) – confirmed operation of a Shell Service Station (611 Pacific Highway) within the Site boundary.

Motor garage and service station (1990) – continued reference to Shell St Leonards Service Station, further corroborating service station use into the 1980s.

Nearby off-site activities:

Scrap metal merchants (36 m west), chemical / emulsion manufacturers (38 m south), dry cleaners (100–102 m west and southeast), textile and paint manufacturers (38 m south), and insecticide manufacturers (104 m southwest).

These activities may have posed a potential risk of off-site contamination; however, the majority were located hydraulically down-gradient or at sufficient distance from the site to be considered low risk contributors.

The business directory review also reflects a general shift in the surrounding land use from industrial and automotive-based businesses (1950s–1970s) to professional and office-based services (post-1980s), consistent with the broader urban redevelopment trends in the St Leonards / Crows Nest precinct.

Public Registers and Planning Records

The NSW EPA's register for contaminated land notices under the Contaminated Land Management Act 1997 (the CLM Act) performed in 2017 and 2021 did not identify any premises within 500 m of the site as being subject to current or prior notices.

The NSW EPA maintains a "List of NSW contaminated sites notified to the EPA" under Section 60 of the CLM Act. The searches performed in 2017 and 2021 indicated that there are no premises within 500 m of the site that have been identified as a contaminated site.

The NSW EPA maintains a public register of premises subject to an Environment Protection Licence (EPL) under the Protection of the Environment Operations Act 1997 (the POEO Act). The searches performed in 2017 and 2021 indicated that there was one premise currently operating under an EPL within 500 m of the site, being the North Shore rail line which was not considered to present a contamination risk to the site.

A search of the SafeWork NSW files for records relating to historical storage of hazardous chemicals at the site was requested by Golder. The results of the search indicated that SafeWork NSW did not locate records of hazardous chemicals being stored at the site.

Site Walkover

The site walkover by Golder identified that the site has been used for professional services since the current building opened with tenants such as IBM occupying multiple floors. The site formerly had a café located in a separate building on the western portion of the site. A grease trap was reported to be present however this was not sighted during the inspection. In the lowest basement level an underground storage tank (UST) was identified which was used to store diesel fuel for the backup power generator. The UST was located within a separate room and the tank was accessed via two concrete floor panels (refer to Drawing 2, Appendix A of this DSi report for the location). The UST was not sighted during the 2017 inspection.

The pipework for this UST was visible within the lower basement room and at ground level where the fill point is located. The UST is refuelled by gravity via above ground pipework. There was no evidence of staining on the concrete hardstand at the fill point nor in the UST lower basement room at the time of the site inspection, however, it was noted that there was no form of secondary containment located at the fill point.

Report Discussions and Conclusion

The UST failed an integrity test (Premo 2017) where it was concluded that a leak (via nitrogen decay) existed in the return line weld. The risk of contamination from this leak is elevated however from a review of photographs within the integrity test report (Premo 2017) it appeared that the weld where the leak exists is above ground and that any leaks would migrate onto the concrete hardstand within the UST access room. In addition, the condition of the UST was classified as fair by SGA in 2013 and water ingress into the UST chamber was observed. The results of a subsequent integrity test (Premo 2019) indicated that the leak had been rectified. Historical leakage had the potential, albeit low, to migrate into the surrounding bedrock and present a risk to groundwater and a vapour intrusion risk. Given that the UST passed a more recent integrity test (Premo 2019) it was considered there is a lower potential for hydrocarbons to migrate to surrounding bedrock and pose a risk to groundwater or vapour intrusion risk to site occupants. As such, the ongoing risk from the UST was assessed as low.

Groundwater underlying the site was considered to flow in a south to south-westerly direction towards Sydney Harbour based on the topography of the area, however this was not confirmed.

The report presented a preliminary conceptual site model (PCSM) which documented potential contamination sources comprising the UST, a former Shell service station uses in part of the site (prior to existing basement excavation), diesel day tanks storage, historical demolition (including fill), and various surrounding historical commercial and industrial activities.

The report considered that the site is suitable for ongoing commercial land use. However, there was considered to be a potential that the consent authority for the proposed redevelopment may request a detailed site investigation (DSI) to confirm site suitability for the intended mixed use residential land uses. The report also states that the proposed redevelopment of the site includes excavation of additional basement levels. The UST below the lowest basement slab should be decommissioned in accordance with regulatory requirements prior to future development in accordance with the Planning Proposal.

The report mentions that as the proposed redevelopment includes enlarging the basement, the development and implementation of an unexpected finds protocol (UFP) would facilitate the management of the potential contamination sources.

6.1.2 **(Douglas, 2025a)**

Douglas prepared a due diligence contamination testing report for Stockland which documented the observations and results of opportunistic soil and groundwater testing from six boreholes constructed across the site for geotechnical investigation purposes.

The scope of work comprised:

- Recovery of soil samples from the drilling augers at each of the six boreholes (BH01 to BH06, refer Drawings 1 and 2, Appendix A) constructed below the lower basement concrete slab, and at regular depth intervals until fill penetration and/or auger refusal;
- PID screening of soil samples for potential volatiles;
- Analysis of soil samples at a National Association of Testing Authorities (NATA) accredited laboratory for a combination of commonly encountered contaminants, including metals, PAH, TRH, BTEX, phenols, OCP, OPP, PCB, asbestos and TCLP;
- Sampling of groundwater from three groundwater monitoring wells installed in Boreholes BH01, BH03 and BH06 using low-flow minimal drawdown sampling methods following collection of stabilised field parameters for pH, temperature, redox, electrical conductivity (EC) and turbidity;
- Analysis of groundwater samples at a NATA accredited laboratory for heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB and VOC testing. QA/QC testing included an intra-laboratory replicate, trip spike and blank; and
- Comparison of the analytical data against the applicable assessment criteria published in NEPC (2013), plus other relevant guidelines. The site assessment criteria (SAC) adopted applied to a high-density residential land use with minimal soil access opportunities.

The investigation and screening levels applied comprised levels adopted for a generic Residential B land use scenario (as an initial conservative screen), notwithstanding that the proposed development is a mixed use with multiple basement levels.

The outcomes of the testing are presented as part of the relevant sections of this DSI, and are therefore not discussed further in this report summary section.

6.1.3 **RAP (Douglas, 2025b)**

Douglas prepared a Remediation Action Plan (RAP) for the site (Douglas, 2025b) based on the information obtained from Golder (2021) and Douglas (2025a). The report summarised the need for further investigative works in order to produce a DSI report (this current report) in addition to providing guidance on validation processes and the removal of the UST.

It was established that as the site is proposed for deeper excavation to accommodate additional basement levels, the only viable remediation option for the UST is decommissioning and removal from site.

The scope of work for the RAP comprised:

- Summarise the findings of previous investigations used to inform the status of contamination and contamination risk at the site;
- Present a conceptual site model (CSM) to list potential and likely contamination source, pathway and receptor linkages to address potentially unacceptable risks to human health and relevant environmental values from contamination;
- Define the anticipated extent of remediation;
- Assess potentially suitable remediation options to render the site suitable for its proposed use, and which will minimise potentially unacceptable risk to human health and/or the environment, and which includes the consideration of the principles of ecologically sustainable development;
- Identify the preferred remediation option;
- Establish the remediation acceptance criteria (RAC) to be adopted for validation of remediation;
- Identify how successful implementation of the RAP will be demonstrated / validated;
- Outline waste classification, handling and tracking requirements;
- Outline environmental safeguards required to complete the remediation works; and
- Include contingency plans and an unexpected finds protocol.

The general sequence of remediation was documented to comprise:

- Decommissioning of the UST (including disposal of contents);
- Excavation of UST backfill soils, stockpiling for waste classification;
- Excavation, removal and disposal of the UST and associated infrastructure (collectively the underground petroleum storage system – UPSS);
- Further excavation of any hydrocarbon impacted soils or bedrock as determined by the Environmental Consultant; and
- Validation of completion of remediation prior to bulk excavation around the location.

As noted above, the RAP documented the data gap investigation to be implemented to inform a DSI report. The scope is consistent with that documented in this current DSI.

The RAP concluded that on the basis of the information presented in the report, and subject to the outcomes of the data gap investigation / DSI, Douglas considered that a long-term environmental management plan is unlikely to be required for the site, as any identified contamination associated with the sources identified in the conceptual site model (CSM) will be removed as part of proposed basement excavation. As a result, it was considered that the site can be made suitable for the proposed mixed-use residential development subject to implementation of the RAP.

7. Conceptual site model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

Based on the previous reports (Golder, 2021 and Douglas, 2025a), the following potential sources of contamination and associated contaminants of potential concern (CoPC) have been identified and summarised in Table 3.

Table 3: Summary of potential sources

Potential sources and associated CoPC
On-site sources
S1: Fill: fill of unknown origin was found in all six boreholes as part of Douglas (2025a). All test results were below SAC, however additional sampling and testing was recommended as part of the RAP to improve site coverage in line with NSW EPA (2022): CoPC include heavy metals, TRH, BTEX, PAH, PCB, OCP, OPP, phenols and asbestos **S2:** Current buildings (noting that a previous hazardous materials management plan identified asbestos in lift friction pads, synthetic mineral fibres (SMF) in in some building materials, and PCB in light fittings. CoPC include asbestos, SMF, lead (in paint) and PCB **S3:** Below ground UST and associated infrastructure CoPC include heavy metals, TRH, BTEX and PAH

The following potential human and environmental receptors, along with relevant potential pathways, have been identified and summarised in Table 4.

Table 4: Summary of potential receptors and pathways

Potential human receptors
HR1: Current users [office workers, retail staff, residents and customers] **HR2:** Construction and maintenance workers **HR3:** End users [residents, retail staff and customers] **HR4**: Adjacent users [residents, retail staff and customers]
Potential environmental receptors
ER1: Surface water **ER2:** Groundwater
Potential pathways to human receptors
HP1: Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours

Potential pathways to environmental receptors
EP1: Leaching of contaminants and vertical migration into groundwater
EP2: Lateral migration of groundwater providing base flow to water bodies (surface water)

Summary of potentially complete exposure pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S3) and receptors are provided in below Table 5.

Table 5: Summary of potentially complete exposure pathways

Source and CoPC	Exposure pathway	Receptor	Recommended action
S1: Fill beneath the slab	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR2:** Construction and maintenance workers	Results in Douglas (2025a) show concentrations below SAC. Data gap investigation recommended to complete fill testing to the NSW EPA (2022) sampling guidelines. All fill to be removed for planned basement excavation works, so formal waste classification to be undertaken to inform off-site disposal.
	EP2: Lateral migration of groundwater providing base flow to water bodies.	**ER1:** Surface water **HR2**: Construction and maintenance workers	
	EP1: Leaching of contaminants and vertical migration into groundwater.	**ER2:** Groundwater **HR2**: Construction and maintenance workers **HR3:** End users	
S2: Hazardous building materials	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2**: Construction and maintenance workers	All hazardous building materials to be removed and a building clearance by a qualified occupational hygienist issued prior to bulk demolition. Ground surface clearance by occupational hygienist post building demolition.

Source and CoPC	Exposure pathway	Receptor	Recommended action
S3: UST and associated infrastructure	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2**: Construction and maintenance workers **HR3:** End users	UST and associated infrastructure to be removed and validated in accordance with the RAP
	EP1: Leaching of contaminants and vertical migration into groundwater. **EP2:** Lateral migration of groundwater providing base flow to water bodies.	**ER1:** Surface water **ER2:** Groundwater	

8. Sampling and analysis plan

8.1 Data quality objectives

The DSI was devised with reference to the seven-step data quality objectives (DQO) process which is provided in Appendix B Schedule B2, NEPC (2013). The data quality objective process is outlined in Appendix C.

8.2 Soil sampling and analysis rationale

Based on the CSM and DQO, a systematic and targeted soil sampling strategy was adopted. The strategy for borehole positioning comprised of the following:

- Six boreholes (BH01 to BH06) systematically positioned across the lowest existing basement carpark level at the site, primarily for geotechnical investigation purposes; and
- Three subsequent boreholes (BH07 to BH09) positioned at the lowest existing basement carpark level (BH07 and BH09) and the lowest accessible room below the basement carpark, also sitting below and adjacent to the room housing the UST (BH08).

Borehole locations are shown on the lower basement level layout plan in Drawing 2, Appendix A.

The total number of sample locations complies with the NSW EPA *Contaminated Sites, Sampling Design Guidelines* (NSW EPA, 2022).

Given that fill was identified as a potential source of contamination, the majority of recovered samples selected for analysis were taken from the observed fill, with a minimum of one fill sample from each borehole analysed for COPC.

8.3 Groundwater sampling and analysis rationale

In order to assess the groundwater contamination status at the site and evaluate whether historical, current or off-site land uses have impacted on groundwater beneath the site, sampling from three monitoring wells (BH01, BH03, BH06) was undertaken.

The locations were selected based on the following rationale, assuming a south-west groundwater flow direction which cannot be confirmed with current data:

- BH01 was positioned hydraulically down-gradient in the south-western portion of the site, presumed to also be hydraulically down-gradient of the UST. The groundwater test results from BH01 were used to evaluate whether the UST has potentially impacted on groundwater quality. The results at BH01 also provide data on the concentration of contaminants in groundwater exiting the site;
- BH06 was positioned hydraulically up-gradient or cross-gradient in the south-eastern portion of the site, presumed to be up-gradient or cross gradient of the UST; and
- BH03 was positioned hydraulically up-gradient on the site. The results at BH03 provide data on the concentration of contaminants in groundwater entering the site.

The general sampling methods are described in the field work methodology in Appendix E.

All samples were analysed for the CoPC in the CSM.

9. Site assessment criteria

The site assessment criteria (SAC) applied in the current investigation are equivalent to those adopted in Douglas (2025a) and are informed by the CSM (Section 7) which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a generic high density residential B land use land use scenario. The derivation of the SAC is in Appendix E, and the adopted SAC are listed on the summary analytical results tables in Appendix F.

10. Results

10.1 Fieldwork results

10.1.1 Soil

The borehole logs are included in Appendix G. The logs recorded the following general sub-surface soil profile.

Pavement:	BH01 and BH02 comprised of a double concrete slab, 250mm and 180mm deep respectively with binding sand separating the layers. BH07, BH08 and BH09 comprised of a single 250mm concrete slab and BH03, BH04, BH05 and BH06 comprised of a single 150mm thick concrete slab.

Fill:	Fill materials comprised of gravels / sand to maximum depths between 0.25 m and 1.1 m below the top of slab. Sandy clay fill was observed below this layer in some of the boreholes to a maximum depth of between 0.7 m and 2.60 m below the top of slab. BH04 contained no clay layer and consisted of solely gravels / sands to a depth of 0.6 m below the top of slab. BH07, BH08 and BH09 contained no clay layer up to maximum depths of between 0.6 and 1.1 m (refusal depth) below the top of slab.
Residual soils:	No residual soil observed.
Ashfield Shale:	Typically, very low to low strength, highly weathered siltstone encountered at depths between 0.6 m and 4.8 m below the top of slab; overlying
Mittagong Formation:	Interbedded and interlaminated siltstone and fine-grained sandstone, of very low to high strength, at depths between 4.05 m and 14.6 m; overlying
Hawkesbury Sandstone:	Medium to coarse grained Hawkesbury Sandstone, encountered at depths of between 12.0 m and 31.5 m, typically medium to high strength. No Hawkesbury sandstone was encountered in BH03, BH05 and BH06. No rock coring was undertaken in BH07, BH08 and BH09.

Visual anthropogenic inclusions were noted in BH05 as “trace PVC fragments” and BH09 as “plastic foam”.

No olfactory evidence was observed during the drilling.

10.1.2 **Groundwater**

Groundwater wells were installed in BH01, BH03 and BH06. Well details are included in the borehole logs in Appendix G and summarised in Table 5 below. Free groundwater was only observed at 25.2 m bgl during auger drilling in borehole BH04, however no well was constructed at this location. The necessary introduction of water to the borehole while wash boring or rock coring precluded any further groundwater observations during drilling.

During groundwater sampling (after well development), groundwater levels were measured at 10.83 m for BH01, 6.73 m for BH03 and 3.4 m for BH06 (82.4 m AHD, 82.4 m AHD and 81.3 m AHD respectively). It should be noted that groundwater levels are affected by climatic conditions and soil permeability and will therefore vary with time.

It is noted that the well construction was designed for geotechnical investigation purposes and therefore may not be ideal to detect free phase product should it be present due to a perched water table.

Table 6: Summary of well installation and groundwater levels

Well ID	Surface Level (RL m AHD)	Standing water level (m bgl)	Standing water level (RL m AHD)	Screened Depth (m bgl)*	Screened geology
BH01	82.4	10.83	71.57	3.1 – 14.8	Siltstone (Ashfield Shale), Interbedded and interlaminated Siltstone with fine grained sandstone (Mittagong Formation) and Sandstone (Hawkesbury Sandstone)
BH03	82.4	6.73	75.67	0.7 – 12.1	Siltstone (Ashfield Shale), Interbedded and interlaminated Siltstone with fine grained sandstone (Mittagong Formation)
BH06	81.3	3.40	77.9	2.00 – 11.05	Siltstone (Ashfield Shale), Interbedded and interlaminated Siltstone with fine grained sandstone (Mittagong Formation)

Notes: *Screened depth in this table refers to the depth range where the slotted well pipe has been installed

Groundwater sampling was carried out after stabilised groundwater readings were obtained for each groundwater well and are presented in Table 7.

Table 7: Stabilised groundwater readings prior to sampling on 17 April 2025

Borehole	Temperature (°C)	Dissolved oxygen (mg/L)	Electrical conductivity (mS/cm)	pH	Redox (mV)	Turbidity
BH01	20.4	1.26	1290	5.07	122.1	335
BH04	20.9	1.07	530	6.29	-31.5	129
BH05	21.1	2.48	620	5.65	118.5	334

10.2 Laboratory analytical results

The results of laboratory analysis are summarised in the following tables in Appendix F:

- Table F1: Summary of Laboratory Results - Soil Site Assessment Results;
- Table F2: Summary of Laboratory Results – Groundwater; and
- Table F3: Summary of Laboratory Results – Preliminary Waste Classification.

The laboratory certificates of analysis together with the chain of custody and sample receipt information are provided in Appendix H.

10.3 Data quality assurance and quality control

The data quality assurance and quality control (QA/QC) results are provided in Appendix I. Based on the results of the field QA and field and laboratory QC, and evaluation against the data quality indicators (DQI) it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

11. Discussion

11.1 Soils

The analytical results for all contaminants tested (heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, and asbestos) in all samples were below the SAC. No asbestos was detected in the analysed samples using the testing method implemented.

11.2 Groundwater

The analytical results for all contaminants tested (heavy metals, TRH, BTEX, PAH, OCP, OPP and PCB) in all samples were below the SAC with the exception of the following:

- Total chromium in samples BH03 (2 µg/L) and BH06 (9 µg/L) which exceeded the ANZG 95% freshwater ecological guideline of 1.0 µg/L;
- Copper in samples BH01 (13 µg/L), BH03 (24 µg/L) and BH06 (36 µg/L) which exceeded the ANZG 95% freshwater ecological guideline of 1.4 µg/L;
- Lead in sample BH06 (8 µg/L), which exceeded the ANZG 95% freshwater ecological guideline of 3.4 µg/L;
- Nickel in samples BH01 (130 µg/L), BH03 (22 µg/L) and BH06 (28 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 11 µg/L;
- Zinc in samples BH01 (270 µg/L), BH03 (59 µg/L) and BH01 (110 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 8 µg/L;
- Dissolved copper in samples BH01 (3.0 µg/L) and BH06 (3.0 µg/L) which exceeded the ANZG 95% freshwater ecological guideline of 1.4 µg/L;
- Dissolved nickel in samples BH01 (100 µg/L), BH03 (17 µg/L) and BH06 (15 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 11 µg/L;
- Dissolved zinc in samples BH01 (120 µg/L), BH03 (28 µg/L) and BH06 (41 µg/L) which exceeded the ANZG 95% freshwater ecological guideline level of 8 µg/L;
- Bromodichloromethane in sample BH03 (5 µg/L) which has no SAC; and
- Dibromochloromethane in sample BH03 (1 µg/L) which has no SAC.

The metals concentrations in the groundwater samples appear to be relatively consistent across the three wells, suggesting a diffuse and regional characteristic of the groundwater beneath the site. The low bromodichloromethane and dibromochloromethane concentrations are considered to be likely associated with residual chlorinated water impacts, potentially associated with historical leaking taps and water supply pipes.

Whilst the reported concentrations are not considered to pose a risk of harm to potential recipients on-site, and do not indicate an on-site source of groundwater contamination, the concentrations will need to be considered for dewatering purposes.

It is noted also that elevated concentrations of some nutrients, anions and cations were reported for the analysed samples. Whilst these do not constitute contaminants, they will need to be considered for dewatering purposes.

11.3 Preliminary waste classification

11.3.1 Fill soils

To assist with project planning, a preliminary waste classification was undertaking using the data obtained from the soil testing. The preliminary classification for fill at the site was undertaken with reference to NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (NSW EPA, 2014).

Table 8: Six step classification procedure

No.	Item	Comment	Rationale
1.	Is the waste special waste?	No	No ACM, clinical or related waste, or waste tyres were observed in the boreholes.
2.	Is the waste liquid waste?	No	The fill comprised a soil matrix.
3.	Is the waste "pre-classified"?	No	The fill is not pre-classified with reference to NSW EPA (2014).
4.	Does the waste possess hazardous waste characteristics?	No	The fill was not observed to contain or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances, corrosive substances, coal tar, batteries, lead paint or dangerous goods containers.
5.	Determining a wastes classification using chemical assessment.	Conducted	Refer to Table F3, Appendix F.
6.	Is the waste putrescible or non-putrescible? [1]	Non-putrescible	The fill does not contain material that is considered to be putrescible.

Notes:
1. Wastes that are generally not classified as putrescible include soils, timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials (NSW EPA, 2014).

As shown in Table F3, contaminant concentrations for the analysed fill samples were generally below the CT1 criteria applicable to a general solid waste classification apart from nickel at BH01/0.5-0.6, BH01/1.4-1.5, BH02/0.4-0.5, BH04/0.4-0.5, BH06/0.4-0.5 and total arsenic at BH06/0.4-0.5.

Toxicity characteristics leaching procedure (TCLP) tests were conducted for the analytes exceeding the CT1 thresholds on representative "worst case" samples. The specific contaminant concentration (SCC) and TCLP concentrations for those samples were below the contaminant thresholds SCC1 and TCLP1 for general solid waste, respectively.

Based on the above, all fill soils across the site are preliminarily classified as general solid waste (non-putrescible).

This preliminary classification is not to be used for waste disposal. Further work prior to offsite disposal of any excess soil to the development is required before a formal classification suitable for waste disposal can be provided. The waste classification is to be confirmed by a qualified environmental consultant including visual and analytical assessments. The RAP outlines the formal waste classification process.

12. Revised conceptual site model

The data collected for this DSI has generally confirmed that certain potential contaminant sources outlined in the CSM in Section 7 pose a potentially complete pathway to the identified receptor(s) whilst others do not. No other sources of contamination have been identified as a result of the testing results. This is summarised in Table 9.

Table 9: Updated summary of potentially complete exposure pathways (proposed land use)

Source and CoPC	Exposure pathway	Receptor	Recommended action
S2: Hazardous building materials	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2**: Construction and maintenance workers	All hazardous building materials to be removed and a building clearance by a qualified occupational hygienist issued prior to bulk demolition. Ground surface clearance by occupational hygienist post building demolition.
S3: UST and associated infrastructure	**HP1:** Ingestion and dermal contact **HP2:** Inhalation of dust and/or vapours	**HR1:** Current site users **HR2**: Construction and maintenance workers **HR3:** End users	UST and associated infrastructure to be removed and validated in accordance with the RAP.
	EP1: Leaching of contaminants and vertical migration into **EP2:** Lateral migration of groundwater providing base flow to water bodies.	**ER1:** Surface water **ER2:** Groundwater	

13. Conclusions and recommendations

Based on the results of this DSI, the following conclusions and recommendations are made:

- The soils within the site, at the tested locations (boreholes) do not exceed the SAC applicable to a high-density residential land use;
- Groundwater below the site is not considered to present a risk of harm or exposure to occupants and workers at the site. However, given the marginally elevated metals, nutrients, anion and cation concentrations discussed in Section 11.2, it is considered likely that some form of pre-treatment will be required to reduce these concentrations prior to disposal of water collected through a dewatering scheme. It is envisaged that would be captured in a dewatering management plan; and
- The test results suggest that the fill at the boreholes preliminarily classifies as general solid waste (non-putrescible) under the NSW EPA (2014) guidelines.

It is therefore concluded that the site can be made suitable for the proposed mixed-use residential development subject to implementation of the RAP (Douglas, 2025b). It is noted that this report already presents the results of the data gap investigation which is recommended in the RAP.

Based on the proposal to extent the basement parking levels deeper, all fill and the UST will necessarily be removed from the site. As such, it is not envisaged that a long-term environmental management plan will be required for the site post remediation and construction.

14. References

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene*. Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

Douglas. (2025a). *Report on Contamination Testing - 601 Pacific Highway, St Leonards, NSW*. Reference 86230.01.R.002.Rev1 Dated 24 October 2025.

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Golder. (2021). *Preliminary Site Investigation - 601 Pacific Highway, St Leonards, NSW*. Reference 1792109-002-R-Rev1 Dated 24 June 2021.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (2014). *Waste Classification Guidelines, Part 1: Classifying Waste*. NSW Environment Protection Authority.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

NSW EPA. (2022). *Contaminated Sites, Sampling Design Guidelines*. NSW Environment Protection Authority.

15. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at 601 Pacific Highway, St Leonards NSW in line with Douglas' proposal dated 22 October 2025 and acceptance received from Hee-Jung Yoon of Stockland Development Pty Limited. The work was carried out as a variation has been procured under Douglas Partners' main Geotechnical contract. This report is provided for the exclusive use of Stockland Development Pty Limited for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the (geotechnical / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Drawings

About This Report





Site Location

Legend

- Site Boundary
- Approximate Borehole Locations

5 0 5 10 15 m

NOTE:
1. Drawing adapted from aerial imagery from metromap.com and shown in GDA2020 / MGA zone 56
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage (handheld GPS, measured off site features)

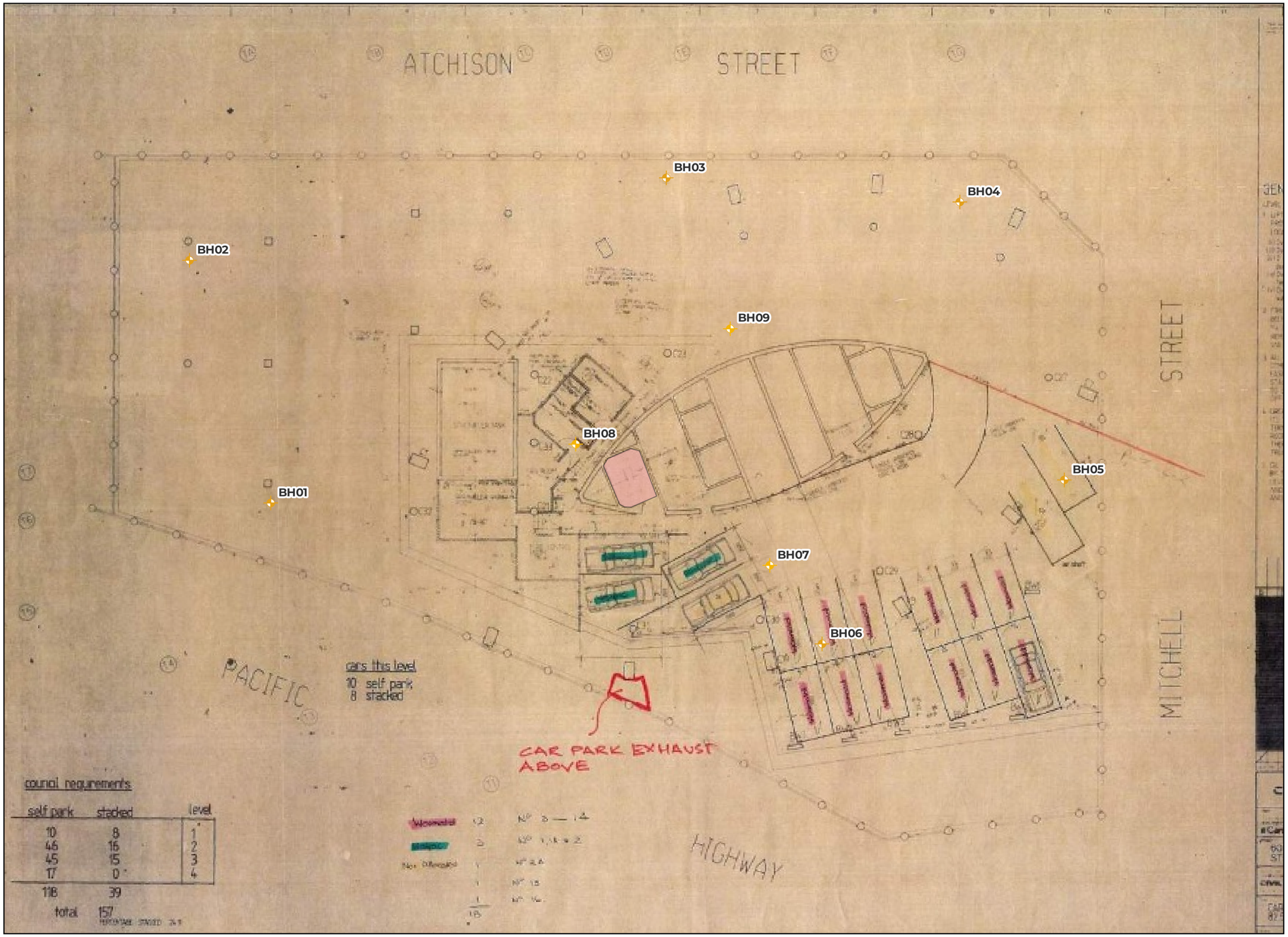
Douglas PARTNERS

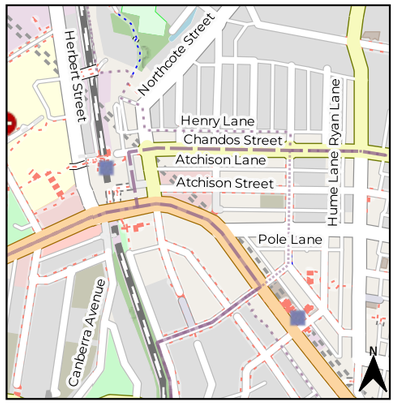
CLIENT: Stockland Development Pty Ltd		
OFFICE: Sydney	DRAWN BY: PW	
SCALE: 1:400 @A3	DATE: 14.11.2025	

TITLE: **Site Overview and Boundary**
Detailed Site Investigation
601 Pacific Highway, St Leonards NSW

N

Project:	86230.03
DRAWING No:	1
REVISION:	0





Site Location

Legend

- UST Location
- Approximate Borehole Locations

5 0 5 10 15 m

NOTE:
1. Drawing adapted from aerial imagery from metromap.com and shown in GDA2020 / MGA zone 56
2. Test locations are approximate only and were located using differential GPS typically accurate to ± 0.1 m depending on satellite coverage (handheld GPS, measured off site features)

Douglas PARTNERS

CLIENT: Stockland Development Pty Ltd		TITLE: **Borehole and UST Location Plan**
OFFICE: Sydney	DRAWN BY: PW	**Detailed Site Investigation**
SCALE: 1:275 @A3	DATE: 20.11.2025	**601 Pacific Highway, St Leonards NSW**

N

Project:	86230.03
DRAWING No:	2
REVISION:	0

About this Report

November 2023

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix B

Site Photographs

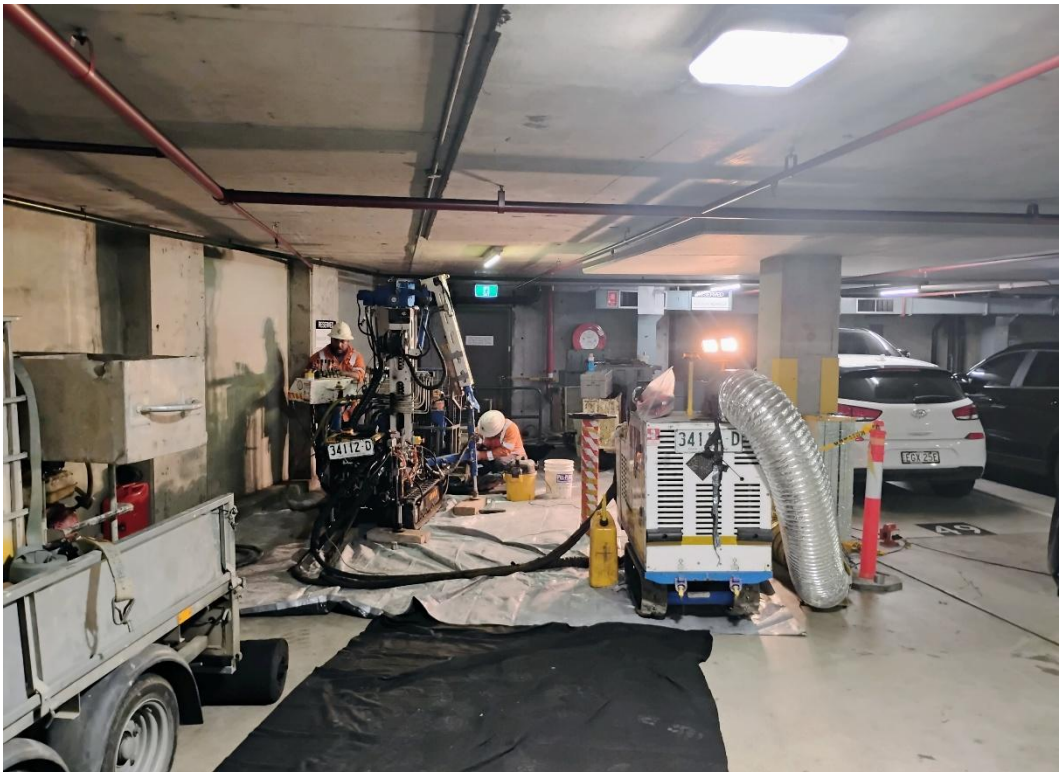

Photo 1: Overview of the augering process undertaken



Photo 2: Overview of the hand augering process undertaken

Douglas PARTNERS	**Site Photographs**	PROJECT:	86230.03
	Detailed Site Investigation	PLATE No:	1
	601 Pacific Highway, St Leonards NSW	REV:	0
	CLIENT	Stockland Development Py Ltd	



Photo 3: Soils encountered at location BH9



Photo 4: Overview of the hand augered borehole at location BH9

Douglas PARTNERS	**Site Photographs**	PROJECT:	86230.03
	Detailed Site Investigation	PLATE No:	2
	601 Pacific Highway, St Leonards NSW	REV:	0
	CLIENT	Stockland Development Py Ltd	



Photo 5: Overview of the hand augered borehole at location BH7



Photo 6: Overview of the hand augered borehole at location BH8

Douglas PARTNERS	**Site Photographs**	PROJECT:	86230.03
	Detailed Site Investigation	PLATE No:	3
	601 Pacific Highway, St Leonards NSW	REV:	0
	CLIENT	Stockland Development Py Ltd	

Appendix C

Data Quality Objectives (DQO)

1. Data quality objectives

The DSI has been devised broadly in accordance with the seven-step data quality objectives (DQO) process which is provided in Appendix B, Schedule B2 of NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

Table 1: Data quality objectives

Step	Summary
1: State the problem	The objective of the investigation is to assess the contamination status of the site with respect to the proposed land use, and to determine if the site is suitable, or can be made suitable, for the proposed development. The investigation is being undertaken as the site is to be redeveloped into a mixed-use residential building. This report has been undertaken with consideration to the requirements of the regulator, the Department of Planning, Housing and Infrastructure (DPHI), in support of the SSDA (SSD-85848713) and concurrent rezoning proposal. A preliminary conceptual site model (CSM) has been prepared (Section 7) for the proposed development. The project team consist of experienced environmental engineers and scientists working in the roles of Project Principal, Project Reviewer, Project Manager and field staff.
2: Identify the decisions / goal of the study	The site history has identified possible contaminating previous uses and features which are identified in the CSM (Section 7). The CSM identifies the associated contaminants of potential concern (CoPC) and the likely impacted media. The site assessment criteria (SAC) for each of the CoPC are detailed in Appendix E. The decision is to establish whether or not the results fall below the SAC. On this basis, an assessment of the site's suitability from a contamination perspective will be derived and a decision made on whether (or not) further assessment and/or remediation will be required.
3: Identify the information inputs	Inputs will be the analytical results for the CoPC and media (identified in the CSM, Section 7) from NATA accredited laboratories and methods, where possible. The SAC for each of the CoPC are detailed in Appendix E. Field results and observations such as photo-ionisation detector (PID) and observations of building debris, ash, odours, staining etc will be used to inform sample selection for laboratory analysis.
4: Define the study boundaries	The lateral boundaries of the investigation area are shown on Drawing 1, Appendix A. The vertical boundaries are to the extent of contamination impact as determined from the site history assessment and site observations, and/or the extent of proposed basement excavation. The assessment is limited to the timeframe over which the field works were undertaken. Constraints to the assessment are identified and discussed in the limitations of the report, Section 15.

Step	Summary
5: Develop the analytical approach (or decision rule)	The decision rule is to compare all analytical results with the SAC (Appendix E, based on NEPC (2013)). Where guideline values are absent, other sources of guideline values accepted by NEPC (2013) shall be adopted where available and warranted. Where a sample result exceeds the adopted criterion, a further qualitative site-specific assessment will be made as to the risk posed by the presence of that contaminant(s). Initial comparisons will be with individual results then, where appropriate, summary statistics (including mean, standard deviation and 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL)) to further assess potential risks posed by the site contamination. Quality control results are to be assessed according to their relative percent difference (RPD) values. For field duplicates, triplicates and laboratory results, RPD values should generally be below 30%; for field blanks and rinsates, results should be at or less than the limits of reporting (NEPC, 2013). The field and laboratory quality assurance assessment is included in Appendix I.
6: Specify the performance or acceptance criteria	Baseline condition: Contaminants at the site exceed the human health and environmental SAC and pose a potentially unacceptable risk to receptors (null hypothesis). Alternative condition: Contaminants at the site comply with the human health and environmental SAC and therefore, do not pose a potentially unacceptable risk to receptors (alternative hypothesis). Unless conclusive information from the collected data is sufficient to reject the null hypothesis, it will be assumed that the baseline condition is true.
7: Optimise the design for obtaining data	As the purpose of the investigation is to assess the contamination status of the site, the sampling program is reliant on professional judgement to identify and sample the potentially affected areas. Further details regarding the sampling plan are in Section 8.

2. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix D

Fieldwork Methodology

1. Guidelines

The following key guidelines were consulted for the field work methodology:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).

2. Soil sampling

Soil sampling was carried out in accordance with Douglas' standard operating procedures. The general sampling and sample management procedures comprise:

- Collect soil samples directly from the solid flight auger and hand auger at regular intervals to the natural bedrock or prior refusal;
- Place samples into laboratory-prepared glass jars with Teflon lined lids, capping immediately and minimising headspace within the sample jar;
- Collect replicate samples in zip-lock bags for photo-ionisation detector (PID) screening;
- Collect ~40 g to 50 g samples in zip-lock bags for asbestos (presence / absence) analysis;
- Wear a new disposable nitrile glove for each sample point thereby minimising potential for cross-contamination;
- Collect 10% replicate samples for quality control (QC) purposes;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable);
- Place samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain of custody documentation.

3. Groundwater sampling

3.1 Monitoring well installation

Monitoring wells are constructed using class 18 uPVC machine slotted screen and blank sections with screw threaded joints. The screened section of each well is backfilled with a washed gravel filter pack to approximately 0.5 m above the screened interval. Each well is completed with a hydrated bentonite plug at least 0.5 m thick and then backfilled to the surface.

3.2 Monitoring well development

Groundwater monitoring wells are developed as soon as practicable following well installation. The purpose of well development is to remove sediments and/or drilling fluid introduced to the well during drilling and to facilitate connection of the monitoring well to the aquifer. The wells are developed by pumping / bailing to remove a minimum of three well volumes, or until dry.

3.3 Groundwater sampling

Bladder pump

Groundwater sampling is carried out in accordance with Douglas' standard operating procedures. Groundwater samples are collected using a positive displacement low flow bladder pump via the micro-purge (minimal drawdown) method. The method minimises aeration of the sample and disturbance to the water column thereby enhancing the quality of results for oxygen sensitive analytes. The sampling method is described as follows:

- Measure the static water level using an electronic interface probe and record the thickness of any LNAPL (if encountered);
- Decontaminate the interface probe and cable between monitoring wells by rinsing in a diluted Liquinox solution and then rinsing in demineralised water;
- Fit the pump with a well-dedicated bladder and tubing. Lower the pump into the well then clamp at a level estimated to be the approximate mid-point of the well screen;
- Set the pump at the lowest rate possible that could produce laminar flow to minimise drawdown of the water column;
- Measure physical parameters by continuously passing the purged water through a flow cell; and
- Following stabilisation of the field parameters, collect samples in laboratory-prepared bottles minimising headspace within the sample bottle and cap immediately.

Sample handling

The general groundwater sample handling and management procedures comprise:

- Collect 10% replicate samples for QC purposes;
- Label sample containers with individual and unique identification details, including project number and sample location;
- Place the sample jars into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain of custody documentation.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

Appendix E

Site Assessment Criteria (SAC)

1. Introduction

1.1 Guidelines

The following key guidelines were consulted for deriving the site assessment criteria (SAC):

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013).
- CRC CARE *Health screening levels for petroleum hydrocarbons in soil and groundwater* (CRC CARE, 2011).
- ANZG *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- ANZECC *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).

1.2 General

The SAC applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination at the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The following inputs are relevant to the selection and/or derivation of the SAC:

- Land use: mixed-use / high density residential.
    - Corresponding to land use category 'B', residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats. Whilst the site is proposed for mixed use, which gives rise to the adoption of less conservative criteria under NEPC (2013), the "B" category of criteria is adopted as a conservative initial screen.
- Soil type: sand (sand has been adopted as a screening tool due to more conservative criteria however on-site soils present multiple fill layers ranging from coarse to fine soils).

2. Soils

2.1 Health investigation and screening levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are in Table 1 and Table 2.

Table 1: Health investigation levels (mg/kg)

Contaminant	HIL-B
Metals	
Arsenic	500
Cadmium	150
Chromium (VI)	500
Copper	30 000
Lead	1200
Mercury (inorganic)	120
Nickel	1200
Zinc	60 000
PAH	
B(a)P TEQ	4
Total PAH	400
Phenols	
Phenol	45 000
Pentachlorophenol	130
OCP	
DDT+DDE+DDD	600
Aldrin and dieldrin	10
Chlordane	90
Endosulfan	400
Endrin	20
Heptachlor	10
HCB	15
Methoxychlor	500
OPP	
Chlorpyrifos	340
PCB	
PCB	1

Table 2: Health screening levels (mg/kg)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	HSL-A&B
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	0.5	0.5	0.5	0.5
Toluene	160	220	310	540
Ethylbenzene	55	NL	NL	NL
Xylenes	40	60	95	170
Naphthalene	3	NL	NL	NL
TRH F1	45	70	110	200
TRH F2	110	240	440	NL

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'
scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

The HSL for direct contact derived from CRC CARE (2011) are in Table 3.

Table 3: Health screening levels for direct contact (mg/kg)

Contaminant	DC HSL-B	DC HSL-IMW
Benzene	140	1100
Toluene	21 000	120 000
Ethylbenzene	5900	85 000
Xylenes	17 000	130 000
Naphthalene	2200	29 000
TRH F1	5600	82 000
TRH F2	4200	62 000
TRH F3	5800	85 000
TRH F4	8100	120 000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
IMW intrusive maintenance worker

2.2 Asbestos in soil

Based on the CSM and/or current site access limitations, a detailed asbestos assessment was not considered to be warranted at this stage. However, due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site.

Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS:4964) has been adopted for this investigation / assessment as an initial screen.

2.3 Ecological investigation levels

Ecological investigation levels (EIL) and added contaminant limits (ACL), have not been evaluated due to the proposed construction of six basement levels at the site. There are not considered to be any environmental receptors as a result.

2.4 Ecological screening levels

The ESL's have not been evaluated due to the proposed construction of six basement levels at the site. There are not considered to be any environmental receptors as a result.

2.5 Management limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

The adopted management limits are in Table 4.

Table 4: Management limits (mg/kg)

Contaminant	Soil type	ML-A-B-C
TRH F1	Coarse	700
TRH F2	Coarse	1000
TRH F3	Coarse	2500
TRH F4	Coarse	10 000
TRH F1	Fine	800
TRH F2	Fine	1000
TRH F3	Fine	3500
TRH F4	Fine	10 000

Notes: TRH F1 is TRH C_6-C_{10} including BTEX
TRH F2 is TRH >C_{10}-C_{16} including naphthalene
ML-A-B-C residential, parkland and public open space

3. Groundwater

3.1 Introduction

The groundwater investigation levels (GIL) used for interpretation of the groundwater data (as a Tier 1 assessment) have been selected for the purposes of a preliminary screening tool, the most conservative criteria for Residential B Land use has been adopted.

Table 5: Groundwater investigation level rationale

Receptor / beneficial use	GIL	Source	Comments / rationale
Aquatic ecosystem	DGV	ANZG (2018)	Freshwater 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants
Building occupants (vapour intrusion)	HSL	NEPC (2013)	2 m to <4 m, 4-8 m HSLs based on measured depths to groundwater. Note that the multi-level basement is likely to sit within groundwater, and under that circumstance the HSL would not apply. If concentrations exceed the laboratory PQL the report will recommend a site specific assessment of groundwater seepage risk into the new basement.

Notes: DGV default guideline value
% LOP percentage level of protection of species
HSL health screening level
GV guideline value
LTV long term value (up to 100 years)
STV short term value (up to 20 years)

3.2 Groundwater investigation levels for aquatic ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 6.

Table 6: Groundwater investigation levels for protection of aquatic ecosystems (µg/L)

Contaminant	Freshwater DGV 95% LOP	Notes
Metals / metalloids		
Arsenic	24 / 13	Levels provided for As III / As IV respectively. Moderate reliability.
Cadmium	0.2	Very high reliability.
Chromium (VI)	1	Chromium VI levels adopted as initial screen for total chromium. Very high reliability.
Copper	1.4	Very high reliability.
Lead	3.4	Moderate reliability.

Contaminant	Freshwater DGV 95% LOP	Notes
Mercury (inorganic)	0.06	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Nickel	11	Low reliability.
Zinc	8	Very high reliability.
BTEX		
Benzene	950	Moderate reliability.
Ethylbenzene	80	Unknown reliability.
m-Xylene	75	Unknown reliability.
o-xylene	350	Low reliability.
p-Xylene	200	Low reliability.
Toluene	180	Unknown reliability.
PAH		
Anthracene	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Benzo(a)pyrene	0.1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Fluoranthene	1	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
Naphthalene	16	Low reliability.
Phenanthrene	0.6	99% LOP adopted as recommended due to potential for bioaccumulation. Unknown reliability.
OCP		
Aldrin	0.001	Unknown reliability and LOP.
Chlordane	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
DDT	0.006	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Dieldrin	0.01	Unknown reliability and LOP.
Endosulfan	0.03	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Endrin	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Heptachlor	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
Methoxychlor	0.005	Unknown reliability and LOP.

Contaminant	Freshwater DGV 95% LOP	Notes
OPP		
Chlorpyrifos	0.01	Moderate reliability.
Diazinon	0.01	Moderate reliability.
Dimethoate	0.15	Low reliability.
Fenitrothion	0.2	Moderate reliability.
Malathion	0.05	Moderate reliability.
Parathion	0.004	Moderate reliability.
PCB		
Aroclor 1242	0.3	99% LOP adopted as recommended due to potential for bioaccumulation. Low reliability.
Aroclor 1254	0.01	99% LOP adopted as recommended due to potential for bioaccumulation. Moderate reliability.
VOC		
Tetrachloroethene (PCE)	70	Unknown reliability.
Trichloroethene (TCE)	330	Unknown reliability.
1,1-dichloroethene (DCE)	700	Unknown reliability.
Chloroethene (vinyl chloride / VC)	100	Unknown reliability.
Tetrachloromethane (carbon tetrachloride / CT)	240	Unknown reliability.
Trichloromethane (chloroform / TCM)	370	99% LOP adopted as recommended to protect key species from chronic toxicity. Unknown reliability.
Inorganics		
Ammonia	900	Very high reliability.

Notes: 95% LOP for non-bioaccumulative contaminants
99% LOP for bioaccumulative contaminants

3.3 Health screening levels for vapour intrusion

The HSL to evaluate potential vapour intrusion risks derived from NEPC (2013) are in Table 7. There are no generic HSL for groundwater within 2 m of the ground (or basement) level.

Table 7: Groundwater health screening levels for vapour intrusion (µg/L)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	Solubility limit
SAND	**2 m to <4 m**	**4 m to <8 m**	**8 m+**	**-**
Benzene	800	800	900	59 000

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	Solubility limit
Toluene	NL	NL	NL	61 000
Ethylbenzene	NL	NL	NL	3900
Xylenes	NL	NL	NL	21 000
Naphthalene	NL	NL	NL	170
TRH F1	1000	1000	1000	9000
TRH F2	1000	1000	1000	3000

Notes: TRH F1 is TRH C_6-C_{10} minus BTEX
TRH F2 is TRH >C_{10}-C_{16} minus naphthalene
The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

4. References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australia and New Zealand Environment and Conservation Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

CRC CARE. (2011). *Health screening levels for petroleum hydrocarbons in soil and groundwater*. Parts 1 to 3, Technical Report No. 10: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC, NRMMC. (2022). *Australian Drinking Water Guidelines 6 2011, Version 3.7*. Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

Appendix F

Summary of Results

Table F1: Summary of Laboratory Results – Metals, PAH, TRH, BTEX, VOC, Priority phenols, OCP, OPP, PCB, Asbestos, pH and CEC

			Priority metals								Priority PAH				PAH											
			Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene
		PQL	4	0.4	1	1	1	0.1	1	1	1	0.05	0.5	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	6	0.9	6	41	18	<0.1	45	370	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BD1/20250325	0 m	25/03/25	5	0.6	7	41	15	<0.1	51	260	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH01	1.4 - 1.5 m	25/03/25	11	0.5	4	37	20	<0.1	55	260	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	NL -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH02	0.13 - 0.2 m	25/03/25	<4	<0.4	4	15	3	<0.1	27	18	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH02	0.4 - 0.5 m	25/03/25	<4	<0.4	5	24	2	<0.1	62	27	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	<4	<0.4	5	46	4	<0.1	59	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH03	0.4 - 0.5 m	25/03/25	11	<0.4	9	38	22	<0.1	36	190	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH04	0.4 - 0.5 m	25/03/25	4	<0.4	13	40	11	<0.1	47	130	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH05	0.15 - 0.2 m	25/03/25	<4	<0.4	2	5	2	<0.1	1	3	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH05	0.4 - 0.5 m	25/03/25	<4	<0.4	9	27	16	<0.1	25	78	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH05	0.9 - 1 m	25/03/25	5	<0.4	8	41	22	<0.1	28	110	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06	0.4 - 0.5 m	25/03/25	170	<0.4	6	25	30	0.2	63	62	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	100	<0.4	6	23	17	0.1	45	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH07	0.3 - 0.4 m	08/11/25	<4	<0.4	3	20	4	<0.1	8	22	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	<4	<0.4	3	13	4	<0.1	9	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH07	0.5 - 0.6 m	08/11/25	8	<0.4	7	27	14	<0.1	34	130	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH08	0.3 - 0.5 m	08/11/25	<4	<0.4	4	21	6	<0.1	15	49	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH08	0.7 - 0.8 m	08/11/25	<4	<0.4	4	10	4	<0.1	12	74	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH09	0.3 - 0.5 m	08/11/25	8	<0.4	8	39	19	<0.1	31	120	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH09	0.6 - 0.8 m	08/11/25	7	<0.4	10	40	18	<0.1	40	110	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BD1/20251108	0 m	08/11/25	6	<0.4	9	40	19	<0.1	38	130	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH09	0.9 - 1.1 m	08/11/25	5	<0.4	10	37	20	<0.1	37	120	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			500 -	150 -	500 -	30,000 -	1,200 -	120 -	1,200 -	60,000 -	3 -	- -	4 -	400 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Lab result
HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Table F1: Summary of Laboratory Results – Metals, PAH, TRH, BTEX, VOC, Priority phenols, OCP, OPP, PCB, Asbestos, pH and CEC

			Priority TRH						TRH		BTEX																			
			TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-Dichloroethene	1,1-dichloropropene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethyl benzene	1,2-dibromo-3-chloropropane	1,2-dibromoethane	1,2-dichlorobenzene	1,2-dichloroethane
		PQL	25	50	25	50	100	100	25	50	0.2	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD1/20250325	0 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	70	240	-	-	-	-	0.5	220	NL	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	0.13 - 0.2 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	0.4 - 0.5 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	0.4 - 0.5 m	25/03/25	<25	<50	<25	<50	120	<100	<25	110	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	0.4 - 0.5 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05	0.15 - 0.2 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05	0.4 - 0.5 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05	0.9 - 1 m	25/03/25	<25	56	<25	56	130	<100	<25	140	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06	0.4 - 0.5 m	25/03/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.3 - 0.4 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.5 - 0.6 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08	0.3 - 0.5 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08	0.7 - 0.8 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.3 - 0.5 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.6 - 0.8 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD1/20251108	0 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.9 - 1.1 m	08/11/25	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	45	110	-	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Lab result
HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Table F1: Summary of Laboratory Results – Metals, PAH, TRH, BTEX, VOC, Priority phenols, OCP, OPP, PCB, Asbestos, pH and CEC

			VOC																										
			1,2-dichloropropane	1,3,5-trimethylbenzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-chlorotoluene	4-chlorotoluene	4-isopropyltoluene	Bromobenzene	Bromochloromethane	Bromodichloroethane	Bromoform	Bromomethane	carbon tetrachloride	Monochlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Cyclohexane	dibromochloromethane	Dibromomethane	Dichlorodifluoromethane	hexachlorobutadiene	Isopropylbenzene (cumene)
		PQL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD1/20250325	0 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	0.13 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05	0.15 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05	0.9 - 1 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.3 - 0.4 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.5 - 0.6 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH08	0.7 - 0.8 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.6 - 0.8 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD1/20251108	0 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.9 - 1.1 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Lab result
HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Table F1: Summary of Laboratory Results – Metals, PAH, TRH, BTEX, VOC, Priority phenols, OCP, OPP, PCB, Asbestos, pH and CEC

													Priority phenols	Priority OCP									OCP					
			n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene (vinylbenzene)	Tert-butyl benzene	tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	1,1,2-trichloroethylene	Trichlorofluoromethane	Vinyl Chloride	Total Phenolics	DDT+DDE+DDD [c]	Aldrin + Dieldrin	Total Chlordane	Total Endosulfan	Endrin	Heptachlor	Hexachlorobenzene	Methoxychlor	Mirex	Heptachlor Epoxide	Endrin Aldehyde	alpha-BHC	beta-BHC	delta-BHC	Lindane
		PQL	1	1	1	1	1	1	1	1	1	1	1	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01	0.5 - 0.6 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BD1/20250325	0 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH01	1.4 - 1.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH02	0.13 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH02	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH03	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH04	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH05	0.15 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH05	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH05	0.9 - 1 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH06	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH07	0.3 - 0.4 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH07	0.5 - 0.6 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH08	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH08	0.7 - 0.8 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BH09	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH09	0.6 - 0.8 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	130 -	600 -	10 -	90 -	400 -	20 -	10 -	15 -	500 -	20 -	- -	- -	- -	- -	- -	- -	- -
BD1/20251108	0 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
BH09	0.9 - 1.1 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

Lab result
HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Table F1: Summary of Laboratory Results – Metals, PAH, TRH, BTEX, VOC, Priority phenols, OCP, OPP, PCB, Asbestos, pH and CEC

			Priority OPP	OPP															PCB	Asbestos	pH and CEC	
			Chlorpyriphos	Azinphos methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Ronnel (fenchlorphos)	Fenitrothion	Fenthion	Malathion	Parathion	Parathion-methyl	Methidathion	Fenamiphos	Total PCB	Asbestos Summary	pH 1:5 soil:water	Cation Exchange Capacity
		PQL	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			1
Sample ID	Depth	Sample Date	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		pH Units	cmol/kg
BH01	0.5 - 0.6 m	25/03/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	6.9	3.9
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BD1/20250325	0 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH01	1.4 - 1.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH02	0.13 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH02	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH03	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH04	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	9.4	16
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH05	0.15 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH05	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH05	0.9 - 1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH06	0.4 - 0.5 m	25/03/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH07	0.3 - 0.4 m	08/11/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH07	0.5 - 0.6 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH08	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH08	0.7 - 0.8 m	08/11/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BH09	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH09	0.6 - 0.8 m	08/11/25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD	-	-
			340 -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 -		- -	- -
BD1/20251108	0 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -
BH09	0.9 - 1.1 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-
			- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		- -	- -

Lab result
HIL/HSL value EIL/ESL/EGV value

HIL/HSL exceedance EIL/ESL exceedance HIL/HSL and EIL/ESL exceedance ML exceedance ML and HIL/HSL or EIL/ESL exceedance

Indicates that asbestos has been detected by the lab, refer to the lab report **Blue** = DC exceedance **Red** = EGV-indirect exceedance HSL 0-<1 Exceedance

Bold = Lab detections - = Not tested or No HIL/HSL/EIL/ESL (as applicable) or Not applicable NL = Not limiting NAD = No Asbestos detected

Notes:

a QA/QC replicate of sample listed directly below the primary sample

b Naphthalene reported as highest detection from the BTEXN or PAH suite, or if both results <PQL as lowest PQL

c EIL criteria applies to DDT only

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		Metals								Metals - Dissolved								TRH			
		Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)
	PQL	1	0.1	1	1	1	0.05	1	1	1	0.1	1	1	1	0.05	1	1	10	50	100	100
ANZG (2018) 95% LOP Fresh		13	0.2	1	1.4	3.4	**0.06**	11	8	13	0.2	1	1.4	3.4	**0.06**	11	8				
NEPC (2013) HSL 2-4m																		1000	1000		
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	**3**	<0.1	<1	**13**	**2**	<0.05	**130**	**270**	<1	<0.1	<1	**3**	<1	<0.05	**100**	**120**	<10	<50	<100	<100
BH03	17/04/25	**6**	<0.1	**2**	**24**	**2**	<0.05	**22**	**59**	**2**	<0.1	<1	<1	<1	<0.05	**17**	**28**	**30**	<50	<100	<100
BH06	17/04/25	**5**	<0.1	**9**	**36**	**8**	<0.05	**28**	**110**	<1	<0.1	<1	**3**	<1	<0.05	**15**	**41**	<10	<50	<100	<100
BD1/250417	17/04/25	**6**	<0.1	**11**	**33**	**10**	<0.05	**33**	**100**	-	-	-	-	-	-	-	-	<10	<50	<100	<100

Notes:

- No criterion / not defined / not tested / not applicable
* QA/QC replicate of sample listed directly below the primary sample
NL Not limiting
PQL Practical quantitation limit

Shaded cell is exceedance of guideline value

Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection

Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.

ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic

ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered

ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		BTEX						PAH														
		Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Total Xylenes	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (B[a]P)	Benzo(b,j+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	Sum of detected PAH
	PQL	1	1	1	1	2	1	0.1	0.1	0.1	0.1	1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ANZG (2018) 95% LOP Fresh		950	180	80	350	75				**0.01**		16	**0.1**					**1**			**0.6**		
NEPC (2013) HSL 2-4m		800	NL	NL			NL					NL											
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH03	17/04/25	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06	17/04/25	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/250417	17/04/25	<1	<1	<1	<1	<2	<1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Notes:

- No criterion / not defined / not tested / not applicable
* QA/QC replicate of sample listed directly below the primary sample
NL Not limiting
PQL Practical quantitation limit

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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		OCP																					
		DDE	DDT	DDD	Aldrin	Dieldrin	Aldrin + Dieldrin (calculated)	alpha-chlordane	gamma-Chlordane	Endosulfan I	Endosulfan II	Endosulfan Sulphate	Endrin	Endrin Aldehyde	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Methoxychlor	Mirex	alpha-BHC	beta-BHC	delta-BHC	Lindane	Sum of detected OCP
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh			**0.006**		**0.001**	**0.01**							**0.01**		**0.01**		0.1	**0.005**	**0.04**				0.2	
NEPC (2013) HSL 2-4m																								
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH03	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

- No criterion / not defined / not tested / not applicable
* QA/QC replicate of sample listed directly below the primary sample
NL Not limiting
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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		OPP																
		Azinphos methyl (Guthion)	Bromophos-ethyl	Chlorpyriphos	Chlorpyriphos-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Ronnel (fenchlorphos)	Fenitrothion	Fenthion	Malathion	Parathion	Parathion-methyl	Methidathion	Fenamiphos	Sum of detected OPP
	PQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ANZG (2018) 95% LOP Fresh		0.02		**0.00004**		0.01		0.15			0.2		0.05	0.004				
NEPC (2013) HSL 2-4m																		
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH03	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BH06	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
BD1/250417	17/04/25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Notes:

- No criterion / not defined / not tested / not applicable
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Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		PCB								VOC															
		Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arocior 1260	Sum of detected PCB	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,2-trichloroethane	1,1,2-trichloroethylene	1,1-dichloroethane	1,1-Dichloroethene	1,1-dichloropropene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethyl benzene	1,2-dibromo-3-chloropropane	1,2-dichlorobenzene	1,2-dichloroethane
	PQL	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ANZG (2018) 95% LOP Fresh					**0.3**		**0.01**				270	400	70	6,500	330		700		**3**		**85**			160	1,900
NEPC (2013) HSL 2-4m																									
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH03	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BH06	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
BD1/250417	17/04/25	<2	<2	<2	<2	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- No criterion / not defined / not tested / not applicable
* QA/QC replicate of sample listed directly below the primary sample
NL Not limiting
PQL Practical quantitation limit

Shaded cell is exceedance of guideline value

Where one or more guideline value is exceeded, the cell is shaded to the colour of the highest guideline value exceeded

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), health screening level Sand 2-4m

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 95% level of protection of species for Fresh aquatic ecosystems [NB: 99% level of protection adopted for bioaccumulative chemicals]

ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, orange text is 'unknown' level of protection

Underlining of ANZG (2018) criteria indicates a criteria with an 'unknown' level of protection.

ANZG (2018) DGV adopted for most conservative species of following analytes: DGV for xylene (m) adopted for xylene (m+p); DGV for CrVI adopted for total chromium; DGV for AsV adopted for total arsenic

ANZG (2018) DGV adopted for aluminium in freshwater is for receiving waters with pH >6.5. For receiving waters with pH <6.5 suitability of the more conservative, low reliability DGV of unknown LOP should be considered

ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		VOC																						
		1,2-dichloropropane	1,3,5-trimethyl benzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-chlorotoluene	4-chlorotoluene	4-isopropyl toluene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	carbon tetrachloride	Chloroethane	Vinyl Chloride	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Isopropylbenzene (cumene)	Cyclohexane	dibromochloromethane	Dibromomethane
	PQL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10	10	1	10	1	1	1	1	1	1
ANZG (2018) 95% LOP Fresh		900		260	1,100	60									240		100	770				30			
NEPC (2013) HSL 2-4m																									
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	**3**	<10	<1	<1	<1	<1	<1	<1
BH03	17/04/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	**5**	<1	<1	<10	<10	**32**	<10	<1	<1	<1	<1	**1**	<1
BH06	17/04/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10	<1	<10	<1	<1	<1	<1	<1	<1
BD1/250417	17/04/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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* QA/QC replicate of sample listed directly below the primary sample
NL Not limiting
PQL Practical quantitation limit

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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F2: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC

		VOC														Nutrients								Anions & Cations	
		Dichlorodifluoromethane	1,2-dibromoethane	hexachlorobutadiene	Bromomethane	Monochlorobenzene	n-butyl benzene	n-propyl benzene	sec-butyl benzene	Styrene (vinylbenzene)	Tert-butyl benzene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane	Sum of detected VOC	Nitrogen	Ammonia as N	TKN in water	Nitrate as N	Nitrite as N	NOx as N	Organic Nitrogen as N	Phosphorous	Chloride	Sulphate
	PQL	10	1	1	10	1	1	1	1	1	1	1	1	10	1	100	5	100	5	5	5	200	50	1000	1000
ANZG (2018) 95% LOP Fresh						55											900		1,100						
NEPC (2013) HSL 2-4m																									
Sample ID	Sample Date	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH01	17/04/25	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**3**	**100**	**12**	**100**	<5	<5	<5	<200	<50	**250,000**	**120,000**
BH03	17/04/25	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	**38**	**300**	<5	**300**	<5	<5	<5	**300**	**60**	**56,000**	**55,000**
BH06	17/04/25	<10	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1	**100**	**12**	**100**	<5	<5	<5	<200	**2,900**	**66,000**	**71,000**
BD1/250417	17/04/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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ANZG (2018) Ammonia DGV is pH and temperature dependant. DGV for a pH of 8 provided in table.

Table F3: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB, VOC, Asbestos

			Metals								TRH		BTEX				PAH		Phenols	OCP				OPP	PCB
			Total Arsenic	TCLP Total Arsenic	Cadmium	Total Chromium	Lead	Mercury (inorganic)	Nickel	TCLP Nickel	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes	Benzo(a)pyrene (B(a)P)	Total PAH	Total Phenolics	Scheduled Chemical Waste (standard)	Total Endosulfan	Total Analysed OCP	Mirex	Total Analysed OPP	Total PCB
			mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PQL			4	0.05	0.4	1	1	0.1	1	0.02	25	50	0.2	0.5	1	1	0.05	0.05	5	0.1	0.1	0.1	0.1	0.1	0.1
CT1			100	-	20	100	100	4	40	-	650	10,000	10	288	600	1000	0.8	200	288	<50	60	-	-	4	<50
SCC1			500	-	100	1,900	1,500	50	1,050	-	650	10,000	18	518	1,080	1,800	10	200	518	<50	108	-	-	7.5	<50
TCLP1			-	5	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2			400	-	80	400	400	16	160	-	2,600	40,000	40	1,152	2,400	4,000	3.2	800	1,152	<50	240	-	-	16	<50
SCC2			2,000	-	400	7,600	6,000	200	4,200	-	2,600	40,000	72	2,073	4,320	7,200	23	800	2,073	<50	432	-	-	30	<50
TCLP2			-	20	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	0.5 - 0.6 m	25/03/25	6	-	0.9	6	18	<0.1	45	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/20250325	0 m	25/03/25	5	-	0.6	7	15	<0.1	51	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	11	-	0.5	4	20	<0.1	55	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH02	0.13 - 0.2 m	25/03/25	<4	-	<0.4	4	3	<0.1	27	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH02	0.4 - 0.5 m	25/03/25	<4	-	<0.4	5	2	<0.1	62	0.07	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	<4	-	<0.4	5	4	<0.1	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	0.4 - 0.5 m	25/03/25	11	-	<0.4	9	22	<0.1	36	-	<25	110	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH04	0.4 - 0.5 m	25/03/25	4	-	<0.4	13	11	<0.1	47	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	0.15 - 0.2 m	25/03/25	<4	-	<0.4	2	2	<0.1	1	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH05	0.4 - 0.5 m	25/03/25	<4	-	<0.4	9	16	<0.1	25	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH05	0.9 - 1 m	25/03/25	5	-	<0.4	8	22	<0.1	28	-	<25	140	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06	0.4 - 0.5 m	25/03/25	170	<0.05	<0.4	6	30	0.2	63	0.2	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	100	-	<0.4	6	17	0.1	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.3 - 0.4 m	08/11/25	<4	-	<0.4	3	4	<0.1	8	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	<4	-	<0.4	3	4	<0.1	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.5 - 0.6 m	08/11/25	8	-	<0.4	7	14	<0.1	34	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH08	0.3 - 0.5 m	08/11/25	<4	-	<0.4	4	6	<0.1	15	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH08	0.7 - 0.8 m	08/11/25	<4	-	<0.4	4	4	<0.1	12	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH09	0.3 - 0.5 m	08/11/25	8	-	<0.4	8	19	<0.1	31	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH09	0.6 - 0.8 m	08/11/25	7	-	<0.4	10	18	<0.1	40	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BD1/20251108	0 m	08/11/25	6	-	<0.4	9	19	<0.1	38	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
BH09	0.9 - 1.1 m	08/11/25	5	-	<0.4	10	20	<0.1	37	-	<25	<50	<0.2	<0.5	<1	<1	<0.05	<0.05	-	-	-	-	-	-	-
Sample ID	Depth	Sample Date																							

CT1 exceedance TCLP1 and/or SCC1 exceedance CT2 exceedance TCLP2 and/or SCC2 exceedance Asbestos detection

- = Not tested, no criteria or not applicable NAD = no asbestos detected

Notes:

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorpyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Table F3: Summary of Laboratory Results – Metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB, VOC, Asbestos

			VOC														Asbestos				
			carbon tetrachloride	Monochlorobenzene	Chloroform	1,2-dichlorobenzene	1,4-dichlorobenzene	1,2-dichloroethane	1,1-Dichloroethene	Styrene (vinylbenzene)	1,1,1,2-tetrachloroethane	1,1,2,2-tetrachloroethane	tetrachloroethene	1,1,1-trichloroethane	1,1,2-trichloroethane	1,1,2-trichloroethylene	Vinyl Chloride	Asbestos ID in materials	Asbestos ID in soil >0.1g/kg	Trace Analysis (AS)	Asbestos Comment	Asbestos Summary
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	-	-	-	
PQL			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
CT1			10	2,000	120	86	150	10	14	60	200	26	14	600	24	10	4	-	-	-	-	-
SCC1			18	3,600	126	155	270	18	25	108	360	46.8	25.2	1,080	43.2	18	7.2	-	-	-	-	-
TCLP1			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CT2			40	8,000	480	344	600	40	56	240	800	104	56	2,400	96	40	16	-	-	-	-	-
SCC2			72	14,400	864	620	1,080	72	100	432	1,440	187.2	100.8	4,320	172.8	72	28.8	-	-	-	-	-
TCLP2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	0.5 - 0.6 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BD1/20250325	0 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01	1.4 - 1.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH02	0.13 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH02	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH02 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH03	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH04	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH05	0.15 - 0.2 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH05	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	NAD	Nil	-
BH05	0.9 - 1 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH05-FC	1.1 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	NAD	-	-
BH06	0.4 - 0.5 m	25/03/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	NAD	NAD	Nil	-
BH06 - [TRIPLICATE]	0.4 - 0.5 m	25/03/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.3 - 0.4 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD	-	-	NAD	-
BH07 - [TRIPLICATE]	0.3 - 0.4 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07	0.5 - 0.6 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-	NAD	-
BH08	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-	NAD	-
BH08	0.7 - 0.8 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD	-	-	NAD	-
BH09	0.3 - 0.5 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-	NAD	-
BH09	0.6 - 0.8 m	08/11/25	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD	-	-	NAD	-
BD1/20251108	0 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09	0.9 - 1.1 m	08/11/25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD	-	-	NAD	-
Sample ID	Depth	Sample Date																				

Notes:

a	QA/QC replicate of sample listed directly below the primary sample
b	Total chromium used as initial screen for chromium(VI).
c	Total recoverable hydrocarbons (TRH) used as an initial screen for total petroleum hydrocarbons (TPH)
d	Criteria for scheduled chemicals used as an initial screen
e	Criteria for Chlorpyrifos used as initial screen
f	NSW EPA, 2014, Waste Classification Guidelines Part 1; Classifying Waste
PQL	Practical quantitation limit
CT1	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: General solid waste
SCC1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
TCLP1	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: General solid waste
CT2	Maximum values of specific contaminant concentration (SCC) for classification without TCLP: Restricted solid waste
SCC2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste
TCLP2	Maximum values for leachable concentration (TCLP) and specific contaminant concentration (SCC) when used together: Restricted solid waste

Appendix G

Logs and Field Sheets

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) / DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0.25	CONCRETE; reinforcement 8mm, 2 slabs 130mm thick and 90mm thick (low), second slab has no reinforcement observable, 10mm blinding sand separating slabs.		FILL	NA	NA								
		0.35	FILL / GRAVEL: dark grey; fine to medium, angular, igneous.		FILL	PC	w<PL		D		0.40			Bentonite	
									D		0.50				
		1	FILL / CLAY trace sand: dark grey; low to medium plasticity; fine sand.						D		0.90 / 1.00				
	81								D		1.40 / 1.50				
		2	2.00m: very poor compaction						D		1.90 / 2.00				
	80	2.60	Continued as rock log												
		3									3			Gravel	
	79														
		4									4				
	78														
		5									5				
	77														
		6									6				
	76														
		7									7				
	75														
		8									8				
	74														
		9									9				
	73														

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW [HW, MW, SW], FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
25/03/25 No free groundwater observed whilst augering	82	0	Continued from soil log												0			Bentonite	
	81	1													1				
	80	2													2				
		2.60	SILTSTONE: dark grey, indistinct, bedded; (horizontal). Ashfield Shale.			2.60		100	100		2.87m: JT, 70°, PR, CN, SM 3.23m: JT, 70°, PR, CN, SM,				3	PLT	PL(A)=0.62MPa		
	79	3						100	100		3.00m: Very minimal water loss				3	PLT	PL(A)=0.78MPa		
		4					M	100	100		3.72m: JT, 70°, PR, CN, SM,				4	PLT	PL(A)=0.65MPa		
	78	4.54													4	PLT	PL(A)=0.62MPa		
		4.54	SANDSTONE: grey, fine to medium grained, indistinct bedding; siltstone ~5 - 10%. Mittagong Formation.		FR						4.09m: JT, 30°, PR, CN, SM,					PLT	PL(A)=0.98MPa		
		5				5.00	L	100	100		4.70m: Water loss ~20%				5	PLT	PL(A)=0.28MPa		
	77					5.60													
		6					H	95	100		5.70m: Water loss ~30-40%				6	PLT	PL(A)=1.1MPa		
	76	6.65														PLT	PL(A)=1.2MPa	Gravel	
		6.70				6.70													
		7					L	100	90		7.30m: Water loss 80-100% recovering to ~40%				7	PLT	PL(A)=1.1MPa		
	75					7.65					7.55-7.65m: B, 5°, PR, CN, RF, x3								
		8					H	100	93		8.03m: B, 10°, PR, CN, RF 8.25m: B, 10°, PR, CN, RF 8.40m: B, 10°, PR, CN, RF				8	PLT	PL(A)=1.6MPa		
	74				FR	8.60					8.62-8.70m: B, 0°, PR, RF, x4								
						8.65													
		9					M	100	100		8.90m: Water loss 60-90% 9.10m: Water loss ~10-20%				9	PLT	PL(A)=0.73MPa		
	73							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Split Soil-Rock Log

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, MW, SW, FR; DW)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.2, 0.6, 2.0)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11					M	100	100		10.80m: Water loss ~20-30%				11	PLT	PL(A)=0.76MPa	Gravel	
	71					11.50		100	100							PLT	PL(A)=0.74MPa		
		12.00	SANDSTONE: grey, medium to coarse grained, indistinct bedding. Hawkesbury Sandstone.		FR										12				
	70						H	100	100							PLT	PL(A)=1.1MPa		
	69	13													13	PLT	PL(A)=1.1MPa		
	68	14				14.20		100	100						14				
						14.25	H - VH									PLT	PL(A)=3.1MPa		
	67	15	Borehole discontinued at 14.80m depth. Target depth reached.																
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.25m, AD/T to 2.6m, NMLC to 14.80m
REMARKS: Unable to perform SPTs due to height restriction

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 2m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 1 of 2



2.60-7.00 m depth



7.00-12.00 m depth

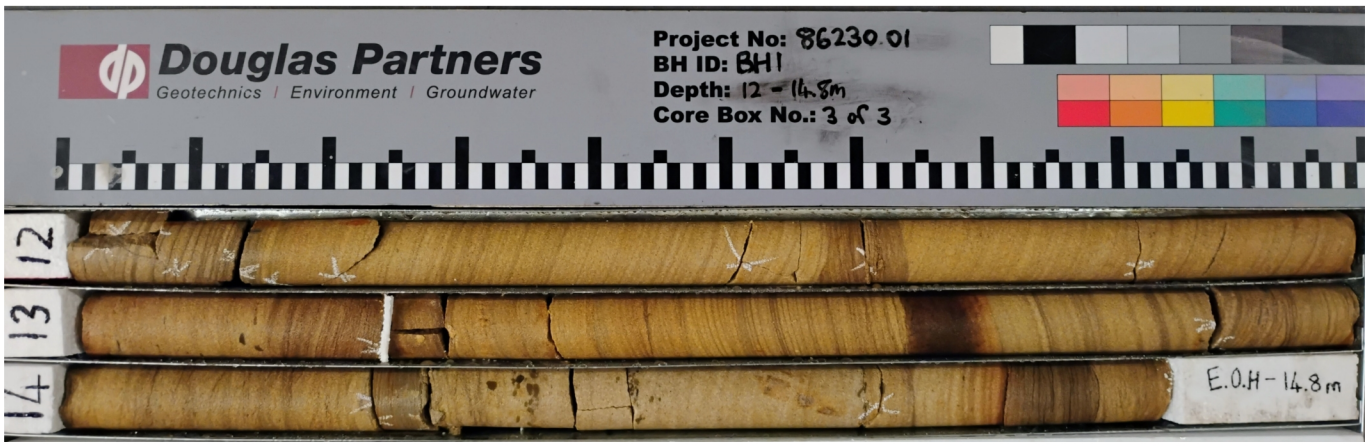
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333081.1, N:6255981.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 86230.01
DATE: 25/03/25
SHEET: 2 of 2



12.00-14.80 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
28/03/25 No free groundwater observed whilst augering	82	0.18	CONCRETE; 2 layers reinforcement 8mm and 4mm.			NA	NA				0		
		0.40	FILL / Gravelly SAND with clay: brownish-grey; fine to medium; medium, sub-angular, igneous gravel.		FILL	ND	M						
					FILL		D						
		0.90	FILL / Clayey SAND trace gravel: dark grey; fine to medium; low to medium plasticity clay; fine to medium, angular, igneous gravel.		FILL		w<PL						
	81	1.10	FILL / CLAY trace sand trace gravel: dark grey; low to medium plasticity.								1		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 28/03/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
82	0	Continued from soil log												0				
	1	SILTSTONE: dark grey, indistinct bedding. Ashfield Shale.		FR	1.10	L	100	100		1.33m: JT, 40°, PR, CN, SM				1	PLT	PL(A)=0.12MPa		
81	2				2.00		100	100						2	PLT	PL(A)=0.14MPa		
	2.50														PLT	PL(A)=0.32MPa		
80	2.63				2.63					2.50m - 3.60m: Water loss <10%					PLT	PL(A)=0.60MPa		
	3			SW		M	88	100		3.27m: JT, 45°, PR, CN, SM				3	PLT	PL(A)=0.66MPa		
79	4						100	100		3.90m: CZ, 0°, PR, Clay, SM, ~5mm 4.25m: CZ, 0°, PR, Clay, SM, ~5mm 4.62-4.67m: CZ, 5°, PR, Clay				4	PLT	PL(A)=0.87MPa PL(A)=0.54MPa		
78	4.72	SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation. 5.50m-5.80m: rip up clasts			5.30										PLT	PL(A)=0.48MPa		
77	5			FR										5	PLT	PL(A)=0.37MPa		
	6				6.00	H	100	100						6	PLT	PL(A)=1.2MPa		
76	7				7.60	M	100	100						7	PLT	PL(A)=1.3MPa		
75	8				8.05					8.56m: CZ, 20mm				8	PLT	PL(A)=1.4MPa		
74	9					H	100	90						9	PLT	PL(A)=1.1MPa		
73							100	100										

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72		[CONT] SANDSTONE: grey, fine and medium grained; with siltstone laminations and bedding. Mittagong Formation.			10.00	M												
		11				10.40		100	100		10.60m CZ, 20mm				11				
	71										11.10m - 14.10m: Water loss <10%					PLT	PL(A)=0.49MPa		
		12			FR			100	100						12	PLT	PL(A)=1.4MPa		
	70						H									PLT	PL(A)=1.8MPa		
		13													13				
	69	13.37	SANDSTONE: pale grey, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					87	87							PLT	PL(A)=1.1MPa		
		13.90													14				
	68		Borehole discontinued at 14.10m depth. Target depth reached.																
		15																	
	67																		
		16																	
	66																		
		17																	
	65																		
		18																	
	64																		
		19																	
	63																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.13m, AD/T to 1.10m, NMLC to 14.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333075.4, N:6255998.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 86230.01
DATE: 28/03/25
SHEET: 2 of 2



10.00-14.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick.			NA			D	0.15 to 0.20	0.15			Bentonite	
		0.25	FILL / Gravelly SAND: yellow and grey; medium; fine to coarse, igneous, concrete gravel.		FILL	ND	w<PL		D	0.40 to 0.50	0.20				
		0.70	FILL / Sandy CLAY trace gravel: dark grey; low to medium plasticity; fine to coarse sand; fine gravel; shale.		FILL						0.50				
	81	1	Continued as rock log								1				
	80	2									2				
	79	3									3				
	78	4									4				
	77	5									5			Sand	
	76	6									6				
	75	7									7				
	74	8									8				
	73	9									9				

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
01/04/25 No free groundwater observed whilst augering	82	0	Continued from soil log															Bentonite	
	81	1	SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.		SW	0.70		100	100		0.75m: JT, 35°, PR, SN Fe 0.92m: JT, 85°, PR, SN Fe 0.70m - 1.80m: Water loss <10%				1	PLT	PL(A)=1.3MPa		
	80	2				1.00		100	100						2	PLT	PL(A)=0.80MPa		
	79	3						100	100						3	PLT	PL(A)=0.61MPa		
	78	4					M H	100	100		3.30m - 4.00m: Water loss ~10% 4.13-4.15m: CZ, 0°, PR, SN Clay		SPT		3.30	PLT	PL(A)=0.91MPa		
	77	4.80 5	SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding. Mittagong Formation.		FR			100	100						3.75	PLT	PL(A)=0.70MPa		
	76	6						100	100		6.08m: B, ~5°, PR, CN, RF 6.49m: JT, 15°, PR, CN, RF				4	PLT	PL(A)=0.67MPa		
	75	7				7.00	H	100	90		7.28m: B, 10°, PR, RF 7.30m: B, 5°, PR, HE 7.35m: B, 50°, PR Clay 6 mm 7.41m: B, ~20°, UN, RF 7.50m: JT, 70°, PR, HE 7.62m: JT, 85°, UN, HE 7.75m: JT, 20°, UN, Clay, ~5mm				4.75	PLT	PL(A)=0.67MPa		
	74	8						100	100		8.46m: B, 5°, ST, Clay, ~2 mm				5	PLT	PL(A)=0.86MPa		
	73	9				9.40	M	100	84		8.79m: JT, 70°, PR, CN, RF 9.45m: JT, 80-90°, CU, Clay, 1-3mm 9.60m: B, ~50°, PR, Clay, PO, 1-2mm				5.20			Sand	
															6	PLT	PL(A)=1.1MPa		
															7	PLT	PL(A)=0.77MPa		
															8	PLT	PL(A)=2.4MPa		
															9	PLT	PL(A)=1.5MPa		
																PLT	PL(A)=0.37MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, laminated; siltstone laminations and bedding. Mittagong Formation.		FR		M	100	84						11	PLT	PL(A)=0.92MPa	Sand	
	71							100	100		11.55m: JT, 40°, PR, VNR Clay, RF 11.63m: CS, 30mm					PLT	PL(A)=0.84MPa		
		12									12.06m: JT, 80°, PR, CN, SM				12				
	70		Borehole discontinued at 12.10m depth. Target depth reached.																
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT to 0.15m, AD/T to 0.70m, NMLC to 12.10m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 1 of 2



0.70-5.00 m depth



5.00-10.00 m depth

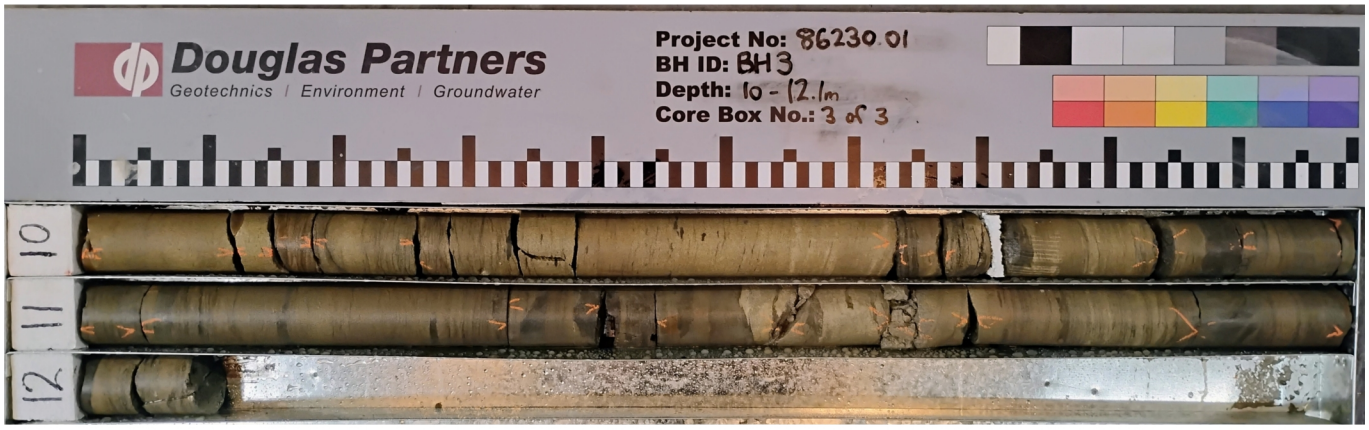
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333109.1, N:6256004.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 86230.01
DATE: 01/04/25
SHEET: 2 of 2



10.00-12.10 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 5

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
07/04/25 Water level measured at 25.2m BGL.		0.15	CONCRETE; 150mm thick; one layer bidirectional reinforcement (SL82).			NA	NA				0.15		
	82	0.23	FILL / SAND: grey; medium.		FILL	ND	M		D		0.20		
		0.60	FILL / Sandy GRAVEL: dark grey; fine to medium, sub-angular, igneous; fine to coarse sand.				M / W		D		0.40 0.50		
		1	Continued as rock log								1		
	81												
		2									2		
	80												
		3									3		
	79												
		4									4		
	78												
		5									5		
	77												
		6									6		
	76												
		7									7		
	75												
		8									8		
	74												
		9									9		
	73												

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
07/04/25 Water level measured at 25.2m BGL.	82	0	Continued from soil log												0	PLT	PL(A)=1.1MPa		
			SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			0.60		100	100							PLT	PL(A)=1.0MPa		
	81	1													1				
		2					H	100	100		1.91m: JT, 50°, PR, CN, SM				2	PLT	PL(A)=1.2MPa		
	80															PLT	PL(A)=0.68MPa		
		3									2.86m: JT, 60°, PR, CN, SM				3	PLT	PL(A)=0.75MPa		
						3.40		100	100							PLT	PL(A)=1.3MPa		
	79	4					M				3.70m: Water loss 10-20%				4	PLT	PL(A)=0.56MPa		
	4.15		SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.			4.10	L				4.15m: JT, ~70°, PR, CN, RF					PLT	PL(A)=0.22MPa		
						4.20		100	100		4.20m: Water loss <10%					PLT	PL(A)=0.85MPa		
	78	5													5				
					FR		H	100	100							PLT	PL(A)=1.2MPa		
	77	6													6				
								100	99		6.70m - 8.20m: Water loss 10%					PLT	PL(A)=1.7MPa		
	76	7				7.50	L				7.60m: JT, 70°, CU, CN, RF				7				
						7.90	M				7.66m: B, 0°, PR, RF 7.68m: B, 0°, PR, RF					PLT	PL(A)=0.13MPa		
	75	8				8.10									8				
							H									PLT	PL(A)=2.2MPa		
	74	9				9.00		100	87		8.72-8.92m: B, 0-10°, PR, RF, 7x				9				
							M				9.00-9.70m: JT, 85°, CU, CN, RF								
	73					9.90		100	100							PLT	PL(A)=0.73MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	10.00	SANDSTONE: grey, pale grey, and pale brown, fine to medium grained, distinct, bedded; siltstone laminae ~5-15%. Mittagong Formation.					100	100						11	PLT	PL(A)=1.1MPa		
	71	11						100	100						12	PLT	PL(A)=0.99MPa		
	70	12						100	100						13	PLT	PL(A)=0.83MPa		
	69	13					M - H	100	100						14	PLT	PL(A)=0.89MPa		
	68	13.05	SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		13.81m: B, 5-10°, PR, VNR Clay, RF				15	PLT	PL(A)=0.80MPa		
	67	14	From 14.30m: pale grey		FR			100	92		15.54m: B, 0°, PR, VNR Clay, RF 15.67m: B, 10°, PR, VNR, RF				16	PLT	PL(A)=0.73MPa		
	66	15						100	100						17	PLT	PL(A)=1.1MPa		
	65	16				17.00		100	100						18	PLT	PL(A)=1.3MPa		
	64	17					H	100	100		19.57m: B, 10°, PR, RF, iron clay 19.80m: Water loss ~20%				19	PLT	PL(A)=1.0MPa		
	63	18						100	100							PLT	PL(A)=1.1MPa		
		19																	

NOTES: [H] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 5

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	62	20	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.					100	100		20.77m: CS, 10mm				20	PLT	PL(A)=1.0MPa		
	61	21									21.20m: B, ~5°, PR, Clay 2mm, RF				21	PLT	PL(A)=1.3MPa		
											21.40m: Water loss ~10%								
	60	22						100	100						22	PLT	PL(A)=1.1MPa		
	59	23					H	100	100						23	PLT	PL(A)=1.6MPa		
	58	24						100	100						24	PLT	PL(A)=1.5MPa		
	57	25			FR			100	100						25	PLT	PL(A)=1.7MPa		
	56	26				26.50	L	100	92		26.12m: JT, 90°, UN, CN, RF 26.20m: B, 5-10°, PR, Clay, RF, 3-4mm 26.26m: B, 0°, PR, Clay, RF, 1-2mm 26.57m: B, 15°, PR, Clay 1mm, RF 26.70m: B, 0°, PR, Clay 5mm, RF 26.75m: B, 0°, PR, Clay, RF, 1-2mm				26	PLT	PL(A)=0.34MPa		
	55	27				26.90					26.00m - 27.40m: Water loss 25%				27	PLT	PL(A)=0.59MPa		
	54	28					M	100	90		27.75m: CS, 10°, PR, Clay 40mm, RF 28.08m: CS, Clay 15mm 28.20m: JT, 20°, PR, Clay 4mm, RF 28.25m: B, 0°, PR, Clay, RF, 2-4mm				28	PLT	PL(A)=0.32MPa		
	53	29				29.50	M	100	76		28.70m: JT, 15°, PR, Clay 4mm, RF 28.94m: JT, 20°, PR, VNR Clay, RF 29.04-29.30m: B, 5°, PR, VNR, RF 29.36m: JT, 70°, PR, CN, RF 29.40m: JT, 15°, PR, VNR, RF 29.57-29.67m: CZ, 10°, PR 29.82m: JT, 5°, UN, VNR				29	PLT	PL(A)=0.43MPa		
																PLT	PL(A)=0.29MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HW to 0.5m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 5 of 5

CONDITIONS ENCOUNTERED													SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	52	30	[CONT] SANDSTONE: pale grey and pale brown, medium to coarse grained; cross-bedded. Hawkesbury Sandstone.		FR	30.00	H	100	90		Clay, RF, 29.92m: JT, 25°, PR, Clay 6mm, RF 29.98m: JT, 15°, PR, Clay, RF, ~2mm 30.10m: Water loss 25% 30.29m: B, 5°, PR, Clay, RF, 2-4mm 30.34-30.39m: B, ~10°, UN, Clay, RF, 4-6mm 30.45m: B, 15°, UN, Clay, RF, ~2mm 30.48m: B, 10°, PR, Clay, RF, ~3mm				31	PLT	PL(A)=0.95MPa PL(A)=1.2MPa		
	51	31	Borehole discontinued at 31.50m depth.																	
	50	32																		
	49	33																		
	48	34																		
	47	35																		
	46	36																		
	45	37																		
	44	38																		
	43	39																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.60m, NMLC to 31.50m
CASING: HW to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 1 of 4



0.60-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 2 of 4



10.00-15.00 m depth



15.00-20.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 3 of 4



20.00-25.00 m depth



25.00-30.00 m depth

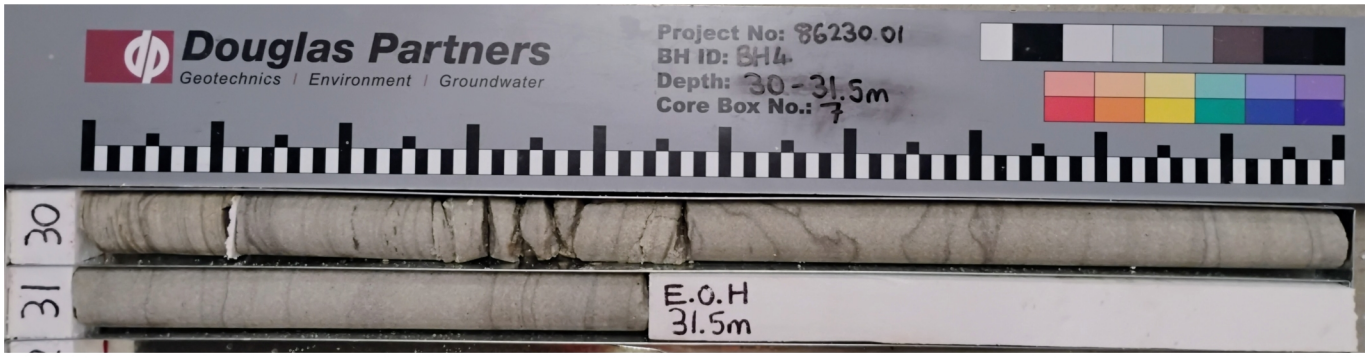
Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.4 AHD
COORDINATE: E:333129.9, N:6256002.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 86230.01
DATE: 03/04/25 - 07/04/25
SHEET: 4 of 4



30.00-31.50 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/04/25 No free groundwater observed whilst augering	82	0.15	CONCRETE; 150mm thick; one layer reinforcement 8mm (SL82).			NA	NA		D		0.15 0.20		
		0.25			FILL								
		0.30	FILL / SAND: yellow-grey; medium.						D		0.40 0.50		
			FILL / GRAVEL: grey; fine to medium, sub-angular, igneous.		FILL	ND	M						
	81	1 1.10	FILL / Sandy CLAY trace gravel: grey; low to medium plasticity; fine sand; fine, angular, siltstone gravel; trace PVC fragments.						D		0.90 1.00		
			Continued as rock log										
	80	2									2		
	79	3									3		
	78	4									4		
	77	5									5		
	76	6									6		
	75	7									7		
	74	8									8		
	73	9									9		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (DW, PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	82	0													0				
	81	1	Continued from soil log			1.10									1				
		1.25	SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			1.25	M	81	81		1.80m: JT, 70°, PR, VNR M, SM,					PLT	PL(A)=0.77MPa		
	80	2				2.20	VL	100	80		1.90m - 3.00m: Water loss ~10%				2	PLT	PL(A)=1.5MPa		
						2.30	M - H				2.20-2.30m: CZ, M, fine to medium					PLT	PL(A)=2.3MPa		
	79	3				3.43	VL	100	60		2.76m: JT, 50-60°, PR, VNR M, SM 2.83m: JT, 50-60°, PR, VNR M, SM 2.88m: JT, 50-60°, PR, VNR M, SM 3.05-3.10m: CZ, M, medium 3.36m: B, PR, M, SM, fine to course				3	PLT	PL(A)=0.35MPa		
						3.65	L - M				3.43-3.65m: CZ, M, fine to course					PLT	PL(A)=0.16MPa		
						3.90	VL				3.75-3.78m: CZ, M, fine to course gravel					PLT	PL(A)=0.66MPa		
	78	4				4.00	L - M				4.30m - 5.90m: Water loss <10%				4	PLT	PL(A)=0.39MPa		
		4.75	SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.			4.71					3.90-4.00m: CZ, 6°, M, fine to medium					PLT	PL(A)=0.13MPa		
	77	5						100	86		4.09m: B, 0°, PR, M, 4mm 4.45m: JT, 35°, PR, VNR M, SM 4.53m: B, 0°, PR, M, SM, 1-2mm 4.67m: B, PR, M, SM, ~2mm 4.71m: B, PR, M, SM, ~2mm				5	PLT	PL(A)=1.0MPa		
				FR							5.90m - 7.50m: Water loss ~10%								
	76	6						100	100		4.74m: B, PR, M, SM, ~2mm 4.77m: B, PR, M, SM, ~2mm 5.33m: B, 5°, PR, SM 6.30m: JT, 70°, PR, CN, RF 6.56m: JT, 70°, PR, CN, RF 6.60m: B, 0°, PR, SM 6.82m: JT, 70°, PR, CN, RF 6.94m: B, 10°, PR, SM				6	PLT	PL(A)=0.69MPa		
	75	7					M - H				7.40m: B, 10°, PR, SM				7	PLT	PL(A)=1.4MPa		
	74	8						100	100						8	PLT	PL(A)=1.6MPa		
	73	9						100	100		9.23m: B, 5°, PR, SM				9	PLT	PL(A)=0.90MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
REMARKS:

OPERATOR: Terratest

LOGGED: JDS
CASING: HWT to 1m

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	72	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, distinct, bedded; with siltstone laminations and bedding ~5%. Mittagong Formation.		FR	12.20	M-H	100	100		10.30m: No drilling muds, water loss ~20%				11	PLT	PL(A)=1.9MPa		
	71							100	92		10.55-1059m: CZ, Clay, coating, infill 6mm 10.66m: B, 15°, PR, Clay 10mm, SM					PLT	PL(A)=0.95MPa		
	70	12									11.57m: B, 10°, PR, M, SM				12				
	69	13				13.20	M	100	100						13	PLT	PL(A)=0.40MPa		
	68	14					H	100	95		13.40m: B, 5°, PR, Clay 1mm, SM 13.45m: JT, 80°, ST, CN, RF				14	PLT	PL(A)=1.0MPa		
											14.55m: B, PR, Clay 11mm					PLT	PL(A)=1.1MPa		
	67	15	Borehole discontinued at 14.60m depth. Target depth reached.																
	66	16																	
	65	17																	
	64	18																	
	63	19																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 1.10m, NMLC to 14.60m
CASING: HWT to 1m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

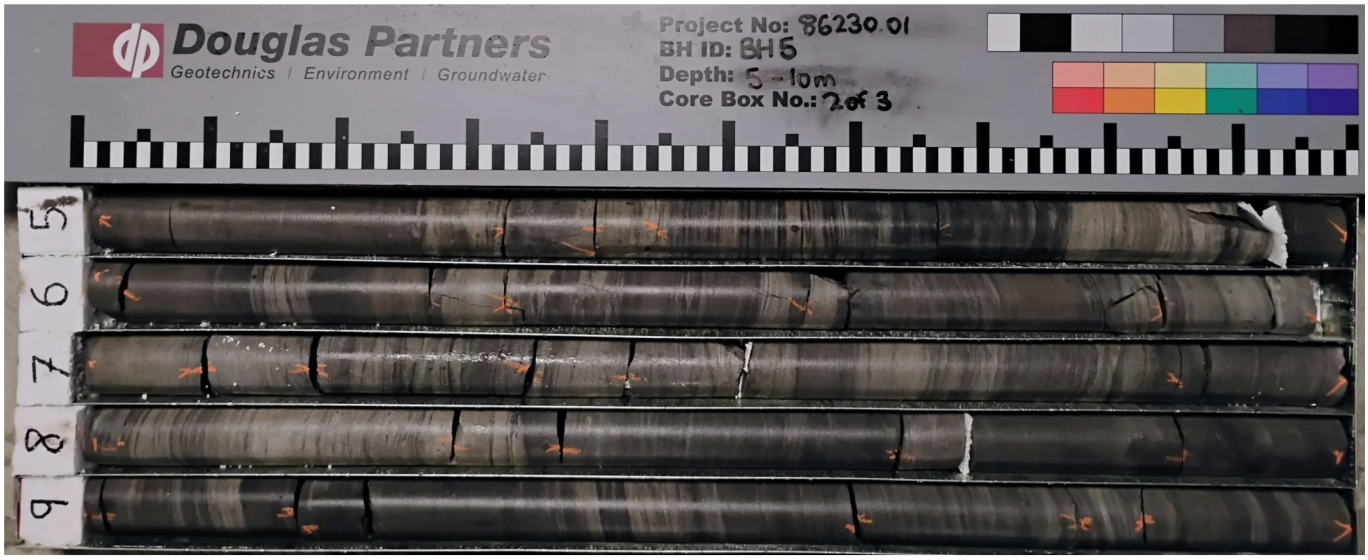
CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 2



1.10-5.00 m depth



5.00-10.00 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:333135.6, N:6255984.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 2



10.00-14.60 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED								SAMPLE			TESTING AND REMARKS			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
08/04/25 No free groundwater observed whilst augering	81	0.15	CONCRETE; 150m thick; one layer reinforcement (SL82).			NA	NA				0.15				
		0.25	FILL / SAND: grey-brown; medium.		FILL	ND	M		D		0.25				
		0.50	FILL / Sandy CLAY with gravel: dark grey; low to medium plasticity; fine to coarse sand; fine, siltstone gravel.		FILL		w=PL		D		0.40				
		0.65	SILTSTONE: dark grey. Ashfield Shale.								0.50				
	80	1	Continued as rock log								1			Bentonite	
	79	2									2				
	78	3									3				
	77	4									4				
	76	5									5				
	75	6									6			Sand	
	74	7									7				
	73	8									8				
	72	9									9				

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED | **SAMPLE** | **TESTING**

GROUNDWATER: 08/04/25 No free groundwater observed whilst augering

RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS
81	0	Continued from soil log								
		SILTSTONE: dark grey, indistinct, bedded. Ashfield Shale.			0.65		100	76		0.85m: B, 0°, PR, 1mm, SM, fines 1.15m: JT, 30°, PR, VNR, SM, fines 1.33m: JT, 30°, PR, VNR, SM, fines 1.35m: JT, 70°, PR, CN, SM 1.42m: CZ, 40mm 1.70m: Water loss <10%. no drilling mud added.
80	1						100	100		
79	2					M				
78	3						100	95		3.00m: CZ, 40mm 3.75m: CZ, 20mm 3.98m: CZ, 20mm
77	4				4.50					
	4.05	SANDSTONE: grey and pale grey, fine to medium grained, indistinct, bedded; siltstone laminations and bedding. Mittagong Formation.		FR			100	100		
76	5									
75	6						100	93		6.21m: CZ, 20mm 6.31m: CZ, 20mm
74	7					H				
73	8						100	100		
72	9						100	91		

SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
			0	PLT	PL(A)=0.94MPa	Bentonite	
			1	PLT	PL(A)=1.8MPa		
				PLT	PL(A)=0.72MPa		
			2	PLT	PL(A)=0.95MPa		
				PLT	PL(A)=0.80MPa		
			3	PLT	PL(A)=0.75MPa		
				PLT	PL(A)=0.88MPa		
			4	PLT	PL(A)=0.70MPa		
				PLT	PL(A)=0.93MPa		
			5	PLT	PL(A)=1.0MPa		
						Sand	
			6	PLT	PL(A)=2.0MPa		
				PLT	PL(A)=2.3MPa		
			7	PLT	PL(A)=1.4MPa		
			8				
			9	PLT	PL(A)=1.5MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	71	11	[CONT] SANDSTONE: grey and pale grey, fine to medium grained, indistinct, bedded; siltstone laminations and bedding. Mittagong Formation.		FR		H	100	91		9.97m: CZ, 80mm 10.10m: B, 10°, PR, Clay 10mm, RF				11	PLT	PL(A)=1.3MPa	Sand	
	70	12	Borehole discontinued at 11.05m depth. Target depth reached.					100	100										
	69	13																	
	68	14																	
	67	15																	
	66	16																	
	65	17																	
	64	18																	
	63	19																	
	62																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: DTS 700
OPERATOR: Terratest
LOGGED: JDS
METHOD: DT (200mm) to 0.15m, AD/T to 0.50m, WB to 0.65m, NMLC to 11.05m
CASING: HWT to 0.5m
REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Split Soil-Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: Stockland Commercial Property
PROJECT: Proposed Commencial Building
LOCATION: 601 Pacific Highway, St Leonards, NSW 2065

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333122.5, N:6255970.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 86230.01
DATE: 08/04/25
SHEET: 1 of 1



0.50-5.00 m depth



5.00-11.05 m depth

Generated with CORE-GS by Geroc - Split Soil-Rock Log

BOREHOLE LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Proposed Mixed Use Residential Building
LOCATION: 601 Pacific Highway, St Leonards, NSW

SURFACE LEVEL: 82.5 AHD
COORDINATE: E:333115.5, N:6255975.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH07
PROJECT No: 86230.03
DATE: 08/11/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/11/25 No Free Groundwater Observed Whilst Augering	82	CONCRETE SLAB.		NA		NA						
	0.25	FILL / Silty Gravelly SAND (SP-SM): dark brown; fine to medium; fine to medium, sub-angular to sub-rounded, igneous gravel.		FILL	ND	M		ES		0.30 0.40	PID	<1ppm
		0.50m: trace ironstone						ES		0.50 0.60	PID	<1ppm
	1	Borehole discontinued at 0.60m depth. Hand auger refusal on gravel.										
	81											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand Auger
REMARKS:

OPERATOR: Douglas Partners (R.Najafi)

LOGGED: R.Najafi
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Proposed Mixed Use Residential Building
LOCATION: 601 Pacific Highway, St Leonards, NSW

SURFACE LEVEL: 79.5 AHD
COORDINATE: E:333105.7, N:6255983.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 86230.03
DATE: 08/11/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[*] / DENSITY.[*]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/11/25 No Free Groundwater Observed Whilst Augering	79	CONCRETE SLAB.		NA								
	0.25	FILL / Silty Gravelly SAND (SP-SM): dark brown; fine to medium; fine to medium, sub-angular to sub-rounded, igneous gravel gravel.		FILL				ES		0.30	PID	<1ppm
		0.60m: Pale brown								0.50		
								ES		0.70	PID	<1ppm
		Borehole discontinued at 0.80m depth. Hand auger refusal on gravel.								0.80		
	1											
	78											

NOTES: [#] Soil origin is "probable" unless otherwise stated. [*] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand Auger
REMARKS:

OPERATOR: Douglas Partners (R.Najafi)

LOGGED: R.Najafi
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

BOREHOLE LOG

CLIENT: Stockland Development Pty Limited
PROJECT: Proposed Mixed Use Residential Building
LOCATION: 601 Pacific Highway, St Leonards, NSW

SURFACE LEVEL: 81.3 AHD
COORDINATE: E:333114.1, N:6255989.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH09
PROJECT No: 86230.03
DATE: 08/11/25
SHEET: 1 of 1

CONDITIONS ENCOUNTERED								SAMPLE				TESTING AND REMARKS	
GROUNDWATER	RL (m) / DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN[#]	CONSIS.[^] / DENSITY.[^]	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
08/11/25 No Free Groundwater Observed Whilst Augering	81 / 0	CONCRETE SLAB.		NA						0.30	PID	ppm
	0.25	FILL / Silty Sandy GRAVEL (GP-GM): dark brown grey; fine to coarse, sub-angular to sub-rounded, trace ironstone, plastic foam; fine to medium sand.		FILL				ES		0.50		
	0.60	FILL / Silty Gravelly SAND (SP-SM); fine to medium; fine to medium, sub-angular to sub-rounded, igneous gravel.		FILL				ES		0.60	PID	ppm
										0.80		
	1	Borehole discontinued at 1.10m depth. Hand auger refusal on gravel.						* ES		0.90		
	80									1	PID	ppm
										1.10		

NOTES: [#] Soil origin is "probable" unless otherwise stated. [^] Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hand Tools
METHOD: Hand Auger
REMARKS: * BD1/20251108 blind duplicate sample at 0.6-0.8m

OPERATOR: Douglas Partners (R.Najafi)

LOGGED: R.Najafi
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil Log

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index[1] $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	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, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	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 deposition of weathering products in pores.	HW
Moderately weathered	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 but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	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 weathered products in pores.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections > 100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

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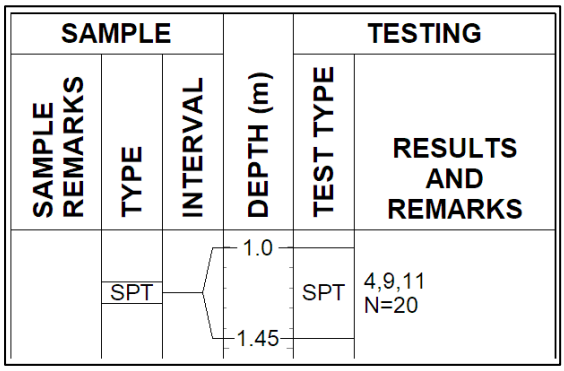
Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =*x* blows for *y* mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150
Dynamic probe super heavy, followed by blow count penetration increment in mm	DPSH/100

Groundwater Observations

	water seepage/inflow
	water seepage/outflow
	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

Douglas PARTNERS

Groundwater (GW) Field Sheet

Project and Bore Installation Details						
Project Name / Site Location					Project Number	86230.01
Well Construction Details	Well ID	BH01	Drilling Method		Hole Diameter (m)~	
	Well Depth (m bgl)	14.8	Screened (m bgl)	3.1	Stick Up (m)	
Survey Information	Easting	333081.1	Northing	6255981.1	Elevation RL	82.4 AHD
GW Level During Drilling		m bgl				
Contaminants/Comments						

Well Development Details					
Date / Time / Weather Conditions	10/4/25			Purged By	JDS
Purge Method / Equipment	Twister pump.				
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))		
GW Level (pre-purge)	11.0	m bgl	Observed Well Depth	14.6	m bgl
Height of Water Column (H)	3.6	m bgl	Estimated Bore Volume*	~10L	L
GW Level (post-purge)	N/A	m bgl	Total Volume Purged**	N/A	L
Appearance/Comments	permeability test carried out.				

Sampling Details					
Date / Time / Weather Conditions	17/4/25 2:45 pm Sunny			Sampled By	ZW
Sampling Method / Equipment	Bladder Pump + HDPE, interface Probe				
WQM Model	YSI		WQM Calibration Date	17/4/25	
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))	N	
GW Level (pre-micropurge)	10.83	m bgl	Observed Well Depth	14.63	m bgl
Height of Water Column	3.8	m bgl	Estimated Bore Volume*	~10.64	L
GW Level (post sample)	11.67	m bgl	Total Volume of Micro-Purged	~2.5	L

Water Quality Parameters

Time	Cumulative Volume (L)	Temp (°C)	DO (mg/L)#	EC (µS or mS/cm)	pH	Redox (mV)	Turbidity^
Stabilisation Target (3 readings)		0.2	+/- 10%	+/- 5%	+/- 0.1	+/- 10 mV	+/- 10%
		21.5	3.01	1090	5.20	109	350
		21.1	2.21	~~EE~~ 1152	5.13	113	364
		20.8	1.81	1222	5.07	117.0	360
		20.6	1.71	1244	5.07	111.8	386
		20.4	1.34	1261	5.08	119.8	371
		20.4	1.29	1269	5.07	120.5	354
		20.4	1.26	1290	5.07	122.1	335

Notes: # Considered stabilised if three DO values are less than 0.5 mg/L ^ Considered stabilised if three Turbidity values are less than 5 NTU

Sample Details						
Sampling Depth (rationale)	12	m bgl,	mid WC			
Sample Observations (e.g. colour, sediment, sheen, odour)	P. brown, slightly silty, no sheen or odour.					
Sample ID	BH01					
QAQC Samples	Replicate		Triplicate		Other	
Sample Containers Quantity / Preservation / Filtration	Amber glass		Plastic		PFAS (no teflon)	
	Metals (F/UF) (HNO3)		Phenols/COD/NH3 (H2SO4)		Vials (HCl)	
	Ferrous/Ferric Iron (HCl)		Cyanides/Chromium (NaOH)		Other	
Comments						

*Estimated Well Volume = H * F	Std. Drilling Diameter	NMLC (0.075)	HQ (0.096)	PQ (0.1226)	SFA (0.125)	HFA (0.194)
**Purge Target: min. 3 well volumes	Factor (F):	2.8	3.7	5.2	5.4	11.1

Groundwater (GW) Field Sheet

Project and Bore Installation Details						
Project Name / Site Location					Project Number	86230.01
Well Construction Details	Well ID	BH03	Drilling Method		Hole Diameter (m)~	
	Well Depth (m bgl)	12.1	Screened (m bgl)	0.7	Stick Up (m)	
Survey Information	Easting	333109.1	Northing	6256004.1	Elevation RL	82.4
GW Level During Drilling		m bgl				
Contaminants/Comments						

Well Development Details					
Date / Time / Weather Conditions	10/4/25			Purged By	JDS
Purge Method / Equipment	Twister pump				
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))		
GW Level (pre-purge)	9.0	m bgl	Observed Well Depth	11.0	m bgl
Height of Water Column (H)	2.0	m bgl	Estimated Bore Volume*	~ 5.6	L
GW Level (post-purge)	N/A	m bgl	Total Volume Purged**	N/A	L
Appearance/Comments	Permeability test carried out				

Sampling Details					
Date / Time / Weather Conditions	17/4/25, 1:40 pm, Overcast.			Sampled By	ZW
Sampling Method / Equipment	Bladder Pump + HDPE, Interface probe				
WQM Model	YSI		WQM Calibration Date	17/4/25	
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / (N))	N	
GW Level (pre-micropurge)	6.73	m bgl	Observed Well Depth	10.92	m bgl
Height of Water Column	4.19	m bgl	Estimated Bore Volume*	~ 11.7	L
GW Level (post sample)	7.02	m bgl	Total Volume of Micro-Purged	~ 2.5	L

Water Quality Parameters

Time	Cumulative Volume (L)	Temp (°C)	DO (mg/L)#	EC (µS or mS/cm)	pH	Redox (mV)	Turbidity^
Stabilisation Target (3 readings)		0.2	+/- 10%	+/- 5%	+/- 0.1	+/- 10 mV	+/- 10%
		21.4	2.81	552	6.37	4.0	220
		21.1	2.31	526	6.34	-2.5	223
		21.0	1.95	528	6.32	-10.3	192
		21.0	1.32	530	6.31	-20.1	159
		20.9	1.27	530	6.3	-27.2	146
		20.9	1.1	530	6.29	-29.8	141
		20.9	1.07	530	6.29	-31.5	129
Notes:	# Considered stabilised if three DO values are less than 0.5 mg/L			^ Considered stabilised if three Turbidity values are less than 5 NTU			

Sample Details						
Sampling Depth (rationale)	9	m bgl,	mid WC / screen			
Sample Observations (e.g. colour, sediment, sheen, odour)	p. grey, slightly silty, no sheen or odour					
Sample ID	BH03					
QAQC Samples	Replicate		Triplicate		Other	
Sample Containers Quantity / Preservation / Filtration	Amber glass		Plastic		PFAS (no teflon)	
	Metals (F/UF) (HNO3)		Phenols/COD/NH3 (H2SO4)		Vials (HCl)	
	Ferrous/Ferric Iron (HCl)		Cyanides/Chromium (NaOH)		Other	
Comments						

*Estimated Well Volume = H * F	Std. Drilling Diameter	NMLC (0.075)	HQ (0.096)	PQ (0.1226)	SFA (0.125)	HFA (0.194)
**Purge Target: min. 3 well volumes	Factor (F):	2.8	3.7	5.2	5.4	11.1

Groundwater (GW) Field Sheet

Project and Bore Installation Details						
Project Name / Site Location					Project Number	86230.01
Well Construction Details	Well ID	BH06	Drilling Method		Hole Diameter (m)	
	Well Depth (m bgl)		Screened (m bgl)	2.0	Stick Up (m)	
Survey Information	Easting	333122.5	Northing	6255970.7	Elevation RL	81.3
GW Level During Drilling		m bgl				
Contaminants/Comments						

Well Development Details					
Date / Time / Weather Conditions	10/4/25			Purged By	JDS
Purge Method / Equipment	Twister pump				
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / N)		
GW Level (pre-purge)	3.7	m bgl	Observed Well Depth	10.9	m bgl
Height of Water Column (H)	7.2	m bgl	Estimated Bore Volume*	~20L	L
GW Level (post-purge)	10.5	m bgl	Total Volume Purged**	~20	L
Appearance/Comments	drained with twister pump.				

Sampling Details						
Date / Time / Weather Conditions	17/4/25, 12:45 pm, Overcast			Sampled By	ZW	
Sampling Method / Equipment	Bladder pump TYGON, Interface probe					
WQM Model	YSI		WQM Calibration Date	17/4/25		
Product observed / Thickness	—	mm	Confirmed with Bailer? (Y / N)	N		
GW Level (pre-micropurge)	3.4	m bgl	Observed Well Depth	10.85	m bgl	
Height of Water Column	7.45	m bgl	Estimated Bore Volume*	~20	L	
GW Level (post sample)	4.12	m bgl	Total Volume of Micro-Purged	~2.5	L	

Water Quality Parameters

Time	Cumulative Volume (L)	Temp (°C)	DO (mg/L)#	EC (µS or mS/cm)	pH	Redox (mV)	Turbidity^
Stabilisation Target (3 readings)		0.2	+/- 10%	+/- 5%	+/- 0.1	+/- 10 mV	+/- 10%
	0.5	21.5	4.0	623	5.65	129	310
	0.75	21.1	3.02	619	5.66	124.6	323
	1	21.1	2.84	618	5.66	121.3	348
	1.25	21.1	2.60	620	5.66	119.5	342
	2	21.1	2.48	620	5.65	118.5	334
Notes:	# Considered stabilised if three DO values are less than 0.5 mg/L			^ Considered stabilised if three Turbidity values are less than 5 NTU			

Sample Details						
Sampling Depth (rationale)	8	m bgl,	mid WC / Screen			
Sample Observations (e.g. colour, sediment, sheen, odour)	P. brown, slightly silty, no sheen, no odour.					
Sample ID	BH06					
QAQC Samples	Replicate	BD1/250417	Triplicate		Other	
Sample Containers Quantity / Preservation / Filtration	Amber glass		Plastic		PFAS (no teflon)	
	Metals (F/UF) (HNO3)		Phenols/COD/NH3 (H2SO4)		Vials (HCl)	
	Ferrous/Ferric Iron (HCl)		Cyanides/Chromium (NaOH)		Other	
Comments						

*Estimated Well Volume = H * F	Std. Drilling Diameter	NMLC (0.075)	HQ (0.096)	PQ (0.1226)	SFA (0.125)	HFA (0.194)
**Purge Target: min. 3 well volumes	Factor (F):	2.8	3.7	5.2	5.4	11.1

Appendix H

Laboratory Results

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CERTIFICATE OF ANALYSIS 378301

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.01, St Leonards**
Number of Samples	21 Soil, 1 Material
Date samples received	15/04/2025
Date completed instructions received	15/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	24/04/2025
Date of Issue	24/04/2025

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Steven Luong, Senior Chemist

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Nancy Zhang, Laboratory Manager

VOCs in soil						
Our Reference		378301-5	378301-8	378301-13	378301-16	378301-19
Your Reference	UNITS	BH01	BH02	BH04	BH05	BH06
Depth		1.4-1.5	0.4-0.5	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date Analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Dichlorodifluoromethane	mg/kg	<1	<1	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloroethane	mg/kg	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	mg/kg	<1	<1	<1	<1	<1
Bromochloromethane	mg/kg	<1	<1	<1	<1	<1
Chloroform	mg/kg	<1	<1	<1	<1	<1
2,2-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
1,2-Dichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	mg/kg	<1	<1	<1	<1	<1
1,1-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1	<1	<1
Carbon Tetrachloride	mg/kg	<1	<1	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromomethane	mg/kg	<1	<1	<1	<1	<1
1,2-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
Trichloroethene	mg/kg	<1	<1	<1	<1	<1
Bromodichloromethane	mg/kg	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	mg/kg	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	mg/kg	<1	<1	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane	mg/kg	<1	<1	<1	<1	<1
Dibromochloromethane	mg/kg	<1	<1	<1	<1	<1
1,2-Dibromoethane	mg/kg	<1	<1	<1	<1	<1
Tetrachloroethene	mg/kg	<1	<1	<1	<1	<1
1,1,1,2-Tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
Chlorobenzene	mg/kg	<1	<1	<1	<1	<1

VOCs in soil						
Our Reference		378301-5	378301-8	378301-13	378301-16	378301-19
Your Reference	UNITS	BH01	BH02	BH04	BH05	BH06
Depth		1.4-1.5	0.4-0.5	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
Bromoform	mg/kg	<1	<1	<1	<1	<1
m+p-Xylene	mg/kg	<2	<2	<2	<2	<2
Styrene	mg/kg	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	mg/kg	<1	<1	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1	<1	<1
1,2,3-Trichloropropane	mg/kg	<1	<1	<1	<1	<1
Isopropylbenzene	mg/kg	<1	<1	<1	<1	<1
Bromobenzene	mg/kg	<1	<1	<1	<1	<1
n-Propylbenzene	mg/kg	<1	<1	<1	<1	<1
2-Chlorotoluene	mg/kg	<1	<1	<1	<1	<1
4-Chlorotoluene	mg/kg	<1	<1	<1	<1	<1
1,3,5-Trimethylbenzene	mg/kg	<1	<1	<1	<1	<1
tert-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,2,4-Trimethylbenzene	mg/kg	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
sec-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
4-Isopropyltoluene	mg/kg	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	mg/kg	<1	<1	<1	<1	<1
n-Butylbenzene	mg/kg	<1	<1	<1	<1	<1
1,2-Dibromo-3-chloropropane	mg/kg	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Hexachlorobutadiene	mg/kg	<1	<1	<1	<1	<1
1,2,3-Trichlorobenzene	mg/kg	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	101	114	103	102	100
Surrogate aaa-Trifluorotoluene	%	96	97	97	100	106
Surrogate Toluene-d_8	%	99	102	99	99	99
Surrogate 4-Bromofluorobenzene	%	99	101	99	98	99

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	105	96	104	97	103

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	91	100	100	106

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		378301-20	378301-21	378301-22
Your Reference	UNITS	TB	TS	BD1/20250325
Depth		-	-	-
Date Sampled		25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025
TRH C_6 - C_9	mg/kg	[NA]	[NA]	<25
TRH C_6 - C_{10}	mg/kg	[NA]	[NA]	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	[NA]	[NA]	<25
Benzene	mg/kg	<0.2	88%	<0.2
Toluene	mg/kg	<0.5	87%	<0.5
Ethylbenzene	mg/kg	<1	88%	<1
m+p-xylene	mg/kg	<2	89%	<2
o-Xylene	mg/kg	<1	88%	<1
Naphthalene	mg/kg	[NA]	[NA]	<1
Total +ve Xylenes	mg/kg	[NA]	[NA]	<1
Surrogate aaa-Trifluorotoluene	%	109	88	102

svTRH (C10-C40) in Soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	110
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	110
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	120
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	120
Surrogate o-Terphenyl	%	110	121	102	109	109

svTRH (C10-C40) in Soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	140	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	140	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	56	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	56	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	130	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	190	<50
Surrogate o-Terphenyl	%	105	101	115	106	103

svTRH (C10-C40) in Soil		
Our Reference		378301-22
Your Reference	UNITS	BD1/20250325
Depth		-
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	17/04/2025
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	117

PAHs in Soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	111	119	118	113	107

PAHs in Soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	109	109	106	126	112

PAHs in Soil		
Our Reference		378301-22
Your Reference	UNITS	BD1/20250325
Depth		-
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	113

Organochlorine Pesticides in soil						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	120	118	120	122	122

Organochlorine Pesticides in soil		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Mirex	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1
Surrogate 4-Chloro-3-NBTF	%	121

Organophosphorus Pesticides in Soil						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	120	118	120	122	122

Organophosphorus Pesticides in Soil		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
Dichlorvos	mg/kg	<0.1
Mevinphos	mg/kg	<0.1
Phorate	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Disulfoton	mg/kg	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1
Parathion-Methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Fenthion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Methidathion	mg/kg	<0.1
Fenamiphos	mg/kg	<0.1
Ethion	mg/kg	<0.1
Phosalone	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Coumaphos	mg/kg	<0.1
Surrogate 4-Chloro-3-NBTF	%	121

PCBs in Soil						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	22/04/2025	22/04/2025	22/04/2025	22/04/2025	22/04/2025
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	117	117	118	117	117

PCBs in Soil		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date extracted	-	16/04/2025
Date analysed	-	22/04/2025
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate 2-Fluorobiphenyl	%	117

Misc Soil - Inorg						
Our Reference		378301-3	378301-8	378301-11	378301-13	378301-15
Your Reference	UNITS	BH01	BH02	BH03	BH04	BH05
Depth		0.5-0.6	0.4-0.5	0.4-0.5	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg		
Our Reference		378301-19
Your Reference	UNITS	BH06
Depth		0.4-0.5
Date Sampled		25/03/2025
Type of sample		Soil
Date prepared	-	16/04/2025
Date analysed	-	24/04/2025
Total Phenolics (as Phenol)	mg/kg	<5

Acid Extractable metals in soil						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Arsenic	mg/kg	6	11	<4	<4	11
Cadmium	mg/kg	0.9	0.5	<0.4	<0.4	<0.4
Chromium	mg/kg	6	4	4	5	9
Copper	mg/kg	41	37	15	24	38
Lead	mg/kg	18	20	3	2	22
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	45	55	27	62	36
Zinc	mg/kg	370	260	18	27	190

Acid Extractable metals in soil						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Arsenic	mg/kg	4	<4	<4	5	170
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	2	9	8	6
Copper	mg/kg	40	5	27	41	25
Lead	mg/kg	11	2	16	22	30
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Nickel	mg/kg	47	1	25	28	63
Zinc	mg/kg	130	3	78	110	62

Acid Extractable metals in soil				
Our Reference		378301-22	378301-23	378301-24
Your Reference	UNITS	BD1/20250325	BH02 - [TRIPLICATE]	BH06 - [TRIPLICATE]
Depth		-	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025
Arsenic	mg/kg	5	<4	100
Cadmium	mg/kg	0.6	<0.4	<0.4
Chromium	mg/kg	7	5	6
Copper	mg/kg	41	46	23
Lead	mg/kg	15	4	17
Mercury	mg/kg	<0.1	<0.1	0.1
Nickel	mg/kg	51	59	45
Zinc	mg/kg	260	49	60

Moisture						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Moisture	%	13	12	13	1.3	6.7

Moisture						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/04/2025	16/04/2025	16/04/2025	16/04/2025	16/04/2025
Date analysed	-	17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Moisture	%	7.0	12	4.8	7.4	8.2

Moisture		
Our Reference		378301-22
Your Reference	UNITS	BD1/20250325
Depth		-
Date Sampled		25/03/2025
Type of sample		Soil
Date prepared	-	16/04/2025
Date analysed	-	17/04/2025
Moisture	%	14

Asbestos ID - soils						
Our Reference		378301-3	378301-5	378301-7	378301-8	378301-11
Your Reference	UNITS	BH01	BH01	BH02	BH02	BH03
Depth		0.5-0.6	1.4-1.5	0.13-0.2	0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Sample mass tested	g	Approx. 50g	Approx. 60g	Approx. 60g	Approx. 55g	Approx. 65g
Sample Description	-	Grey fine-grained soil & rocks	Grey fine-grained soil & rocks	Brown coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		378301-13	378301-14	378301-15	378301-16	378301-19
Your Reference	UNITS	BH04	BH05	BH05	BH05	BH06
Depth		0.4-0.5	0.15-0.2	0.4-0.5	0.9-1	0.4-0.5
Date Sampled		25/03/2025	25/03/2025	25/03/2025	25/03/2025	25/03/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Sample mass tested	g	Approx. 80g	Approx. 65g	Approx. 80g	Approx. 70g	Approx. 80g
Sample Description	-	Brown coarse-grained soil & rocks	Brown sandy soil	Brown coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	Nil	Nil	Nil	Nil	Nil
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - materials		
Our Reference		378301-17
Your Reference	UNITS	BH05-FC
Depth		1.1
Date Sampled		25/03/2025
Type of sample		Material
Date analysed	-	17/04/2025
Mass / Dimension of Sample	-	80x70x4mm
Sample Description	-	White plastic-like material
Asbestos ID in materials	-	No asbestos detected
Trace Analysis	-	No asbestos detected

Misc Inorg - Soil			
Our Reference		378301-3	378301-13
Your Reference	UNITS	BH01	BH04
Depth		0.5-0.6	0.4-0.5
Date Sampled		25/03/2025	25/03/2025
Type of sample		Soil	Soil
Date prepared	-	22/04/2025	22/04/2025
Date analysed	-	22/04/2025	22/04/2025
pH 1:5 soil:water	pH Units	6.9	9.4

CEC			
Our Reference		378301-3	378301-13
Your Reference	UNITS	BH01	BH04
Depth		0.5-0.6	0.4-0.5
Date Sampled		25/03/2025	25/03/2025
Type of sample		Soil	Soil
Date prepared	-	23/04/2025	23/04/2025
Date analysed	-	23/04/2025	23/04/2025
Exchangeable Ca	meq/100g	2.3	13
Exchangeable K	meq/100g	0.4	0.3
Exchangeable Mg	meq/100g	1.1	2.2
Exchangeable Na	meq/100g	0.2	0.7
Cation Exchange Capacity	meq/100g	3.9	16

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stochiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date Extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date Analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
trans-1,2-Dichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1-Dichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	118	[NT]
cis-1,2-Dichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Bromochloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chloroform	mg/kg	1	Org-023	<1	8	<1	<1	0	122	[NT]
2,2-Dichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	107	[NT]
1,1,1-Trichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	126	[NT]
1,1-Dichloropropene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Carbon Tetrachloride	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	8	<0.2	<0.2	0	109	[NT]
Dibromomethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Trichloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	117	[NT]
Bromodichloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	127	[NT]
trans-1,3-Dichloropropene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
cis-1,3-Dichloropropene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1,2-Trichloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	8	<0.5	<0.5	0	112	[NT]
1,3-Dichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Dibromochloromethane	mg/kg	1	Org-023	<1	8	<1	<1	0	128	[NT]
1,2-Dibromoethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Tetrachloroethene	mg/kg	1	Org-023	<1	8	<1	<1	0	112	[NT]
1,1,1,2-Tetrachloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Chlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	116	[NT]
Bromoform	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
m+p-Xylene	mg/kg	2	Org-023	<2	8	<2	<2	0	114	[NT]
Styrene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,1,2,2-Tetrachloroethane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
o-Xylene	mg/kg	1	Org-023	<1	8	<1	<1	0	118	[NT]
1,2,3-Trichloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Isopropylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Bromobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
n-Propylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
2-Chlorotoluene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
4-Chlorotoluene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,3,5-Trimethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
tert-Butylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2,4-Trimethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,3-Dichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
sec-Butylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,4-Dichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
4-Isopropyltoluene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
n-Butylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2-Dibromo-3-chloropropane	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2,4-Trichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
1,2,3-Trichlorobenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	105	8	114	102	11	99	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	103	8	97	98	1	110	[NT]
Surrogate Toluene-d_8	%		Org-023	100	8	102	99	3	100	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	100	8	101	99	2	100	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date Extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date Analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trans-1,2-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
cis-1,2-Dichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromochloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chloroform	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
2,2-Dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,1-Trichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1-Dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Carbon Tetrachloride	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Dibromomethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Trichloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromodichloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
trans-1,3-Dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
cis-1,3-Dichloropropene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,2-Trichloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
1,3-Dichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Dibromochloromethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dibromoethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Tetrachloroethene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,1,2-Tetrachloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Chlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromoform	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-Xylene	mg/kg	2	Org-023	[NT]	19	<2	<2	0	[NT]	[NT]
Styrene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,1,2,2-Tetrachloroethane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,3-Trichloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Isopropylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Bromobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
n-Propylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
2-Chlorotoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
4-Chlorotoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,3,5-Trimethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
tert-Butylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,4-Trimethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,3-Dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
sec-Butylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,4-Dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
4-Isopropyltoluene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
n-Butylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2-Dibromo-3-chloropropane	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,4-Trichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
1,2,3-Trichlorobenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	19	100	108	8	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	19	106	108	2	[NT]	[NT]
Surrogate Toluene-d_8	%		Org-023	[NT]	19	99	101	2	[NT]	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	[NT]	19	99	100	1	[NT]	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	<25	8	<25	<25	0	91	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	8	<25	<25	0	91	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	8	<0.2	<0.2	0	109	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	8	<0.5	<0.5	0	112	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	8	<1	<1	0	116	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	8	<2	<2	0	114	[NT]
o-Xylene	mg/kg	1	Org-023	<1	8	<1	<1	0	118	[NT]
Naphthalene	mg/kg	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	103	8	97	98	1	110	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	19	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	19	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	19	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	19	106	108	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	8	<50	<50	0	103	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	8	<100	<100	0	92	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	8	<100	<100	0	100	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	8	<50	<50	0	103	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	8	<100	<100	0	92	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	8	<100	<100	0	100	[NT]
Surrogate o-Terphenyl	%		Org-020	107	8	109	108	1	114	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	19	103	103	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	102	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	90	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	94	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	98	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	106	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	120	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	8	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	8	<0.05	<0.05	0	96	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	110	8	113	110	3	126	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	19	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	19	112	107	5	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	106	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	100	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	92	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	110	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	104	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	118	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	90	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	80	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	128	8	118	119	1	137	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	19	121	133	9	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	120	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	108	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	115	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	124	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
Fenthion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	109	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	112	[NT]
Phosalone	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	128	8	118	119	1	137	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Mevinphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenthion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phosalone	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	19	121	133	9	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			22/04/2025	8	22/04/2025	22/04/2025		22/04/2025	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	85	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	121	8	117	117	0	137	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	22/04/2025	22/04/2025		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	19	117	116	1	[NT]	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			16/04/2025	3	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			24/04/2025	3	24/04/2025	24/04/2025		24/04/2025	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	3	<5	<5	0	88	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date prepared	-			16/04/2025	8	16/04/2025	16/04/2025		16/04/2025	[NT]
Date analysed	-			17/04/2025	8	17/04/2025	17/04/2025		17/04/2025	[NT]
Arsenic	mg/kg	4	Metals-020	<4	8	<4	<4	0	117	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	8	<0.4	<0.4	0	105	[NT]
Chromium	mg/kg	1	Metals-020	<1	8	5	5	0	108	[NT]
Copper	mg/kg	1	Metals-020	<1	8	24	46	63	108	[NT]
Lead	mg/kg	1	Metals-020	<1	8	2	3	40	106	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	8	<0.1	<0.1	0	120	[NT]
Nickel	mg/kg	1	Metals-020	<1	8	62	61	2	106	[NT]
Zinc	mg/kg	1	Metals-020	<1	8	27	45	50	106	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	19	16/04/2025	16/04/2025		[NT]	[NT]
Date analysed	-			[NT]	19	17/04/2025	17/04/2025		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	19	170	220	26	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	19	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	19	6	5	18	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	19	25	20	22	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	19	30	21	35	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	19	0.2	0.1	67	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	19	63	110	54	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	19	62	54	14	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			22/04/2025	[NT]	[NT]	[NT]	[NT]	22/04/2025	[NT]
Date analysed	-			22/04/2025	[NT]	[NT]	[NT]	[NT]	22/04/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			23/04/2025	3	23/04/2025	23/04/2025		23/04/2025	[NT]
Date analysed	-			23/04/2025	3	23/04/2025	23/04/2025		23/04/2025	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	3	2.3	2.2	4	102	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	3	0.4	0.4	0	109	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	3	1.1	1.0	10	101	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	3	0.2	0.2	0	103	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Acid Extractable Metals in Soil:
-The laboratory RPD acceptance criteria has been exceeded for 378301-8 for Cu and Zn. Therefore a triplicate result has been issued as laboratory sample number 378301-23.
-The laboratory RPD acceptance criteria has been exceeded for 378301-19 for Ni.
Therefore a triplicate result has been issued as laboratory sample number 378301-24.

MISC_INORG_DRY: pH
Samples were out of the recommended holding time for this analysis.

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.
Note: Samples requested for asbestos testing were sub-sampled from bags provided by the client.

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	86230.01	**Suburb:**	St Leonards	**To:**	Envirolab Services
Project Manager:	Paul.Gorman	**Order Number:**		**Sampler:**	JDS
Email:	Paul.Gorman@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.com
Prior Storage:	☐ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☐ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

	Sample ID			Date Sampled	Sample Type	Container Type	Analytes											Notes/ Preservation/ Additional Requirements
	Location / Other ID	Depth From	Depth To		S - soil W - water M - Material	G - glass P - plastic	Combo 8a	Combo 3a	VOC	pH, CEC	BTEX	Combo 3	Asbestial material					
BH01 1		0.15	0.16	25/03/25	S	G,P												HOLD
BH01 2		0.28	0.35	25/03/25	S	G,P												HOLD
BH01 3		0.5	0.6	25/03/25	S	G,P	x			x								
BH01 4		0.9	1	25/03/25	S	G,P												HOLD
BH01 5		1.4	1.5	25/03/25	S	G,P		x	x									
BH01 6		1.9	2	25/03/25	S	G,P												HOLD
BH02 7		0.13	0.2	25/03/25	S	G,P		x										
BH02 8		0.4	0.5	25/03/25	S	G,P	x		x									
BH02 9		0.9	1	25/03/25	S	G,P												HOLD
BH03 10		0.15	0.2	25/03/25	S	G,P												HOLD
BH03 11		0.4	0.5	25/03/25	S	G,P	x											
BH04 12		0.15	0.2	25/03/25	S	G,P												HOLD
BH04 13		0.4	0.5	25/03/25	S	G,P	x		x	x								
BH05 14		0.15	0.2	25/03/25	S	G,P		x										

ENVIROLAB group

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 378301
Date Received: 15/4/25
Time Received: 1210
Received By: JW
Temp: Cool/Ambient
Cooling: Ice/Icepack 12°C
Security: Intact/Broken/None

Metals to analyse:			**LAB RECEIPT**
Number of samples in container:	**Transported to laboratory by:**		**Lab Ref. No:** 378301
Send results to:	Douglas Partners Pty Ltd		**Received by:** Katy Wayne
Address:	96 Hermitage Road, West Ryde NSW 2114	**Phone:** (02) 9809 0666	**Date & Time** 15/4/25 1210
Relinquished by: JZ	**Date:** 15/3/25	**Signed:**	**Signed:**

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	86230.01	**Suburb:** St Leonards	**To:** Envirolab Services
Project Manager:	Paul.Gorman		**Dispatch date:** 0/01/1900

	Sample ID			Date Sampled	Sample Type	Container Type	Analytes											Notes/ Preservation/ Additional Requirements
	Location / Other ID	Depth From	Depth To		S - soil W - water M - Material	G - glass P - plastic	Combo 8a	Combo 3a	VOC	pH, CEC	BTEX	Combo 3	Asbestial material					
BH05 15		0.4	0.5	25/03/25	S	G,P	x											
BH05 16		0.9	1	25/03/25	S	G,P		x	x									
BH05-FC 17		1.1		25/03/25	S	P							x					
BH06 18		0.15	0.2	25/03/25	S	G,P												HOLD
BH06 19		0.4	0.5	25/03/25	S	G,P	x		x									
TB/TC 20/	21			25/03/25	S	G					x							
BD1/20250325	22			25/03/25	S	G						x						#378301 15/4 lw

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.01, St Leonards
Envirolab Reference	378301
Date Sample Received	15/04/2025
Date Instructions Received	15/04/2025
Date Results Expected to be Reported	24/04/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	21 Soil, 1 Material
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
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Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBs in Soil	Misc Soil - Inorg	Acid Extractable metalsin soil	Asbestos ID - soils	Asbestos ID - materials	Misc Inorg - Soil	CEC	On Hold
BH01-0.15-0.16														✓
BH01-0.28-0.35														✓
BH01-0.5-0.6		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
BH01-0.9-1														✓
BH01-1.4-1.5	✓	✓	✓	✓					✓	✓				
BH01-1.9-2														✓
BH02-0.13-0.2		✓	✓	✓					✓	✓				
BH02-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH02-0.9-1														✓
BH03-0.15-0.2														✓
BH03-0.4-0.5		✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH04-0.15-0.2														✓
BH04-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
BH05-0.15-0.2		✓	✓	✓					✓	✓				
BH05-0.4-0.5		✓	✓	✓	✓	✓	✓	✓	✓	✓				
BH05-0.9-1	✓	✓	✓	✓					✓	✓				
BH05-FC-1.1											✓			
BH06-0.15-0.2														✓
BH06-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
TB		✓												
TS		✓												
BD1/20250325		✓	✓	✓					✓					

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 378301-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.01, St Leonards**
Number of Samples	Additional analysis
Date samples received	15/04/2025
Date completed instructions received	28/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	05/05/2025
Date of Issue	05/05/2025

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Giovanni Agosti, Group Technical Manager

Authorised By
Nancy Zhang, Laboratory Manager

Metals from Leaching Fluid pH 2.9 or 5			
Our Reference		378301-A-8	378301-A-19
Your Reference	UNITS	BH02	BH06
Depth		0.4-0.5	0.4-0.5
Date Sampled		25/03/2025	25/03/2025
Type of sample		Soil	Soil
Date extracted	-	01/05/2025	01/05/2025
Date analysed	-	01/05/2025	01/05/2025
pH of soil for fluid# determ.	pH units	9.0	8.9
pH of soil TCLP (after HCl)	pH units	1.9	1.8
Extraction fluid used		1	1
pH of final Leachate	pH units	5.1	5.2
Arsenic	mg/L	[NA]	<0.05
Nickel	mg/L	0.07	0.2

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439. Please note that the mass used may be scaled down from default based on sample mass available. Samples are stored at 2-6oC before and after leachate preparation.
Metals-020	Determination of various metals by ICP-AES following buffer determination as per USEPA 1311 and hence AS 4439.3. Extraction Fluid 1 refers to the pH 5.0 buffer and Extraction Fluid 2 is the pH 2.9 buffer. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.

QUALITY CONTROL: Metals from Leaching Fluid pH 2.9 or 5					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	378301-A-8
Date extracted	-			01/05/2025	[NT]	[NT]	[NT]	[NT]	01/05/2025	01/05/2025
Date analysed	-			01/05/2025	[NT]	[NT]	[NT]	[NT]	01/05/2025	01/05/2025
Arsenic	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	119	[NT]
Nickel	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	101	99

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

Anna Bui

From: Greta Petzold
Sent: Monday, 28 April 2025 10:38 AM
To: Paul Gorman; Envirolab Sydney Sample Receipt
Subject: RE: Results for Registration 378301 86230.01, St Leonards

No worries, Paul

@Envirolab Sydney Sample Receipt A- job please

ELS ref: 378301-A

TAT: STANDARD

DUE: 5/5/25

AB

Kind Regards,

Greta Petzold | Operations Manager | Envirolab Services

Great Science. Great Service.

12 Ashley Street Chatswood NSW 2067
T 612 9910 6200
E GPetzold@envirolab.com.au | **W** www.envirolab.com.au

Follow us on: LinkedIn | Facebook | Twitter

Samples will be analysed per our T&C's.

From: Paul Gorman <paul.gorman@douglaspartners.com.au>
Sent: Monday, 28 April 2025 10:02 AM
To: Greta Petzold <GPetzold@envirolab.com.au>
Subject: RE: Results for Registration 378301 86230.01, St Leonards

CAUTION: This email originated from outside of the organisation. Do not act on instructions, click links or open attachments unless you recognise the sender and know the content is authentic and safe.

Thanks Greta.

Can I please request TCLP testing on a standard turnaround as follows:

8 BH02/0.4-0.5 TCLP nickel
9 BH06/0.4-0.5 TCLP arsenic, nickel

Thanks

Paul Gorman | Principal

02 8878 0632 +61 427 949 878 Paul.Gorman@douglaspartners.com.au

www.douglaspartners.com.au 96 Hermitage Road, West Ryde
NSW 2114 | Wallumedegal Country
PO Box 472, West Ryde, NSW 1685

Douglas PARTNERS | GROUNDED EXPERTISE

Click here to learn about our awards and achievements.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.01, St Leonards
Envirolab Reference	378301-A
Date Sample Received	15/04/2025
Date Instructions Received	28/04/2025
Date Results Expected to be Reported	05/05/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	Additional analysis
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	pH of soil for fluid#determ.	pH of soil TCLP (after HCl)	Extraction fluid used	pH of final Leachate	Arsenic	Nickel	On Hold
BH01-0.15-0.16							✓
BH01-0.28-0.35							✓
BH01-0.5-0.6							✓
BH01-0.9-1							✓
BH01-1.4-1.5							✓
BH01-1.9-2							✓
BH02-0.13-0.2							✓
BH02-0.4-0.5	✓	✓	✓	✓		✓	
BH02-0.9-1							✓
BH03-0.15-0.2							✓
BH03-0.4-0.5							✓
BH04-0.15-0.2							✓
BH04-0.4-0.5							✓
BH05-0.15-0.2							✓
BH05-0.4-0.5							✓
BH05-0.9-1							✓
BH05-FC-1.1							✓
BH06-0.15-0.2							✓
BH06-0.4-0.5	✓	✓	✓	✓	✓	✓	
TB							✓
TS							✓
BD1/20250325							✓
BH02 - [TRIPLICATE]-0.4-0.5							✓
BH06 - [TRIPLICATE]-0.4-0.5							✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 378866

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.01, St Leonards**
Number of Samples	6 Water
Date samples received	23/04/2025
Date completed instructions received	23/04/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	01/05/2025
Date of Issue	01/05/2025

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Loren Bardwell, Development Chemist
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water				
Our Reference	UNITS	378866-1	378866-2	378866-3
Your Reference		BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date Extracted	-	24/04/2025	24/04/2025	24/04/2025
Date Analysed	-	28/04/2025	28/04/2025	28/04/2025
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	3	32	<1
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	<1	5	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1

VOCs in water				
Our Reference		378866-1	378866-2	378866-3
Your Reference	UNITS	BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Bromoform	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	105	106	105
Surrogate Toluene-d8	%	100	100	99
Surrogate 4-Bromofluorobenzene	%	97	98	96

vTRH(C6-C10)/BTEXN in Water						
Our Reference		378866-1	378866-2	378866-3	378866-4	378866-5
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417	TS
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	28/04/2025	28/04/2025	28/04/2025	28/04/2025	28/04/2025
TRH C_6 - C_9	µg/L	<10	27	<10	<10	[NA]
TRH C_6 - C_{10}	µg/L	<10	30	<10	<10	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	30	<10	<10	[NA]
Benzene	µg/L	<1	<1	<1	<1	117%
Toluene	µg/L	<1	<1	<1	<1	108%
Ethylbenzene	µg/L	<1	<1	<1	<1	105%
m+p-xylene	µg/L	<2	<2	<2	<2	95%
o-xylene	µg/L	<1	<1	<1	<1	118%
Naphthalene	µg/L	<1	<1	<1	<1	[NA]
Surrogate Dibromofluoromethane	%	105	106	105	106	103
Surrogate Toluene-d8	%	100	100	99	100	102
Surrogate 4-Bromofluorobenzene	%	97	98	96	96	101

vTRH(C6-C10)/BTEXN in Water		
Our Reference		378866-6
Your Reference	UNITS	TB
Date Sampled		17/04/2025
Type of sample		Water
Date extracted	-	24/04/2025
Date analysed	-	28/04/2025
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Surrogate Dibromofluoromethane	%	104
Surrogate Toluene-d8	%	100
Surrogate 4-Bromofluorobenzene	%	97

svTRH (C10-C40) in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100
Total +ve TRH (C10-C36)	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	µg/L	<50	<50	<50	<50
Surrogate o-Terphenyl	%	106	102	119	117

PAHs in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
Naphthalene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	124	115	108	127

Organochlorine Pesticides in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
HCB	µg/L	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2
Mirex	ug/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	114	110	107	115

OP Pesticides in Water					
Our Reference	UNITS	378866-1	378866-2	378866-3	378866-4
Your Reference		BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
Dichlorvos	µg/L	<0.2	<0.2	<0.2	<0.2
Mevinphos	µg/L	<0.2	<0.2	<0.2	<0.2
Phorate	µg/L	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2	<0.2
Disulfoton	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion-Methyl	µg/L	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2	<0.2
Fenthion	µg/L	<0.2	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2
Methidathion	µg/L	<0.2	<0.2	<0.2	<0.2
Fenamiphos	µg/L	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2
Phosalone	µg/L	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2	<0.2	<0.2
Coumaphos	µg/L	<0.2	<0.2	<0.2	<0.2
Surrogate 4-Chloro-3-NBTF	%	114	110	107	115

PCBs in Water					
Our Reference		378866-1	378866-2	378866-3	378866-4
Your Reference	UNITS	BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date extracted	-	24/04/2025	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	29/04/2025	29/04/2025	29/04/2025	29/04/2025
Aroclor 1016	µg/L	<2	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2	<2
Surrogate 2-Fluorobiphenyl	%	112	110	104	114

HM in water - total					
Our Reference	UNITS	378866-1	378866-2	378866-3	378866-4
Your Reference		BH01	BH03	BH06	BD1/250417
Date Sampled		17/04/2025	17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	28/04/2025	28/04/2025	28/04/2025	28/04/2025
Date analysed	-	28/04/2025	28/04/2025	28/04/2025	28/04/2025
Arsenic-Total	µg/L	3	6	5	6
Cadmium-Total	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Total	µg/L	<1	2	9	11
Copper-Total	µg/L	13	24	36	33
Lead-Total	µg/L	2	2	8	10
Mercury-Total	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Total	µg/L	130	22	28	33
Zinc-Total	µg/L	270	59	110	100

HM in water - dissolved				
Our Reference	UNITS	378866-1	378866-2	378866-3
Your Reference		BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date prepared	-	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	24/04/2025	24/04/2025	24/04/2025
Arsenic-Dissolved	µg/L	<1	2	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	3	<1	3
Lead-Dissolved	µg/L	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	100	17	15
Zinc-Dissolved	µg/L	120	28	41

Metals in Waters - Acid extractable				
Our Reference		378866-1	378866-2	378866-3
Your Reference	UNITS	BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date prepared	-	24/04/2025	24/04/2025	24/04/2025
Date analysed	-	28/04/2025	28/04/2025	28/04/2025
Phosphorus - Total	mg/L	<0.05	0.06	2.9

Miscellaneous Inorganics				
Our Reference		378866-1	378866-2	378866-3
Your Reference	UNITS	BH01	BH03	BH06
Date Sampled		17/04/2025	17/04/2025	17/04/2025
Type of sample		Water	Water	Water
Date prepared	-	23/04/2025	23/04/2025	23/04/2025
Date analysed	-	23/04/2025	23/04/2025	23/04/2025
pH	pH Units	5.3	6.7	6.3
Oil & Grease (LLE)	mg/L	16	<5	7
Sulphate, SO4	mg/L	120	55	71
Chloride, Cl	mg/L	250	56	66
Ammonia as N in water	mg/L	0.012	<0.005	0.012
Nitrate as N in water	mg/L	<0.005	<0.005	<0.005
Nitrite as N in water	mg/L	<0.005	<0.005	<0.005
NOx as N in water	mg/L	<0.005	<0.005	<0.005
Total Nitrogen in water	mg/L	0.1	0.3	0.1
TKN in water	mg/L	0.1	0.3	0.1
Organic Nitrogen as N	mg/L	<0.2	0.3	<0.2
Phosphate as P in water	mg/L	<0.005	<0.005	0.01

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-003	Oil & Grease - determine gravimetrically following extraction with Hexane, in accordance with APHA latest edition, 5520-B.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055	Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-062	TKN - determined colourimetrically based on APHA latest edition 4500 Norg. Alternatively, TKN can be derived from calculation (Total N - NOx).
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES. Total Phosphate determined stochiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements. Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation.

Method ID	Methodology Summary
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date Extracted	-			24/04/2025	1	24/04/2025	28/04/2025		24/04/2025	[NT]
Date Analysed	-			28/04/2025	1	28/04/2025	29/04/2025		28/04/2025	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	1	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	96	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	1	3	3	0	99	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	1	<1	1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Dibromomethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	108	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	109	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	1	<1	<1	0	117	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Bromoform	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	98	[NT]
Styrene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	103	1	105	102	3	102	[NT]
Surrogate Toluene-d8	%		Org-023	99	1	100	97	3	101	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	1	97	95	2	100	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			24/04/2025	1	24/04/2025	28/04/2025		24/04/2025	[NT]
Date analysed	-			28/04/2025	1	28/04/2025	29/04/2025		28/04/2025	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	97	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	97	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	97	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	98	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	98	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	103	1	105	102	3	102	[NT]
Surrogate Toluene-d8	%		Org-023	99	1	100	97	3	101	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	95	1	97	95	2	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate o-Terphenyl	%		Org-020	120	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	75	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	77	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	69	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	109	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: Organochlorine Pesticides in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
HCB	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	77	[NT]
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	78	[NT]
delta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	89	[NT]
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	76	[NT]
Dieldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	86	[NT]
Endrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	84	[NT]
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mirex	ug/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	97	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
Dichlorvos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Mevinphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phorate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dimethoate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Disulfoton	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion-Methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	74	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Malathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	81	[NT]
Chlorpyriphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	78	[NT]
Fenthion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	71	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methidathion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fenamiphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	74	[NT]
Phosalone	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Coumaphos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	97	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: PCBs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			24/04/2025	[NT]	[NT]	[NT]	[NT]	24/04/2025	[NT]
Date analysed	-			29/04/2025	[NT]	[NT]	[NT]	[NT]	29/04/2025	[NT]
Aroclor 1016	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	79	[NT]
Aroclor 1260	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	91	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	378866-3
Date prepared	-			24/04/2025	1	28/04/2025	28/04/2025		28/04/2025	28/04/2025
Date analysed	-			28/04/2025	1	28/04/2025	28/04/2025		28/04/2025	28/04/2025
Arsenic-Total	µg/L	1	Metals-022	<1	1	3	3	0	98	91
Cadmium-Total	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	95	96
Chromium-Total	µg/L	1	Metals-022	<1	1	<1	<1	0	99	102
Copper-Total	µg/L	1	Metals-022	<1	1	13	13	0	101	99
Lead-Total	µg/L	1	Metals-022	<1	1	2	2	0	99	94
Mercury-Total	µg/L	0.05	Metals-021	<0.05	1	<0.05	[NT]		120	[NT]
Nickel-Total	µg/L	1	Metals-022	<1	1	130	130	0	101	102
Zinc-Total	µg/L	1	Metals-022	<1	1	270	270	0	95	94

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	378866-2
Date prepared	-			24/04/2025	1	24/04/2025	24/04/2025		24/04/2025	24/04/2025
Date analysed	-			24/04/2025	1	24/04/2025	24/04/2025		24/04/2025	24/04/2025
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	89	94
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	86	88
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	87	90
Copper-Dissolved	µg/L	1	Metals-022	<1	1	3	3	0	89	92
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	92	89
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	[NT]		107	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	100	98	2	88	92
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	120	120	0	87	94

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	24/04/2025	24/04/2025		[NT]	[NT]
Date analysed	-			[NT]	3	24/04/2025	24/04/2025		[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	[NT]		[NT]	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	3	<0.1	[NT]		[NT]	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	[NT]		[NT]	[NT]
Copper-Dissolved	µg/L	1	Metals-022	[NT]	3	3	[NT]		[NT]	[NT]
Lead-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	[NT]		[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	3	<0.05	<0.05	0	[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	3	15	[NT]		[NT]	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	3	41	[NT]		[NT]	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	378866-2
Date prepared	-			24/04/2025	1	24/04/2025	24/04/2025		24/04/2025	24/04/2025
Date analysed	-			28/04/2025	1	28/04/2025	28/04/2025		28/04/2025	28/04/2025
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	1	<0.05	<0.05	0	107	115

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	378866-3
Date prepared	-			23/04/2025	1	23/04/2025	23/04/2025		23/04/2025	23/04/2025
Date analysed	-			23/04/2025	1	23/04/2025	23/04/2025		23/04/2025	23/04/2025
pH	pH Units		Inorg-001	[NT]	1	5.3	5.2	2	101	[NT]
Oil & Grease (LLE)	mg/L	5	Inorg-003	<5	1	16	[NT]		80	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	120	[NT]		105	73
Chloride, Cl	mg/L	1	Inorg-081	<1	1	250	[NT]		98	72
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.012	[NT]		92	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		102	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		101	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	<0.005	[NT]		102	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.1	0.1	0	120	122
TKN in water	mg/L	0.1	Inorg-062	<0.1	1	0.1	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	<0.2	1	<0.2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	[NT]		93	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	23/04/2025	23/04/2025		[NT]	[NT]
Date analysed	-			[NT]	3	23/04/2025	23/04/2025		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	3	6.3	[NT]		[NT]	[NT]
Oil & Grease (LLE)	mg/L	5	Inorg-003	[NT]	3	7	[NT]		[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	3	71	[NT]		[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	3	66	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	3	0.012	0.016	29	[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	<0.005	0	[NT]	[NT]
Nitrite as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	<0.005	0	[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	3	<0.005	0.005	0	[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	[NT]	3	0.1	[NT]		[NT]	[NT]
TKN in water	mg/L	0.1	Inorg-062	[NT]	3	0.1	[NT]		[NT]	[NT]
Organic Nitrogen as N	mg/L	0.2	Inorg-055/062/127	[NT]	3	<0.2	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	3	0.01	0.01	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

CHAIN OF CUSTODY DESPATCH SHEET

Douglas PARTNERS

Project No:	86230.01	**Suburb:**	St Leonards	**To:**	Envirolab Services
Project Manager:	Alex Gibson / Paul Gorman	**Order Number:**		**Sampler:** ZW	12 Ashley St, Chatswood NSW 2067
Email:	Paul.Gorman@douglaspartners.com.au			**Attn:**	Sample Receipt
Turnaround time	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200 samplereceipt@envirolab.cor
Prior Storage	☐ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☐ No ☐ Yes (If YES, handle, transport, store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Combo 6*	8 HM ** (dissolved)	VOC	pH	oil & grease	sulfate	chloride	nutrient suite	BTEX			Notes/ Preservation/ Additional Requirements
1	BH01			17.04.25	W	G/P	X	X	X	X	X	X	X	X				* total metals, low level
2	BH03			17.04.25	W	G/P	X	X	X	X	X	X	X	X				** low level
3	BH06			17.04.25	W	G/P	X	X	X	X	X	X	X	X				
4	BD1/250417				W	G/P	X											
5	TS														X			
6	TB														X			

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 378866
Date Received: 23/4/25
Time Received: 1300
Received By: ST
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:

Number of samples in container:

Transported to laboratory by:

Send results to: Douglas Partners Pty Ltd

Address: 96 Hermitage Road, West Ryde NSW 2114 **Phone:** (02) 9809 0666

Relinquished by: **Date:** **Signed:**

LAB RECEIPT

Lab Ref. No: 378866

Received by: Shann ToC

Date & Time 23/4/25 1300

Signed: ST

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.01, St Leonards
Envirolab Reference	378866
Date Sample Received	23/04/2025
Date Instructions Received	23/04/2025
Date Results Expected to be Reported	01/05/2025

Sample Condition

Samples received in appropriate condition for analysis	Holding time exceedance
No. of Samples Provided	6 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Please contact the laboratory within 24 hours if you wish to cancel the aformentioned testing. Otherwise testing will proceed as per the COC and hence invoiced accordingly.

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	VOCs in water	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	HM in water - total	HM in water - dissolved	Metals in Waters -Acid extractable	pH	Oil & Grease (LLE)	Sulphate, SO4	Chloride, Cl	Ammonia as N in water	Nitrate as N in water	Nitrite as N in water	NOx as N in water	Total Nitrogen in water	TKN in water	Organic Nitrogen as N	Phosphate as P in water
BH01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BD1/250417		✓	✓	✓	✓	✓	✓	✓														
TS		✓																				
TB		✓																				

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 395023

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86230.03, St Leonards**
Number of Samples	8 Soil
Date samples received	10/11/2025
Date completed instructions received	11/11/2025

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client unless as indicated below in the method summaries. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	18/11/2025
Date of Issue	18/11/2025

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Asbestos Approved By
Analysed by Asbestos Approved Analyst: Nyovan Moonean
Authorised by Asbestos Approved Signatory: Nyovan Moonean

Results Approved By
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Jack Wallis, Senior Chemist
Jenny He, Inorganic Team Leader
Liam Timmins, Organics Supervisor
Nyovan Moonean, Asbestos Approved Identifier/Counter
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in soil				
Our Reference		395023-1	395023-4	395023-6
Your Reference	UNITS	BH07	BH08	BH09
Depth		0.3-0.4	0.7-0.8	0.6-0.8
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date Extracted	-	12/11/2025	12/11/2025	12/11/2025
Date Analysed	-	14/11/2025	14/11/2025	14/11/2025
Dichlorodifluoromethane	mg/kg	<1	<1	<1
Chloromethane	mg/kg	<1	<1	<1
Vinyl Chloride	mg/kg	<1	<1	<1
Bromomethane	mg/kg	<1	<1	<1
Chloroethane	mg/kg	<1	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1	<1
trans-1,2-Dichloroethene	mg/kg	<1	<1	<1
1,1-Dichloroethane	mg/kg	<1	<1	<1
cis-1,2-Dichloroethene	mg/kg	<1	<1	<1
Bromochloromethane	mg/kg	<1	<1	<1
Chloroform	mg/kg	<1	<1	<1
2,2-Dichloropropane	mg/kg	<1	<1	<1
1,2-Dichloroethane	mg/kg	<1	<1	<1
1,1,1-Trichloroethane	mg/kg	<1	<1	<1
1,1-Dichloropropene	mg/kg	<1	<1	<1
Cyclohexane	mg/kg	<1	<1	<1
Carbon Tetrachloride	mg/kg	<1	<1	<1
Benzene	mg/kg	<0.2	<0.2	<0.2
Dibromomethane	mg/kg	<1	<1	<1
1,2-Dichloropropane	mg/kg	<1	<1	<1
Trichloroethene	mg/kg	<1	<1	<1
Bromodichloromethane	mg/kg	<1	<1	<1
trans-1,3-Dichloropropene	mg/kg	<1	<1	<1
cis-1,3-Dichloropropene	mg/kg	<1	<1	<1
1,1,2-Trichloroethane	mg/kg	<1	<1	<1
Toluene	mg/kg	<0.5	<0.5	<0.5
1,3-Dichloropropane	mg/kg	<1	<1	<1
Dibromochloromethane	mg/kg	<1	<1	<1
1,2-Dibromoethane	mg/kg	<1	<1	<1
Tetrachloroethene	mg/kg	<1	<1	<1
1,1,1,2-Tetrachloroethane	mg/kg	<1	<1	<1
Chlorobenzene	mg/kg	<1	<1	<1

VOCs in soil				
Our Reference		395023-1	395023-4	395023-6
Your Reference	UNITS	BH07	BH08	BH09
Depth		0.3-0.4	0.7-0.8	0.6-0.8
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Ethylbenzene	mg/kg	<1	<1	<1
Bromoform	mg/kg	<1	<1	<1
m+p-Xylene	mg/kg	<2	<2	<2
Styrene	mg/kg	<1	<1	<1
1,1,2,2-Tetrachloroethane	mg/kg	<1	<1	<1
o-Xylene	mg/kg	<1	<1	<1
1,2,3-Trichloropropane	mg/kg	<1	<1	<1
Isopropylbenzene	mg/kg	<1	<1	<1
Bromobenzene	mg/kg	<1	<1	<1
n-Propylbenzene	mg/kg	<1	<1	<1
2-Chlorotoluene	mg/kg	<1	<1	<1
4-Chlorotoluene	mg/kg	<1	<1	<1
1,3,5-Trimethylbenzene	mg/kg	<1	<1	<1
tert-Butylbenzene	mg/kg	<1	<1	<1
1,2,4-Trimethylbenzene	mg/kg	<1	<1	<1
1,3-Dichlorobenzene	mg/kg	<1	<1	<1
sec-Butylbenzene	mg/kg	<1	<1	<1
1,4-Dichlorobenzene	mg/kg	<1	<1	<1
4-Isopropyltoluene	mg/kg	<1	<1	<1
1,2-Dichlorobenzene	mg/kg	<1	<1	<1
n-Butylbenzene	mg/kg	<1	<1	<1
1,2-Dibromo-3-chloropropane	mg/kg	<1	<1	<1
1,2,4-Trichlorobenzene	mg/kg	<1	<1	<1
Hexachlorobutadiene	mg/kg	<1	<1	<1
1,2,3-Trichlorobenzene	mg/kg	<1	<1	<1
Surrogate Dibromofluoromethane	%	94	94	97
Surrogate aaa-Trifluorotoluene	%	76	71	75
Surrogate Toluene-d_8	%	101	101	100
Surrogate 4-Bromofluorobenzene	%	99	98	99

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		395023-1	395023-2	395023-3	395023-4	395023-5
Your Reference	UNITS	BH07	BH07	BH08	BH08	BH09
Depth		0.3-0.4	0.5-0.6	0.3-0.5	0.7-0.8	0.3-0.5
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	78	96	90	101	92

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		395023-6	395023-7	395023-8
Your Reference	UNITS	BH09	BH09	BD1/20251108
Depth		0.6-0.8	0.9-1.1	-
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	14/11/2025	14/11/2025	14/11/2025
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	94	95	103

svTRH (C10-C40) in Soil						
Our Reference		395023-1	395023-2	395023-3	395023-4	395023-5
Your Reference	UNITS	BH07	BH07	BH08	BH08	BH09
Depth		0.3-0.4	0.5-0.6	0.3-0.5	0.7-0.8	0.3-0.5
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	72	74	75	73	79

svTRH (C10-C40) in Soil				
Our Reference		395023-6	395023-7	395023-8
Your Reference	UNITS	BH09	BH09	BD1/20251108
Depth		0.6-0.8	0.9-1.1	-
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	13/11/2025	13/11/2025	13/11/2025
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	76	77	77

PAHs in Soil						
Our Reference		395023-1	395023-2	395023-3	395023-4	395023-5
Your Reference	UNITS	BH07	BH07	BH08	BH08	BH09
Depth		0.3-0.4	0.5-0.6	0.3-0.5	0.7-0.8	0.3-0.5
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	12/11/2025	12/11/2025	17/11/2025	17/11/2025
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	73	79	78	74	73

PAHs in Soil				
Our Reference		395023-6	395023-7	395023-8
Your Reference	UNITS	BH09	BH09	BD1/20251108
Depth		0.6-0.8	0.9-1.1	-
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	12/11/2025	12/11/2025
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	74	79	77

Organochlorine Pesticides in soil				
Our Reference		395023-1	395023-4	395023-6
Your Reference	UNITS	BH07	BH08	BH09
Depth		0.3-0.4	0.7-0.8	0.6-0.8
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	17/11/2025	17/11/2025
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Total Positive Aldrin+Dieldrin	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	74	74	75

Organophosphorus Pesticides in Soil				
Our Reference		395023-1	395023-4	395023-6
Your Reference	UNITS	BH07	BH08	BH09
Depth		0.3-0.4	0.7-0.8	0.6-0.8
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	17/11/2025	17/11/2025
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Mevinphos	mg/kg	<0.1	<0.1	<0.1
Phorate	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Disulfoton	mg/kg	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1
Parathion-Methyl	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Fenthion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Methidathion	mg/kg	<0.1	<0.1	<0.1
Fenamiphos	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Phosalone	mg/kg	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Coumaphos	mg/kg	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	74	74	75

PCBs in Soil				
Our Reference		395023-1	395023-4	395023-6
Your Reference	UNITS	BH07	BH08	BH09
Depth		0.3-0.4	0.7-0.8	0.6-0.8
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date extracted	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	17/11/2025	17/11/2025
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	73	73	76

Misc Soil - Inorg				
Our Reference		395023-1	395023-4	395023-6
Your Reference	UNITS	BH07	BH08	BH09
Depth		0.3-0.4	0.7-0.8	0.6-0.8
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date prepared	-	13/11/2025	13/11/2025	13/11/2025
Date analysed	-	13/11/2025	13/11/2025	13/11/2025
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5

Acid Extractable metals in soil						
Our Reference		395023-1	395023-2	395023-3	395023-4	395023-5
Your Reference	UNITS	BH07	BH07	BH08	BH08	BH09
Depth		0.3-0.4	0.5-0.6	0.3-0.5	0.7-0.8	0.3-0.5
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/11/2025	12/11/2025	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	17/11/2025	17/11/2025	17/11/2025	17/11/2025
Arsenic	mg/kg	<4	8	<4	<4	8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	3	7	4	4	8
Copper	mg/kg	20	27	21	10	39
Lead	mg/kg	4	14	6	4	19
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	8	34	15	12	31
Zinc	mg/kg	22	130	49	74	120

Acid Extractable metals in soil					
Our Reference		395023-6	395023-7	395023-8	395023-9
Your Reference	UNITS	BH09	BH09	BD1/20251108	BH07 - [TRIPLICATE]
Depth		0.6-0.8	0.9-1.1	-	0.3-0.4
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	12/11/2025	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	17/11/2025	17/11/2025	17/11/2025	17/11/2025
Arsenic	mg/kg	7	5	6	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	10	9	3
Copper	mg/kg	40	37	40	13
Lead	mg/kg	18	20	19	4
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	40	37	38	9
Zinc	mg/kg	110	120	130	29

Moisture						
Our Reference		395023-1	395023-2	395023-3	395023-4	395023-5
Your Reference	UNITS	BH07	BH07	BH08	BH08	BH09
Depth		0.3-0.4	0.5-0.6	0.3-0.5	0.7-0.8	0.3-0.5
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/11/2025	12/11/2025	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	13/11/2025	13/11/2025	13/11/2025	13/11/2025	13/11/2025
Moisture	%	8.7	5.0	9.7	11	7.4

Moisture				
Our Reference		395023-6	395023-7	395023-8
Your Reference	UNITS	BH09	BH09	BD1/20251108
Depth		0.6-0.8	0.9-1.1	-
Date Sampled		08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil
Date prepared	-	12/11/2025	12/11/2025	12/11/2025
Date analysed	-	13/11/2025	13/11/2025	13/11/2025
Moisture	%	8.9	7.3	5.2

Asbestos ID - Soils (NEPM)						
Our Reference		395023-1	395023-2	395023-3	395023-4	395023-5
Your Reference	UNITS	BH07	BH07	BH08	BH08	BH09
Depth		0.3-0.4	0.5-0.6	0.3-0.5	0.7-0.8	0.3-0.5
Date Sampled		08/11/2025	08/11/2025	08/11/2025	08/11/2025	08/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed		14/11/2025	14/11/2025	14/11/2025	14/11/2025	14/11/2025
Sample Mass Tested	g	980.29	900.38	999.01	1,201.52	837.33
Sample Description	-	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in Soil	-	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*
Total Asbestos	%w/w	<0.01	<0.01	<0.01	<0.01	<0.01
Residual Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
ACM >7mm Estimation (Mass)*	g	–	–	–	–	–
ACM >7mm Estimation*	%w/w	<0.01	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation (Mass)*	g	–	–	–	–	–
FA and AF Estimation*	%w/w	<0.001	<0.001	<0.001	<0.001	<0.001
Additional Comments - Refer to Last Page	-	Nil	Nil	Nil	Nil	Nil

Asbestos ID - Soils (NEPM)			
Our Reference		395023-6	395023-7
Your Reference	UNITS	BH09	BH09
Depth		0.6-0.8	0.9-1.1
Date Sampled		08/11/2025	08/11/2025
Type of sample		Soil	Soil
Date analysed		14/11/2025	14/11/2025
Sample Mass Tested	g	831.25	883.12
Sample Description	-	Grey coarse-grained soil & rocks	Grey coarse-grained soil & rocks
Asbestos ID in Soil	-	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*	No asbestos detected at reporting limit 0.01%W/W Organic fibres detected*
Total Asbestos	%w/w	<0.01	<0.01
Residual Analysis	-	No asbestos detected	No asbestos detected
ACM >7mm Estimation (Mass)*	g	–	–
ACM >7mm Estimation*	%w/w	<0.01	<0.01
FA and AF Estimation (Mass)*	g	–	–
FA and AF Estimation*	%w/w	<0.001	<0.001
Additional Comments - Refer to Last Page	-	Nil	Nil

Method ID	Methodology Summary
ASB-003	Asbestos ID –Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques as per Australian Standard 5370. When Inconclusive mineral fibres are detected by polarised light microscopy including dispersion staining, these fibres may or may not be asbestos fibres. To confirm the identities, another independent analytical technique may be required. When asbestos presence is reported below the reporting limit of 0.01%w/w, the result is not covered by AS5370 and is supplied for information purposes only as required by some state jurisdictions.
ASB-003	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.01% w/w as per Australian Standard AS5370. Results reported denoted with * are outside our scope of NATA accreditation. NOTE#1 Total Asbestos %w/w was analysed and reported as per Australian Standard AS5370 (This is the sum of ACM >7mm, <7mm and FA/AF relative to the sample mass tested) NOTE#2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques. Visible asbestos is defined as asbestos detected below the reporting limit of 0.01% w/w as per AS5370. NOTE #3 When asbestos presence is reported below the reporting limit of 0.01%w/w, the result is not covered by AS5370 and is supplied for information purposes only as required by some state jurisdictions.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.

Method ID	Methodology Summary
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-020	Determination of various metals/elements by ICP-AES. Total Phosphate determined stochiometrically from Phosphorus (assumed to be present as Phosphate). Where salts (oxides, chlorides etc.) are calculated from the element concentration stoichiometrically there is no guarantee that the salt form is completely soluble in the acids used in the preparation. Submission of low masses of sample e.g. for dust samples, may result in raised PQLs. Where molecular anion forms are calculated from an element (e.g. SO4 from S or PO4 from P stoichiometrically), the assumption is that the element is only present in that molecular anion form.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
Date Extracted	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	[NT]
Date Analysed	-			14/11/2025	1	14/11/2025	14/11/2025		14/11/2025	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
trans-1,2-Dichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1-Dichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	112	[NT]
cis-1,2-Dichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromochloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chloroform	mg/kg	1	Org-023	<1	1	<1	<1	0	124	[NT]
2,2-Dichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	115	[NT]
1,1,1-Trichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	107	[NT]
1,1-Dichloropropene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Carbon Tetrachloride	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	112	[NT]
Dibromomethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Trichloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	115	[NT]
Bromodichloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	109	[NT]
trans-1,3-Dichloropropene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-Dichloropropene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-Trichloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	111	[NT]
1,3-Dichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Dibromochloromethane	mg/kg	1	Org-023	<1	1	<1	<1	0	103	[NT]
1,2-Dibromoethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Tetrachloroethene	mg/kg	1	Org-023	<1	1	<1	<1	0	113	[NT]
1,1,1,2-Tetrachloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Chlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	112	[NT]
Bromoform	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
m+p-Xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	113	[NT]
Styrene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-Tetrachloroethane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	[NT]
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	111	[NT]
1,2,3-Trichloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Isopropylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Bromobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-Propylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
2-Chlorotoluene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-Chlorotoluene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-Trimethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
tert-Butylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-Trimethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,3-Dichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
sec-Butylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,4-Dichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
4-Isopropyltoluene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
n-Butylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2-Dibromo-3-chloropropane	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-Trichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-Trichlorobenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	96	1	94	93	1	93	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	94	1	76	77	1	99	[NT]
Surrogate Toluene-d_8	%		Org-023	100	1	101	101	0	98	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	99	1	99	99	0	100	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date extracted	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	12/11/2025
Date analysed	-			14/11/2025	1	14/11/2025	14/11/2025		14/11/2025	14/11/2025
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	120	108
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	120	108
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	122	110
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	115	103
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	124	112
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	119	108
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	116	104
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	91	1	78	96	21	105	100

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date extracted	-			13/11/2025	1	12/11/2025	12/11/2025		13/11/2025	12/11/2025
Date analysed	-			13/11/2025	1	13/11/2025	13/11/2025		13/11/2025	13/11/2025
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	106	93
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	95	89
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	114	109
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	106	93
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	95	89
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	114	109
Surrogate o-Terphenyl	%		Org-020	77	1	72	78	8	84	79

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date extracted	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	12/11/2025
Date analysed	-			17/11/2025	1	17/11/2025	17/11/2025		17/11/2025	17/11/2025
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	72
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	76
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	70
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	82
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	80
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	72	76
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	70	66
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	72	70
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	77	1	73	75	3	76	82

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date extracted	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	12/11/2025
Date analysed	-			17/11/2025	1	17/11/2025	17/11/2025		17/11/2025	17/11/2025
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	76	66
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	76
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	76
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	86
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	88
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	72	76
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	88
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	72	74
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	66	70
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	74	70
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	78	1	74	75	1	78	73

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date extracted	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	12/11/2025
Date analysed	-			17/11/2025	1	17/11/2025	17/11/2025		17/11/2025	17/11/2025
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	83
Mevinphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Phorate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Disulfoton	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion-Methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	80	83
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	78	78
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	80
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	93
Fenthion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	72	75
Bromophos-ethyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Methidathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fenamiphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	82	87
Phosalone	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Coumaphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	78	1	74	75	1	78	73

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date extracted	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	12/11/2025
Date analysed	-			17/11/2025	1	17/11/2025	17/11/2025		17/11/2025	17/11/2025
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	89	80
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	78	1	73	73	0	73	73

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			13/11/2025	[NT]	[NT]	[NT]	[NT]	13/11/2025	[NT]
Date analysed	-			13/11/2025	[NT]	[NT]	[NT]	[NT]	13/11/2025	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	395023-4
Date prepared	-			12/11/2025	1	12/11/2025	12/11/2025		12/11/2025	12/11/2025
Date analysed	-			17/11/2025	1	17/11/2025	17/11/2025		17/11/2025	17/11/2025
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	110	106
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	100	88
Chromium	mg/kg	1	Metals-020	<1	1	3	2	40	101	94
Copper	mg/kg	1	Metals-020	<1	1	20	11	58	104	103
Lead	mg/kg	1	Metals-020	<1	1	4	4	0	103	95
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	97	83
Nickel	mg/kg	1	Metals-020	<1	1	8	9	12	102	91
Zinc	mg/kg	1	Metals-020	<1	1	22	25	13	101	#

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

For Dust Deposit Gauge (DDG) analysis the sampling, sampling period and funnel exposure area do not fall under Envirolab's NATA accreditation (unless the Newcastle laboratory where responsible for the sampling), hence the annotation on the DDG units of reporting.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

Report Comments

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

Acid Extractable Metals in Soil:
- The laboratory RPD acceptance criteria has been exceeded for 395023-1 for Cu. Therefore a triplicate result has been issued as laboratory sample number 395023-9.
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

GC. 11/11/25 1010

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	86230.03	**Suburb:**	St Leonards	**To:**	Envirolab Services
Project Manager:	Paul Gorman	**Order Number:**		**Sampler:** RN	12 Ashley St, Chatswood NSW 2067
Email:	Paul Gorman; ryan.najafi@douglaspartners.com.au			**Attn:**	samplereceipt@envirolab.com.au
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ☐ 24 hour ☐ Same day				(02) 9910 6200
Prior Storage:	☑ Fridge ☐ Freezer ☐ Esky ☐ Shelf	**Do samples contain 'potential' HBM?**	☑ No ☐ Yes (If YES, then handle, transport and store in accordance with FPM HAZID)		

Lab ID	Sample ID: Location / Other ID	Depth From	Depth To	Date Sampled	Sample Type: S - soil W - water M - Material	Container Type: G - glass P - plastic	Analytes: Combo 8a NEPM	Combo 3a NEPM	Combo 3	VOC								Notes/ Preservation/ Additional Requirements
1	BH07	0.3	0.4	8/11/25	S	G/P	x			x								
2	BH07	0.5	0.6	8/11/25	S	G/P		x										
3	BH08	0.3	0.5	8/11/25	S	G/P		x										
4	BH08	0.7	0.8	8/11/25	S	G/P	x			x								
5	BH09	0.3	0.5	8/11/25	S	G/P		x										
6	BH09	0.6	0.8	8/11/25	S	G/P	x			x								
7	BH09	0.9	1.1	8/11/25	S	G/P		x										
8	BD1/20251108			8/11/25	S	G			x									

Metals to analyse:			**LAB RECEIPT**
Number of samples in container:	**Transported to laboratory by:** RN		**Lab Ref. No:** 395023
Send results to: Douglas Partners Pty Ltd			**Received by:** KATH WAYNE
Address:	**Phone:**		**Date & Time** 10/11/25 1545
Relinquished by: RN	**Date:** 10.11.25	**Signed:**	**Signed:** KW

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

86230.03
St. Leonards

Company:	Douglas Partners	Client Project Name/Number/Site etc (ie report title):	
Contact Person:	Paul Gorman		
Project Mgr:	=	PO No. (if applicable):	
Sampler:	Ryan Najafi	Envirolab Quote No.:	
Address:	96 Hermitage Rd., West Ryde	Date results required: Or choose: ☐ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day	
Phone: 02 8878 0632	Mob: 0427 949 878	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*	
Email Results to:	Paul.Gorman@douglaspartners.com.au	Additional report format: Esdat ☐ Equis ☐ Datanest ☐	
Email Invoice to:	=	Lab Comments:	

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
7-11 Catalano Rd, Canning Vale, WA 6155
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Newcastle Lab - Envirolab Services
92 Hill Street, Carrington Newcastle, NSW 2294
02 4902 9231 | newcastle@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Tests Required	Comments
1	BH07	0.3-0.4	8/11	Jar + AFFA		
2	BH07	0.5-0.6	8/11	" "		
3	BH08	0.3-0.5	8/11	" "		
4	BH08	0.7-0.8	8/11	" "		
5	BH09	0.3-0.5	8/11	" "		
6	BH09	0.6-0.8	8/11	" "		
7	BH09	0.9-1.1	8/11	" "		
8	BD1/20251108	-	8/11	Jar		
9						

Sample information | Tests Required | Comments

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	Douglas Partners	Received by (Company):	ES SYD
Print Name:	DP	Print Name:	Katy Wayne
Date & Time:	11/8 3:40 pm	Date & Time:	10/11/25 1545
Signature:	RN	Signature:	

Lab Use Only

Job number: 395023	Cooling: Ice / Ice pack / None
Temperature: 12°C	Security seal: Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

on-hold

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	Paul Gorman

Sample Login Details

Your reference	86230.03, St Leonards
Envirolab Reference	395023
Date Sample Received	10/11/2025
Date Instructions Received	11/11/2025
Date Results Expected to be Reported	18/11/2025

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	8 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBs in Soil	Misc Soil - Inorg	Acid Extractable metals in soil	Asbestos ID - Soils (NEPM)
BH07-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH07-0.5-0.6		✓	✓	✓					✓	✓
BH08-0.3-0.5		✓	✓	✓					✓	✓
BH08-0.7-0.8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH09-0.3-0.5		✓	✓	✓					✓	✓
BH09-0.6-0.8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH09-0.9-1.1		✓	✓	✓					✓	✓
BD1/20251108		✓	✓	✓					✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

We acknowledge receipt of your samples and Purchase Order (PO) (if provided). If a PO includes your terms & conditions, Envirolab hereby expressly rejects and will not be bound by any external or third-party terms and conditions, including those referenced or attached to a PO.

All services to be performed by Envirolab will be governed exclusively by Envirolab's General Terms and Conditions attached to this acknowledgement (Envirolab Terms) via hyperlink or found on our websites.

If you do not object in writing within two (2) business days of the date of this acknowledgement, you will be deemed to have accepted the Envirolab Terms. In addition, your provision of further instructions, additional samples, payment of any invoice, or acceptance of services or results from Envirolab will constitute acceptance of the Envirolab Terms. For clarity, Envirolab's commencement or continuation of work following receipt of the PO is performed solely under the Envirolab Terms and does not constitute acceptance of any external terms. All rights are expressly reserved.

Appendix I

Quality Assurance and Quality Control (QA/QC)

1. Field and laboratory data quality assurance and quality control

The field and laboratory data quality assurance and quality control (QA/QC) procedures and results are summarised in the following Table 1. Reference should be made to the field work methodology and the laboratory results / certificates of analysis for further details. The relative percentage difference (RPD) results, along with the other field QC samples are included in at the end of this appendix.

Table 1: Field and laboratory quality control

Item	Evaluation / acceptance criteria	Compliance
Analytical laboratories used	NATA accreditation	C
Holding times	Various based on type of analysis	C
Intra-laboratory replicates	10% of primary samples; <30% RPD	C PC
Trip spikes	1 per sampling event; 60-140% recovery	C
Trip blanks	1 per sampling event; <PQL	C
Laboratory / reagent blanks	1 per batch; <PQL	C
Laboratory duplicate	1 per lab batch; as laboratory certificate	C
Matrix spikes	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Surrogate spikes	All organics analysis; 70-130% recovery (inorganics); 60-140% recovery (organics)	PC
Control samples	1 per lab batch; 70-130% recovery (inorganics); 60-140% recovery (organics)	C
Standard operating procedures (SOP)	Adopting SOP for all aspects of the sampling field work	C

Notes: C = compliance; PC = partial compliance; NC = non-compliance

The RPD results were all within the acceptable range, with the exception of those indicated in Table QA1 (results in bold). The exceedances are not, however, considered to be of concern given that:

- The actual differences in the concentrations of the replicate pairs where RPD exceedances occurred were typically low;
- The replicate pairs were collected from fill soils which by its nature are heterogeneous;
- Replicates, rather than homogenised duplicates, were used to minimise risk of volatile loss, hence greater analytical variability between replicate pairs can be expected;
- Most of the recorded concentrations were relatively close to the PQL;

- The majority of RPD results from a replicate pair were within the acceptable limits; and
- All other QA/QC parameters met the data quality indicators.

The laboratory certificates included the following comments:

- The laboratory RPD acceptance criteria has been exceeded for 378301-8 for Cu and Zn. Therefore, a triplicate result has been issued as laboratory sample number 378301-23.
- The laboratory RPD acceptance criteria has been exceeded for 378301-19 for Ni. Therefore, a triplicate result has been issued as laboratory sample number 378301-24.
- The laboratory RPD acceptance criteria has been exceeded for 395023-1 for Cu. Therefore, a triplicate result has been issued as laboratory sample number 395023-9. # Percent recovery was not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However, an acceptable recovery was obtained for the LCS.

The non-compliances in the laboratory QC are considered to be consistent with the field observations and primary results. Non-compliant samples 378301-8 (BH02/0.4-0.5), 378301-19 (BH06/0.4-0.5) and 395023-1 (BH07/0.3-0.4) are all sampled from fill material at the site which is understood to be heterogenous by nature. Overall, the non-compliances are considered to be minor in nature and not to compromise the reliability of the data.

In summary, the QC data is determined to be of sufficient quality to be considered acceptable for the assessment.

2. Data quality indicators

The reliability of field procedures and analytical results was assessed against the following data quality indicators (DQI) as outlined in NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013):

- Completeness: a measure of the amount of usable data from a data collection activity;
- Comparability: the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness: the confidence (qualitative) of data representativeness of media present on-site;
- Precision: a measure of variability or reproducibility of data; and
- Accuracy: a measure of closeness of the data to the 'true' value.

The results of the assessment are summarised in Table 2.

Table 2: Data quality indicators

Data quality indicator	Method(s) of achievement
Completeness	Systematic and selected target locations sampled.
	Preparation of borehole logs, sample location plan and chain of custody records.
	Preparation of field groundwater sampling sheets.
	Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody.
	Samples analysed for contaminants of potential concern (CoPC) identified in the conceptual site model (CSM).
	Completion of chain of custody documentation.
	NATA accredited laboratory results certificates provided by the laboratory.
	Satisfactory frequency and results for field and laboratory quality control (QC) samples as discussed in Section 1.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project.
	Experienced sampler(s) used.
	Use of NATA registered laboratories.
Representativeness	Target media sampled.
	Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQO.
	Samples were extracted and analysed within the required holding times, with the exception of pH, which was initially tested to support the assessment of site-specific EILs. This deviation is not considered significant given the planned construction of six basement levels, which renders the ESLs and EILs not applicable.
	Samples were analysed in accordance with the chain of custody.
Precision	Field staff followed standard operating procedures.
	Acceptable RPD between original samples and replicates.
	Satisfactory results for all other field and laboratory QC samples.
Accuracy	Field staff followed standard operating procedures.
	Satisfactory results for field and laboratory QC samples.

Based on the above, it is considered that the DQI have generally been complied with.

3. Conclusion

Based on the results of the field QA and field and laboratory QC, and evaluation against the DQI it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

4. References

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

Table QA1: Relative Percentage Difference Results – Soil Sampling

Lab Report No	Sample ID	Depth	Sample Date	Sample Type	Units	Priority metals								Priority PAH				PAH					
						Total Arsenic	Cadmium	Total Chromium	Copper	Lead	Mercury (inorganic)	Nickel	Zinc	Naphthalene [b]	Benzo(a)pyrene (B(a)P)	Benzo(a)pyrene TEQ (B(a)P TEQ)	Total PAH	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(g,h,i)perylene	Chrysene
395023	BH09	0.6 - 0.8 m	08/11/25	Soil	mg/kg	7	<0.4	10	40	18	<0.1	40	110	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
395023	BD1/20251108	0 m	08/11/25	Soil	mg/kg	6	<0.4	9	40	19	<0.1	38	130	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			Difference		mg/kg	1	0	1	0	1	0	2	20	0	0	0	0	0	0	0	0	0	0
			RPD		%	15%	0%	11%	0%	5%	0%	5%	17%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
378301	BH01	0.5 - 0.6 m	25/03/25	Soil	mg/kg	6	0.9	6	41	18	<0.1	45	370	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
378301	BD1/20250325	0 m	25/03/25	Soil	mg/kg	5	0.6	7	41	15	<0.1	51	260	<1	<0.05	<0.5	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
			Difference		mg/kg	1	0.3	1	0	3	0	6	110	0	0	0	0	0	0	0	0	0	0
			RPD		%	18%	**40%**	15%	0%	18%	0%	13%	**35%**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA1: Relative Percentage Difference Results –

Lab Report No	Sample ID	Depth	Sample Date	Sample Type	Units	PAH						Priority TRH						TRH		BTEX			
						Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Phenanthrene	Pyrene	TRH C6 - C10	TRH >C10-C16	F1 ((C6-C10)-BTEX)	F2 (>C10-C16 less Naphthalene)	F3 (>C16-C34)	F4 (>C34-C40)	TRH C6 - C9	TRH C10-C36	Benzene	Toluene	Ethylbenzene	Total Xylenes
395023	BH09	0.6 - 0.8 m	08/11/25	Soil	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1
395023	BD1/20251108	0 m	08/11/25	Soil	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1
			Difference		mg/kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			RPD		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
378301	BH01	0.5 - 0.6 m	25/03/25	Soil	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1
378301	BD1/20250325	0 m	25/03/25	Soil	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<25	<50	<25	<50	<100	<100	<25	<50	<0.2	<0.5	<1	<1
			Difference		mg/kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			RPD		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table QA2: Trip Blank Results - Soil Sampling

Sample ID	Sample Date	Media Being Sampled	Sample Type	Units	BTEX				Lab Report No
					Benzene	Toluene	Ethylbenzene	Total Xylenes	
TB	25/03/25	Soil	Soil	mg/kg	<0.2	<0.5	<1	<1	378301

Table QA3: Trip Spike Results – Soil Sampling (% Recovery)

Sample ID	Sample Date	Media Being Sampled	Sample Type	Benzene	Toluene	Ethylbenzene	o-Xylene	m+p-Xylene	Lab Report No
TS	25/03/25	Soil	Soil	88	87	88	88	89	378301

Appendix H – Noise & Vibration Assessment

601 Pacific Highway, St Leonards (SSD-85848713)

Noise and Vibration Impact Assessment

Document No.	AC-7000-NVIA[P2]
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E-LAB Consulting

Where science and engineering inspire design.

Document QA and Revisions

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6	23/03/2026	For SSDA	Alyssa D'Souza	Kanin Mungkarndee

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Authorised by:

E-LAB Consulting



Brandon Notaras | Director

Acoustics & Vibration

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1 EXECUTIVE SUMMARY

This Noise and Vibration Impact Assessment has been prepared by E-LAB Consulting and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

Furthermore, this Noise and Vibration Impact Assessment has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs), issued on 4 July 2025. Table 1 below summarises the SEARs requirements and outlines the appropriate mitigation measures and the corresponding section within this report where the mitigation has been considered.

Table 1: SEARs requirements and report section reference

ITEM	DESCRIPTION OF REQUIREMENT	SECTION REFERENCE (THIS REPORT)
10	**Noise and Vibration**	
	▪ Provide a noise and vibration impact assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented. ▪ Noise Impacts: The provisions of Section 2.120 (Impact of road noise or vibration on non-road development) of the State Environmental Planning Policy (Transport and Infrastructure) 2021 apply to the SSDA as the annual average daily traffic volume along this section of the Pacific Highway is more than 20,000 vehicles. Demonstrate the development will comply with the provisions contained in Section 2.120 of State Environmental Planning Policy (Transport and Infrastructure) 2021, particularly Subclause 3.	Refer to Section 7 for operational assessment and Section 8 for operational mitigation measures, including compliance against State Environmental Planning Policy (Transport and Infrastructure) 2021. Refer to Section 9 and 10 for construction assessment and Section 11 for construction mitigation measures.

This report concludes that the proposed mixed-use development is acceptable and warrants approval subject to the implementation of the mitigation measures outlined in Section 8 and 11.

Following implementation of the mitigation measures, the remaining impacts are appropriate.

2 INTRODUCTION

This Noise and Vibration Impact Assessment has been prepared by E-LAB Consulting and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1
- Demolition of the existing 14 storey commercial office building that is currently on the site
- Site excavation, remediation and other preparatory works
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m^2), comprising:
    - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
    - A contribution of 5% of the residential GFA toward Affordable Housing.
    - Retail and commercial land uses at the ground and podium levels.
    - Internal and external residential amenities provided throughout the building.
    - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
    - Vehicular access to the basement via Atchison Street.
    - Landscaping and Public Domain works.
    - Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

3 SITE DESCRIPTION

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400m (walking distance) from the Crows Nest Metro station.

A site aerial and location plan is provided in Figure 1 below.

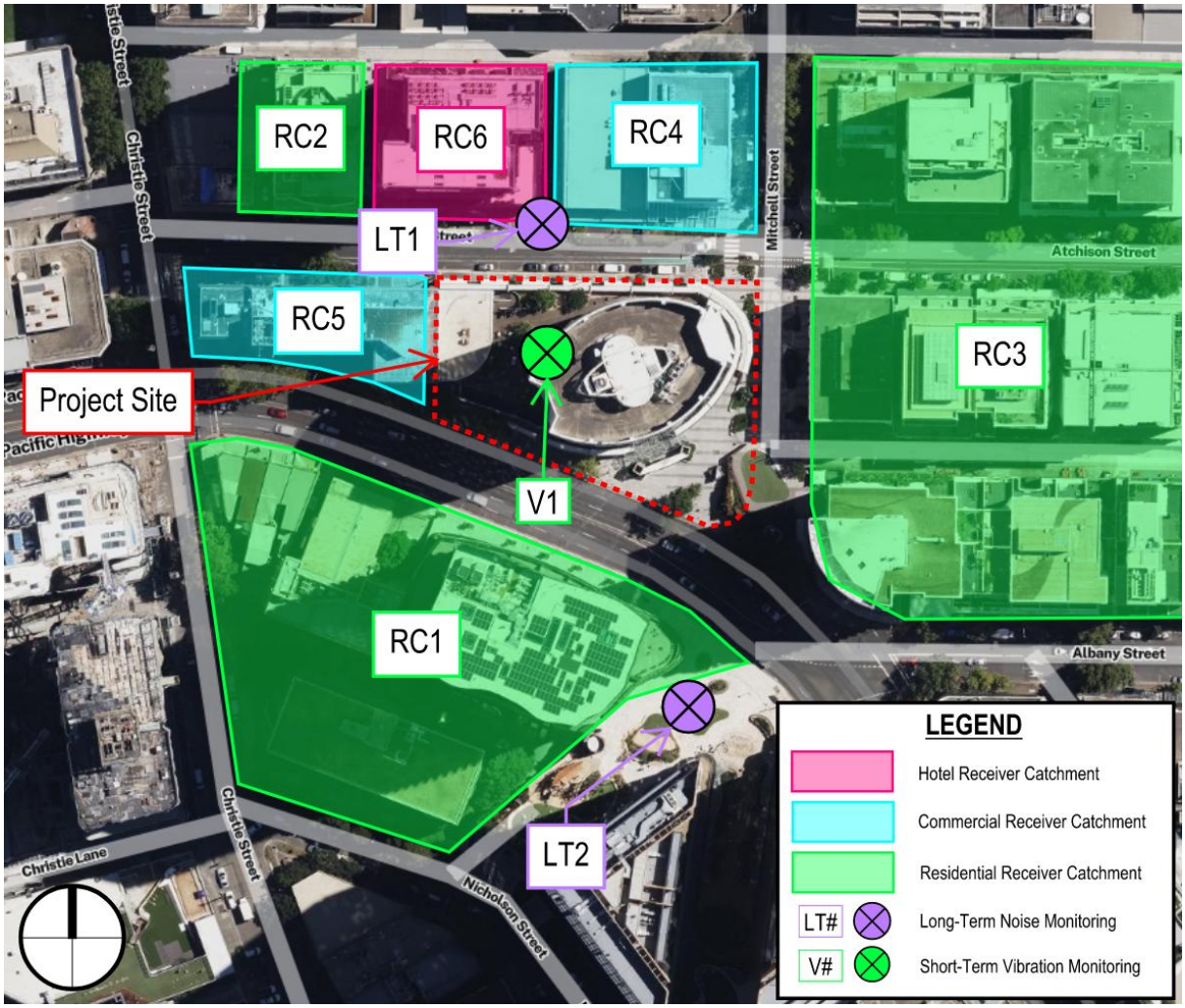
Figure 1: Aerial view of the site (Source: Urbis)



The location of the proposed development, noise/vibration monitoring and measurement locations, and surrounding noise-sensitive receivers are presented in Figure 2. Noise and vibration sensitive receivers have been delineated into receiver catchments (RCs) as shown in Figure 2.

- RC1 – Existing residential receiver to the south, across Pacific Highway
- RC2 – Existing residential receivers to the north-west, across Atchison St
- RC3 – Existing residential receivers to the east, across Mitchell St
- RC4 – Existing commercial receivers to the north, across Atchison St
- RC5 – Existing hotel receivers to the north, across Atchison St
- RC6 – Existing commercial receivers to the west, adjoining the site

Figure 2: Acoustic site plan identifying the surrounding noise-sensitive receivers and noise monitoring locations



4 METHODOLOGY

To assess the noise and vibration impacts of the proposed development, the following process was carried out:

- Identify and classify the surrounding noise and vibration sensitive receivers surrounding the proposed development
- Identify and classify the noise and vibration sources generated by the proposed development, together with external noise and vibration sources impacting on the proposed development
- Carry out site noise investigations to quantify the background noise levels local to the proposed development
- Determine the project noise and vibration criteria applicable to the proposed development in accordance with the requirements listed in the SEARs
- Assess the operational and construction noise and vibration impacts of the noise and vibration sources generated by the proposed development to the surrounding noise-sensitive receivers, together with any impacts on the occupants of the proposed development
- Provide details of mitigation measures required to alleviate noise and vibration impacts to achieve the project noise and vibration criteria

The following operational noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Airborne noise intrusion to the development's habitable areas from surrounding roads
- Vibration impact to the development's habitable areas from the below Metro corridor
- Noise emissions associated with carparking and service vehicle activities
- Noise emissions associated with retail and commercial tenancies
- Noise emission from mechanical plant and equipment serving the development
- Noise emissions associated with residential communal spaces
- Noise emission from the residential cinema room
- Noise emission from the residential gym

The following construction noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Noise generated during the construction of the development and associated impacts on the surrounding noise sensitive receivers
- Vibration generated during the construction of the development and associated impacts on the surrounding vibration sensitive receivers

The noise and vibration assessments conducted as part of this report have been assessed to the noise and vibration criteria established in the following guidelines, standards and policies:

- NSW EPA's Noise Policy for Industry 2017, dated October 2017 (NPI)
- NSW EPA's Road Noise Policy, dated March 2011 (RNP)
- NSW's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP 2021)
- NSW EPA's Development Near Rail Corridors and Busy Roads – Interim Guideline, dated December 2008 (Interim Guideline)
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG)
- Assessing vibration: A Technical Guideline 2006 (AVTG)
- British Standard BS5228 – Part 1:1997 "Noise and Vibration Control on Construction and Open Sites."
- British Standard BS7358:1993 "Evaluation and Measurement for Vibration in Buildings"

- German Standard DIN4150 – Part 3: “Structural vibration in buildings – Effects on structures”
- AS 1055:2018 - “Acoustics – Description and measurement of environmental noise”
- Sydney Metro Underground Corridor Protection Technical Guidelines, dated July 2025

5 SITE NOISE INVESTIGATIONS

5.1 NOISE MEASUREMENT EQUIPMENT

The following instrumentation was used for noise measurement and analysis:

- Bruel and Kjaer Sound Calibrator Type 4231 (S/N: 3029638)
- NSRT mk3 Sentry Noise Loggers
- Svantek 958A Class 1 four-channel vibration analyser (S/N: 97750)

All instrument systems are laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.2dB during measurements. No adjustments for instrument drift during the measurement period were warranted.

5.2 LONG-TERM NOISE MONITORING

5.2.1 Background Noise

Based on our site survey, the long-term monitoring locations shown in Figure 2 were chosen. Background noise levels and subsequent Rating Background Noise Level (RBL) have been established for nearby residential receivers in accordance with the NPI using the results of the noise monitoring at LT1 and LT2. Noise monitoring was conducted between 13 and 24 October 2025.

The description of time of day presented in Table 2 is outlined within the NPI and described as follows:

- Day – the period from 7:00am to 6:00pm Monday to Saturday, 8am to 6pm on Sundays and public holidays
- Evening – the period from 6:00pm to 10:00pm
- Night – the period from 10:00pm to 7:00am, or 10:00pm to 8:00am on Sundays and public holidays.
- The noise monitoring results are presented in Table 2.

Table 2: Unattended noise monitoring results

LOCATION	RATING BACKGROUND NOISE LEVELS - dB(A)		
	DAY	EVENING	NIGHT
LT1	56	50	45
LT2	60	55	49

The local ambient noise environment is expected to be typical of an Urban residential environment (as classified by the NPI). Please note that any adverse weather affected data (in accordance with the NPI) or extraneous noise sources during the period of logging has been excluded from the calculations.

5.2.2 Traffic Noise

Based on our site survey, the long-term monitoring locations shown in Figure 2 were chosen, which will be used to establish the traffic noise levels at the project site.

The description of time of day presented in Table 3 is described as follows:

- Day – the period from 7:00am to 10:00pm
- Night – the period from 10:00pm to 7:00am

Table 3: Unattended traffic noise monitoring results

LOCATION	MEASURED TRAFFIC NOISE LEVELS	
	DAY $L_{Aeq,15hour}$ dB(A)	NIGHT $L_{Aeq,9hour}$ dB(A)
LT1	60	55
LT2	67	62

6 PROJECT NOISE AND VIBRATION CRITERIA

6.1 RELEVANT NOISE AND VIBRATION ASSESSMENT DOCUMENTS

The project noise and vibration criteria has been established considering the following documents:

- NSW EPA's Noise Policy for Industry 2017, dated October 2017 (NPI)
- NSW EPA's Road Noise Policy, dated March 2011 (RNP)
- NSW's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP 2021)
- NSW EPA's Development Near Rail Corridors and Busy Roads – Interim Guideline, dated December 2008 (Interim Guideline)
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG)
- Assessing vibration: A Technical Guideline 2006 (AVTG)
- British Standard BS5228 – Part 1:1997 "Noise and Vibration Control on Construction and Open Sites."
- British Standard BS7358:1993 "Evaluation and Measurement for Vibration in Buildings"
- German Standard DIN4150 – Part 3: "Structural vibration in buildings – Effects on structures"
- AS 1055:2018 - "Acoustics – Description and measurement of environmental noise"
- Sydney Metro At-grade and Elevated Sections Corridor Protection Technical Guideline, dated 1 August 2025

6.2 INTERNAL NOISE LEVELS

6.2.1 SEPP (Transport and Infrastructure) 2021

For developments with residential accommodation which are adjacent to a transitway and that the consent authority considers is likely to be adversely affected by road noise or vibration, SEPP 2021 provides the following acoustic criteria.

2.120 Impact of road noise or vibration on non-road development

(1) This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—

(a) residential accommodation,

(b) a place of public worship,

(c) a hospital,

(d) an educational establishment or centre-based child care facility.

(2) Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section and published in the Gazette.

(3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded—

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

(3A) Subsection (3) does not apply to a building to which State Environmental Planning Policy (Housing) 2021, Chapter 3, Part 7 applies.

(4) In this section, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993.

It is noted that based on Transport for NSW's Traffic Volume Map (Map 12D), Pacific Hwy is classified as a road which triggers a mandatory noise assessment under clause 2.120 of SEPP (Transport and Infrastructure) 2021.

6.2.2 Development Near Rail Corridors and Busy Roads – Interim Guideline

The Interim Guideline provides guidance on designing residential developments which are adjacent to transitways by governing maximum internal noise levels averaged over certain periods within bedrooms and living areas.

The Interim Guideline details the application of the SEPP 2007, which we note has been superseded by SEPP 2021. In addition, the Interim Guideline also recommends the following in relation to the assessment of ventilation by means of opened windows or doors:

If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

Table 4 provides a summary of the criteria established in accordance with the Interim Guideline and SEPP 2021.

Table 4: Summary of internal noise criteria from the Interim Guideline and SEPP 2021

TYPE OF HABITABLE SPACE	APPLICABLE TIME PERIOD	INTERNAL NOISE LEVEL CRITERIA – WINDOWS/DOORS CLOSED	INTERNAL NOISE LEVEL CRITERIA – WINDOWS/DOORS OPEN
Sleeping areas (bedrooms)	10:00pm – 7:00am	35 dB(A)$L_{Aeq(9hour)}$	45 dB(A)$L_{Aeq(9hour)}$
Living rooms	At any time	40 dB(A)$L_{Aeq(15hour)}$	50 dB(A)$L_{Aeq(15hour)}$

6.3 GROUNDBORNE VIBRATION

Internal ground/structure borne vibration levels to the proposal should be controlled to within the requirements of the AVTG. Recommended Vibration Dose Values (VDVs) for intermittent vibration as scheduled in the AVTG are summarised in Table 5.

Table 5: Acceptable vibration dose values for intermittent vibration

LOCATION	PREFERRED VALUES		MAXIMUM VALUE	
	DAY	NIGHT	DAY	NIGHT
Residential areas	0.20 $m/s^{1.75}$	0.13 $m/s^{1.75}$	0.40 $m/s^{1.75}$	0.26 $m/s^{1.75}$

6.4 GROUNDBORNE NOISE

As per Section 3.6.2 of the Interim Guideline, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne $L_{Amax,slow}$ noise limit of 40dBA (daytime) or 35dBA (night-time).

6.5 NOISE EMISSIONS

6.5.1 NSW EPA Noise Policy for Industry (NPI) 2017 – Industrial Noise (Plant and Equipment)

The NSW EPA's Noise Policy for Industry (NPI) 2017 has been implemented to assess the noise impacts of mechanical plant and equipment, as well as other industrial noise sources on the surrounding receiver catchments.

The NPI sets out a framework for the derivation of project noise trigger levels that are used to assess the potential impacts of noise from industry (and industrial noise sources) and indicate the noise level at which feasible and reasonable noise management measures should be considered.

This policy applies to noise sources from activities listed in Schedule 1 of the POEO Act and those regulated by the EPA. This includes noise sources from mechanical plant and equipment within the proposed redevelopment, for which this policy will be applied.

The project noise trigger level provides a benchmark for assessing a proposal, where if exceeded, indicates a potential noise impact on the community and so triggers a management response such as additional mitigation measures. The project noise trigger level is the lower (the more stringent) value of the project intrusiveness noise level and project amenity noise level determined in Sections 2.3 and 2.4 of the NPI, respectively.

Project Intrusiveness Noise Level

The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (in terms of L_{Aeq}) measured over a 15-minute period does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. The project intrusiveness noise level is only applicable to surrounding residential receivers.

To account for the temporal variation of background noise levels, the method outlined in Fact Sheet A of the NPI establishes a method in determining the Rating Background Noise Level (RBL) to be used in the assessment.

The intrusiveness noise level is determined as follows:

- $L_{Aeq,15min}$ (Intrusiveness Criteria) = Rating Background Noise Level (RBL) + 5 dB(A)

Where the RBLs established in accordance with Fact Sheet A are lower than the values presented in Table 6 for each assessment period, the values presented in Table 6 shall be used for that particular assessment period. These result in the minimum intrusiveness noise levels provided in Table 6.

Table 6: Minimum assumed RBLs and project intrusiveness noise levels

TIME OF DAY	MINIMUM ASSUMED RBL - dB(A)	MINIMUM PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
Day	35	40
Evening	30	35
Night	30	35

Table 7 provides the project intrusiveness noise levels applicable to each of the surrounding residential noise-sensitive receivers.

Table 7: Project intrusiveness noise level criteria for each residential receiver catchment

RECEIVER CATCHMENT	TIME OF DAY	MEASURED RBL - dB(A)	PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
RC1[1]	Day	60	65
	Evening	55	60
	Night	49	54
RC2 and RC3[2]	Day	56	61
	Evening	50	55
	Night	45	50

Note 1: Based on monitored background noise levels at LT2

Note 2: Based on monitored background noise levels at LT1

Project Amenity Noise Level

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

- Project Amenity Noise Level = Recommended Amenity Noise Level (see Table 8) – 5 dB(A)

The following exceptions to the above method to derive the project amenity noise level apply:

- In areas with high traffic noise levels. Where the level of transport noise, road traffic noise in particular is high enough to make noise from an industrial source inaudible, the project amenity noise level shall be set at 15 dB(A) below the measured $L_{Aeq,period(traffic)}$ for the particular assessment period
- In proposed developments in major industrial clusters
- Where the resultant project amenity noise level is 10 dB(A) or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB(A) below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time
- Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development

The recommended amenity noise level, project amenity noise level, and converted project amenity noise level for comparison with the intrusiveness criteria (from time of day period to 15-minute) is provided for each surrounding receiver catchment in Table 8.

Table 8: Project amenity noise level criteria for each receiver catchment

RECEIVER CATCHMENT	RECEIVER TYPE	TIME OF DAY	RECOMMENDED AMENITY NOISE LEVEL - $L_{Aeq,period}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,period}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)
RC1 to RC3	Residential (Urban)[1]	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
RC4 and RC5	Commercial	When in use	65	60	63
RC6	Hotel	Day	65	60	63
		Evening	55	50	53
		Night	50	45	48

Note 1: Urban residential as classified in Table 2.3 of the Noise Policy for Industry (NPI) 2017

Under Section 2.4.1 of the NPI, where the existing traffic noise is ≥ 10 dB(A) above the recommended amenity level and road traffic is the dominant source unlikely to decrease, a high-traffic project amenity noise level may be applied, defined as $L_{Aeq,period(traffic)}$ –15 dB(A).

These criteria are considered to be satisfied at the site:

- Surveys and monitoring undertaken have identified road traffic as the persistent and continuous noise source in the area
- Measured L_{Aeq} values for the LT2 monitor are over 10 dB(A) above the NPI's urban residential amenity level in the evening (65 dBA) and night (62 dBA) periods
- Given the site's location on arterial corridors with established public transport and future developments, traffic noise levels are not expected to decline in future years

Accordingly, it is appropriate and consistent with Section 2.4.1 of the NPI to adopt high-traffic amenity noise levels for the evening and night-time periods for RC1, derived as 15 dB(A) below the measured $L_{Aeq,period}$ traffic levels.

The resultant project amenity noise levels have been presented in Table 9 below.

Table 9: Project amenity noise level criteria for each receiver catchment (with high traffic amenity noise levels applied)

RECEIVER CATCHMENT	RECEIVER TYPE	TIME OF DAY	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)
RC1	Residential (Urban)	Day	58
		Evening	53[1]
		Night	50[1]
RC2 and RC3		Day	58
		Evening	48
		Night	43
RC4 and RC5	Commercial	When in use	63
RC6	Hotel	Day	63
		Evening	53
		Night	48

Note 1: High traffic project amenity noise level for RC1 is based on monitored traffic noise levels at LT2

Sleep Disturbance and Maximum Noise Level Assessment

Where the proposed redevelopment night-time noise levels generated at a residential location exceed either:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB(A), whichever is greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB(A), whichever is greater,

a detailed maximum noise level event assessment should be undertaken.

Corrections for Annoying Noise Characteristics – Noise Policy for Industry Fact Sheet C

Fact Sheet C contained within the Noise Policy for Industry outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels established within this report, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

- The contribution noise level from the premises when assessed/measured at a receiver location, and
- The nature of the noise source and its characteristics (as set out in Fact Sheet C)

Table C1 within Fact Sheet C sets out the corrections to be applied for any assessment in-line with the NPI. The corrections specified for tonal, intermittent and low-frequency noise are to be added to be added to the measured or predicted levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

Project Noise Trigger Levels

Table 10 presents the project intrusiveness and project amenity noise levels for each period, and each receiver catchment, as well as the resultant project noise trigger levels (PNTLs) that shall be applied for any assessment of impacts of mechanical plant and equipment noise on the surrounding receiver catchments.

Table 10: Project noise trigger levels (PNTL) to be applied to each surrounding receiver catchment

RECEIVER CATCHMENT	RECEIVER TYPE	TIME OF DAY	PROJECT INTRUSIVENESS NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	SLEEP DISTURBANCE NOISE LEVEL - dB(A)	PNTL - $L_{Aeq,15min}$ dB(A)
RC1	Residential (Urban)	Day	65	58	-	**58**
		Evening	60	53	-	**53**
		Night	54	50	54 $L_{Aeq,15min}$ 64 L_{AFmax}	**50**
RC2 and RC3		Day	56	58	-	**58**
		Evening	50	48	-	**48**
		Night	45	43	45 $L_{Aeq,15min}$ 55 L_{AFmax}	**43**
RC4 and RC5	Commercial	When in use	-	63	-	**63**
RC6	Hotel	Day	-	63	-	**63**
		Evening	-	53	-	**53**
		Night	-	48	-	**48**

6.6 CONSTRUCTION NOISE CRITERIA

6.6.1 Interim Construction Noise Guideline (ICNG)

The noise criteria outlined within the ICNG has been adopted for the assessment of noise emissions from the construction of the proposed redevelopment.

Airborne Noise – Residential Receiver Catchments

The airborne noise criteria for surrounding residential receiver catchments have been extracted from Table 2 in the ICNG and is presented in Table 11 below.

Table 11: NSW ICNG construction noise criteria for surrounding residential receiver catchments

TIME OF DAY	MANAGEMENT LEVEL $L_{Aeq,15min}$[1]	HOW TO APPLY
Recommended Standard Hours within NSW ICNG: Monday – Friday 7am – 6pm Saturday 8am – 1pm No work on Sundays or public holidays	Noise Affected RBL + 10dB	The noise-affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured **$L_{Aeq,15min}$** is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ The proponent should also inform all potentially impacted residences of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
	Highly Noise Affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur in, taking into account: – Times identified by the community when they are less sensitive to noise (such as before and after school, for works near schools, or mid-morning or mid-afternoon for works near residences) – If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Recommended Standard Hours	Noise Affected RBL + 5dB	▪ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. ▪ For guidance on negotiating agreements see section 7.2.2.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Airborne Noise – Commercial Receiver Catchments

The airborne noise criteria for surrounding commercial receiver catchments have been extracted from Table 3 in the ICNG and is presented in Table 12 below.

Table 12: NSW ICNG construction noise criteria for surrounding commercial receiver catchments

LAND USE	MANAGEMENT LEVEL (APPLIES WHEN PROPERTIES ARE BEING USED) $L_{Aeq,15min}$
Offices, Retail Outlets	70 dB(A)

Ground-borne Noise – Residential Receiver Catchments

Ground-borne noise is noise generated by vibration transmitted through the ground into a structure, such as an excavator with a hydraulic hammer attachment, or impact/bore piling. The following ground-borne noise levels for residences have been extracted from Section 4.2 of the ICNG and indicate when management actions should be implemented.

- Evening (6pm to 10pm) – Internal Noise Level: $L_{Aeq,15min}$ 40 dB(A); and
- Night-time (10pm to 7am) – Internal Noise Level: $L_{Aeq,15min}$ 35 dB(A).

An assessment of ground-borne noise to these levels is only required when the ground-borne noise levels are higher than airborne noise levels, and for surrounding residential receiver catchments. The ground-borne noise levels are for evening and night-time periods only. The levels shall be assessed at the centre of the most affected habitable room.

6.7 OPERATIONAL & CONSTRUCTION VIBRATION CRITERIA

It is important for vibration emissions from vibration-intensive equipment utilised during the construction works be managed to maintain appropriate levels of human comfort, and to avoid both cosmetic and structural damage. The vibration limits proposed in the ensuing sub-sections aid in achieving this outcome.

6.7.1 Human Comfort

The office of Environment and Heritage (OEH) developed a document, "Assessing vibration: A technical guideline" in February 2006 to assist in preventing people from exposure to excessive vibration levels from construction and operation of a development within buildings. The guideline does not however address vibration induced damage to structures or structure-borne noise effects. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent.

Continuous and Impulsive Vibration

Structural vibration in buildings can be detected by occupants and can affect them in many ways including reducing their quality of life and also their working efficiency. Complaint levels from occupants of buildings subject to vibration depend upon their use of the building and the time of the day.

Maximum allowable magnitudes of building vibration with respect to human response are shown in Table 13. It should be noted that the human comfort for vibration is more stringent than the building damage criteria.

Table 13: Preferred and maximum weighted RMS values for continuous and impulsive vibration acceleration (m/s^2) 1-80 Hz

LOCATION	ASSESSMENT PERIOD[1]	PREFERRED VALUES		MAXIMUM VALUES	
		Z-AXIS	X- AND Y-AXES	Z-AXIS	X- AND Y-AXES
Continuous vibration					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night time	0.020	0.014	0.040	0.028
Impulsive vibration					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night time	0.64	0.46	1.28	0.92

Note 1: Daytime is 7:00am to 10:00pm and night time is 10:00pm to 7:00am

Intermittent Vibration Criteria

Disturbance caused by vibration will depend on its duration and its magnitude. This methodology of assessing intermittent vibration levels involves the calculation of a parameter called the Vibration Dose Value (VDV) which is used to evaluate the cumulative effects of intermittent vibration. Various studies support the fact that VDV assessment methods are far more accurate in assessing the level of disturbance than methods which is only based on the vibration magnitude.

Table 14: Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

LOCATION	DAYTIME[1]		NIGHT-TIME[1]	
	PREFERRED VALUE	MAXIMUM VALUE	PREFERRED VALUE	MAXIMUM VALUE
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80

Note 1: Daytime is 7:00am to 10:00pm and night time is 10:00pm to 7:00am

6.7.2 Cosmetic Damage

Structural vibration thresholds are set to minimize the risk of cosmetic surface cracks and lie below the levels that have the potential to cause damage to the main structure. Table 15 presents guide values for building vibration, based on the vibration thresholds above which cosmetic damage has been demonstrated outlined within BS7385-Part 2:1993. These values are evaluated to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as 95% probability of no effect.

Table 15: Transient vibration guide values for cosmetic damage – BS 7385-2:1993

TYPE OF BUILDING	PEAK PARTICLE VELOCITY IN FREQUENCY RANGE OF PREDOMINANT PULSE (PPV)	
	4 Hz TO 15 Hz	15 Hz AND ABOVE
Reinforced or framed structures Industrial or light commercial type buildings	50mm/s	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s	20mm/s (50mm/s at 40Hz and above)

6.7.3 Structural Damage

Ground vibration criteria is defined in terms of the levels of vibration emission from the construction activities which will avoid the risk of damaging surrounding buildings or structures. It should be noted that human comfort criteria are normally expressed in terms of acceleration whereas structural damage criteria are normally expressed in terms of velocity.

Most specified structural vibration levels are defined to minimize the risk of cosmetic surface cracks and are set below the levels that have the potential to cause damage to the main structure. Structural damage criteria are presented in German Standard DIN4150-Part 3 "Structural vibration in buildings – Effects on structures" and British Standard BS7385-Part 2: 1993 "Evaluation and Measurement for Vibration in Buildings". Table 16 indicates the vibration limits presented in DIN4150-Part 3 to ensure structural damage doesn't occur.

Table 16: Guideline value of vibration velocity, vi, for evaluating the effects of short-term vibration – DIN4150-3

LINE	TYPE OF STRUCTURE	VIBRATION VELOCITY, V_i, IN mm/s			
		FOUNDATION			PLANE OF FLOOR OF UPPERMOST FULL STOREY
		AT A FREQUENCY OF			
		LESS THAN 10HZ	10 TO 50HZ	50 TO 100HZ*	ALL FREQUENCIES
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8
*For frequencies above 100Hz, at least the values specified in this column shall be applied					

6.7.4 Sydney Metro Underground Corridor Protection Technical Guidelines

Section 5.4.1 of the Sydney Metro Underground Corridor Protection Technical Guidelines, dated July 2025, provides the following considerations during construction of a development:

5.4.1 Considerations during construction of Development

During construction of Development, and in accordance with TS 01717 Development Near Rail Tunnels, vibration impacts on Sydney Metro structures must be minimised. The maximum peak particle velocity (PPV) at 4 Hz and above at the tunnel lining is:

- *20 mm/s measured at the tunnel lining for segment lined tunnels*
- *15 mm/s measured at the tunnel lining for mass concrete lined tunnels (e.g. Epping to Chatswood, mined station caverns, crossover caverns etc.).*

Sources of vibration that are to be considered include: demolition, piling, ground treatments (e.g. compaction), construction equipment, tunnelling and industrial machinery.

Continuous rock breaking/hammering and sheet piling, vibratory rollers, excavators and the like can give rise to dynamic magnification due to resonance.

Sydney Metro may request construction vibration monitoring. In these instances, the Applicant or public authority should nominate an Alert level for monitoring and management purposes to advise when vibration levels are approaching these limits to ensure that the limits are not exceeded.

Atypical construction methods are to be assessed on a case-by-case basis with reference to relevant standards.

To assess the likelihood of cosmetic damage due to vibration, Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives specifies that the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) are to be compared with the guidance vibration velocity limits.

7 OPERATIONAL NOISE AND VIBRATION ASSESSMENT

7.1 TRAFFIC AND RAIL AIRBORNE NOISE INTRUSION

7.1.1 Noise Modelling and Assumptions

In order to provide acoustic amenity to occupants of the proposed development and comply with the project specific internal noise limits, the noise impact of surrounding roads were assessed at the façade of the proposed development.

3D acoustic modelling for noise emissions from the surrounding roads was conducted using the software SoundPlan (Version 9.0). Noise emissions and impacts from surrounding roads were modelled in accordance with the CoRTN prediction techniques and calibrated to the measurements conducted for this assessment.

This model is recognised by regulatory authorities around Australia and is endorsed by the NSW DP&E for use in projects of this scale. The acoustic modelling was undertaken considering specific meteorological characteristics such as wind speeds, prevailing wind directions and temperature in accordance with the hourly weather data for a full calendar year described in the Test Reference Year for Mascot 1987 (94767 Mascot (Syd AMO) 1978-87 1987).

Attenuation due to distances, building shielding and environmental absorption, together with additional noise incident on the façade due to façade reflections are taken into account within the 3D model.

7.1.2 "Windows Closed" Assessment

The results of the 3D modelling are provided in Appendix A (in the form of façade noise contours), showing the incident noise levels on the façade (daytime and night-time) as a result of external noise sources (traffic and rail). The incident noise levels are presented as $L_{Aeq,9h}$ and $L_{Aeq,15h}$ statistical metrics for the purpose of demonstrating compliance with the State Environmental Planning Policy (Transport and Infrastructure) 2021 and Interim Guideline, and mitigation measures are presented in Section 8.1.

7.1.3 "Windows Open" Assessment

A preliminary "windows open" assessment has been conducted to assess whether the habitable spaces can meet the project internal noise limits established in Section 6.2.2 with windows open for natural ventilation (open in accordance with the natural ventilation requirements of the NCC).

If the project internal noise limits for windows/doors open is exceeded, the habitable area is considered noise-affected, and an alternative means of ventilation is required in accordance with the requirements of the NCC (i.e. an alternative ventilation system complying with AS 1668.2 and AS/NZS 3666.1).

The assessment has been conducted under the assumption the occupant has opened their windows to achieve natural ventilation (and as recommended in the DoP Interim Guideline), that is, when the windows are open to 5% of the floor area of the room being ventilated, with a reduction of incident noise level to internal noise level of 10dB(A). Room loss has also been considered as part of this assessment.

In order to achieve the project internal noise limits established in Section 6.2.2 whilst simultaneously achieving the ventilation requirements, mitigation measures have been proposed in Appendix C for the proposed development.

The results of the acoustic façade analysis indicate that highlighted residential habitable areas will require an alternative means of ventilation (e.g. mechanical ventilation). It should be noted that these areas are indicative and may change as the design develops due to a change in the building form, form of the façade, internal finishes within each of the habitable spaces and location of openings.

7.2 METRO VIBRATION IMPACT

Operator attended measurements of vibration levels from the below Metro corridor have been undertaken at the project site (locations V1 as indicated in Figure 2).

Table 17 provides the worst-case overall VDV based on the undertaken measurements of Metro movements and checks for compliance against the AVTG criteria.

Table 17: Metro vibration compliance

LOCATION	TIME OF DAY	VIBRATION DOSE VALUE VDV ($M/S^{1.75}$)			COMPLIANCE (YES / NO)
		MEASURED	PREFERRED	MAXIMUM	
V1	Day	0.001	0.20	0.40	Yes
	Night	0.0007	0.13	0.26	

7.3 METRO GROUNDBORNE NOISE IMPACT

Based on the undertaken vibration measurements on site, it is predicted that groundborne noise at the closest residential habitable spaces within the development, being Level 02, will be less than 20dB(A) $L_{Amax,slow}$ in both the day and night. Subsequently, the development will be capable of satisfying the Interim Guideline groundborne noise requirements without further acoustic mitigation measures.

7.4 CARPARKING AND SERVICE VEHICLE NOISE EMISSION

All carparking, loading dock and waste collection areas for the development will be located within structural enclosed basement levels. In consideration of this, it is expected that noise generated by activities of these areas will not have an adverse noise impact on the surrounding noise-sensitive receivers and the project specific noise emission criteria are capable of being met without additional acoustic mitigation measures. Nonetheless, general loading dock management recommendations have been provided in Section 8.2.

7.5 RETAIL AND COMMERCIAL NOISE EMISSION

At the time of writing, the tenants for the retail and commercial spaces have not been determined and therefore the operational details and internal layouts for these spaces are unknown.

Future usage of the retail spaces may be subject to a separate development application and detailed assessment of their expected operation and activities may be required by North Sydney Council. The selected tenants may be required by Council to submit a separate Development Application based on use.

7.6 MECHANICAL SERVICES NOISE EMISSION

Primary external mechanical plant and equipment serving the development are expected to be located on rooftop and Level 5 plant room, and are generally limited to ventilation fans, VRF units, hot water heat pumps, cooling towers and a building maintenance unit located on the roof. At this stage the mechanical design is preliminary, and detailed equipment selections are yet to be made.

During the detailed design of the project, the mitigation measures outlined in Section 8.3 shall be considered when developing the mechanical services design. With provision of the mitigation measures, it is expected that the development will be capable of complying with the project specific noise emission criteria outlined in Section 6.5.1.

7.7 COMMUNAL AREAS NOISE EMISSION

It is proposed that the development will consist of residential communal areas throughout, such as outdoor gardens and lap pool. The intended design and usage of these areas are for passive recreational use by residents and are not intended for noise intensive events (e.g. commercial events/parties with amplified music). The anticipated noise emissions from typical residential use, primarily casual conversation, is consistent with normal residential environments which are also expected to generally be masked by the urban and traffic noise in the environment. Additional acoustic treatment is not warranted; however operational recommendations are provided in Section 8.4 to minimise noise impact at surrounding receivers.

7.8 RESIDENTIAL GYM NOISE EMISSION

It is proposed that there will be a gym on Level 5 for residents to use. Due to the potential for high sources of noise from this space, an indicative assessment of noise emission from the operation has been conducted to determine suitable noise mitigation measures where required.

7.8.1 Details and Assumptions

The operational noise assessment of the gym has been conducted based on the following assumptions:

- The average sound pressure level within the gym is 80dB(A), which is representative of an active environment with moderately loud background music being played and is considered conservative for the space
- The gym façade is fixed or closed whilst in use and consists of typical glazing systems (such as 6.38mm laminated glass)

7.8.2 Predicted Noise Levels

The noise generated by the gym has been predicted to the facades of the surrounding noise-sensitive receivers during the nighttime period (being the most noise-sensitive period for residential receivers) and are summarised below in Table 18. Attenuation factors from distance, barriers, etc. have been applied where applicable.

Table 18: Cumulative predicted noise level from residential gym

RECEIVER	PREDICTED NOISE LEVEL dB(A)$L_{Aeq15min}$	PROJECT TRIGGER NOISE LEVEL dB(A)$L_{Aeq15min}$	COMPLIANCE (YES/NO)
RC1	< 30	50	Yes
RC2	< 30	43	Yes
RC3	< 30	43	Yes
RC4	< 30	63	Yes
RC5	< 30	63	Yes
RC6	< 30	48	Yes

Based on the predicted noise levels, the residential gym will be capable of complying with the NPI project noise trigger levels.

8 OPERATIONAL MITIGATION MEASURES

8.1 EXTERNAL SOUND ISOLATION – BUILDING ENVELOPE

8.1.1 Glazed Façade Elements

To simplify the acoustic façade requirements across the development, an acoustic facade type (AFT) has been assigned to typical glazing arrangements in Table 19. A markup of the AFT's on architectural general arrangement plans are provided in Appendix B. The acoustic ratings provided in Table 19 are indicative of the glazing assembly in its entirety (glass and frame).

Table 19: Acoustic façade types & glazing arrangements

ACOUSTIC FAÇADE TYPE	REQUIRED ACOUSTIC RATING ($R_w + C_{tr}$)	TYPICAL EQUIVALENT GLASS
1	29	Single-glazed: 6.38mm laminated glass Double-glazed: 6.38mm / 12mm airgap / 6mm
2	33	Single-glazed: 10.38mm laminated glass Double-glazed: 10.38mm / 12mm airgap / 6mm

The façade recommendations in Table 19 will be refined once the architectural design is progressed into detailed design.

8.1.2 Non-Glazed Façade Elements

In addition to the required glazing systems outlined in Appendix B, the solid/non-glazed elements of the façade for residential accommodation spaces shall be constructed to ensure the resulting internal noise levels within each space in the proposed development do not exceed the project internal noise limits outlined in Section 6.2.

Masonry constructions such as concrete or core-filled blockwork will be satisfactory with no additional acoustic treatment required.

Lightweight constructions are to have an indicative acoustic performance of no less than $R_w + C_{tr}$ 45 to ensure the resulting internal noise levels within each space in the proposed development do not exceed the project internal noise limits outlined in Section 6.2.

8.2 LOADING DOCK

The following general noise mitigation and management procedures are recommended to be integrated into the overall Operational Management Plan for the development:

- Vehicles travel at no faster than 10km/h whilst on the premises
- All service vehicle engines are to be switched off when parked or when unloading goods
- Releasing of airbrakes are to only occur once inside the development's basement levels

8.3 MECHANICAL SERVICES

Mitigation measures for the mechanical plant that are to be considered during the design development stage to ensure compliance with project noise emission criteria are as follows:

- Positioning mechanical plant away from nearby receivers
- Acoustic attenuators fitted to duct work
- Screening around mechanical plant
- Acoustic insulation within duct work
- Absorptive finishes to plant rooms
- Programming reduced capacities during sensitive times (e.g. night time)

In relation to building management units, noise is primarily generated during short hydraulic operations (e.g., launching/parking), occurring infrequently for less than ~10 minutes twice per day. During detailed design, acoustic performance will be managed by specifying maximum allowable noise levels and incorporating mitigation measures such as larger hydraulic pumps, insulated power packs, and acoustic isolation pads to reduce both hydraulic noise and vibration from tracked movement.

It should be noted that the noise reduction requirements will be confirmed and refined once the mechanical plant and equipment selections and design have been progressed further during the detailed design of the proposed development. The mitigation measures proposed at this stage of the development are conservative in nature.

8.4 COMMUNAL AREAS

It is recommended that the following mitigation measures are considered for the outdoor communal spaces (e.g. gardens and lap pool) and may also be incorporated as part of the operational management plan for the development:

- Communal outdoor spaces are restricted to only be accessible between 7am and 10pm to ensure there is no risk of offensive noise to surrounding receivers during the night (10pm to 7am)
- Signage displayed reminding residents to be considerate and minimise noise while the space is in use (i.e. no shouting, restriction on any amplified music, and that the outdoor communal space is not to be used for parties)

9 CONSTRUCTION NOISE ASSESSMENT

It is noted that a detailed construction plan/methodology is not available at this stage and a contractor has not been appointed. As such, the below assessments are indicative and should be further developed as part of a Construction Noise and Vibration Management Sub-Plan.

9.1 PROPOSED CONSTRUCTION ACTIVITIES

At the time of writing, a contractor has not been engaged and a detailed description of work / construction methodology has not been determined. As such, the construction staging has been assumed as follows:

- Bulk excavation and piling
- Civil works after piling (detailed excavation, retention and foundation)
- Structural works (construction, façade, finishes and services).

Similarly, hours of work are also yet to be confirmed. For the purpose of this assessment, we understand that the potential construction hours are as follows:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 8:00am to 1:00pm
- Sunday and public holidays: no work unless approved via specific applications that are approved for outside of hours work

9.2 EXPECTED CONSTRUCTION EQUIPMENT

The noise sources likely to be associated with the works listed in the previous section of this report are presented in Table 20. The equipment noise levels have been extracted from AS2436:2010 “Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites”.

Table 20: Cumulative impact – construction equipment noise levels

STAGES	ESTIMATED DURATION	EQUIPMENT	QUANTITY	SOUND POWER LEVEL – dB(A)	ACOUSTICAL USAGE FACTOR (%)	USAGE IN 15-MINUTE PERIOD (MINUTES)	TIME CORRECTED SOUND POWER LEVEL– dB(A) $L_{Aeq,15min}$
Demolition	3 months	Excavator 30 tonne	1	107	40	6	103
		Excavator breaker	1	118	40	6	114
		Bobcat	1	107	40	6	103
		General Truck	1	107	30	4.5	102
Excavation and Civil Works	6 months	Excavator 30 tonne	1	107	40	6	103
		Bobcat	2	107	40	6	103
		General Truck	2	107	30	4.5	102
Structural Works	18 months	Powered hand tool	6	102	50	7.5	99
		Concrete pump truck	1	108	50	7.5	105
		General truck	2	107	30	4.5	102
		Mobile crane	1	104	20	3	97

It is noted that a detailed construction plan/methodology is not available at this stage and a contractor has not been appointed. As such, the above equipment and noise levels are indicative and should be further developed as part of a Construction Noise and Vibration Management Sub-Plan.

9.3 NOISE MODELLING AND ASSUMPTIONS

In order to assess the noise impact from the site during the various construction stages, a desktop noise calculation was prepared and has been conducted generally in accordance with the ICNG calculation procedure. The calculation represents a 'reasonable' worst case noise level as this does not account for shielding attenuation such as from buildings and elevated grounds, and ground absorption.

The assumptions that were made within the assessment include the following:

- All construction equipment for each stage are operating simultaneously in an assessed 15-minte period, representing a reasonably worst-case scenario
- All construction equipment for each stage are concentrated near the project boundary closest to the respective receiver, representing a reasonably worst-case scenario
- The predicted noise levels at the receivers have been assessed at a height of 1.5m above ground level in accordance with the assessment procedures of the ICNG
- The noise levels have been assessed using neutral weather conditions

9.4 PREDICTED NOISE LEVELS

The predicted noise levels at surrounding noise-sensitive receivers have been presented in Table 21 to Table 23 and have been assessed to the ICNG construction noise management levels established in Section 6.6, during the ICNG recommended hours of work.

Table 21: Predicted 'worst-case' noise levels at surrounding noise-sensitive receivers (demolition works)

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL EXCEEDANCE (dBA)	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1	68-73	65	Up to 8	No
RC2	66-71	60	Up to 11	No
RC3	67-72	60	Up to 12	No
RC4	70-75	70	Up to 5	N/A
RC5	70-75	70	Up to 5	N/A
RC6	70-75	60[1]	Up to 15	N/A

Note 1: The noise management level for residential receiver RC2 and RC3 have been adopted as the ICNG does not specify levels for hotel receivers

Table 22: Predicted 'worst-case' noise levels at surrounding noise-sensitive receivers (excavation and piling works)

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL EXCEEDANCE (dBA)	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1	63-68	65	Up to 3	No
RC2	60-65	60	Up to 5	No
RC3	61-66	60	Up to 6	No
RC4	65-70	70	0	N/A
RC5	65-70	70	0	N/A
RC6	64-69	60[1]	Up to 9	N/A

Note 1: The noise management level for residential receiver RC2 and RC3 have been adopted as the ICNG does not specify levels for hotel receivers

Table 23: Predicted 'worst-case' noise levels at surrounding noise-sensitive receivers (structural works)

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL EXCEEDANCE (dBA)	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1	64-69	65	Up to 4	No
RC2	61-66	60	Up to 6	No
RC3	62-67	60	Up to 7	No
RC4	67-72	70	Up to 2	N/A
RC5	65-70	70	0	N/A
RC6	65-70	60[1]	Up to 10	N/A

Note 1: The noise management level for residential receiver RC2 and RC3 have been adopted as the ICNG does not specify levels for hotel receivers

10 CONSTRUCTION VIBRATION ASSESSMENT

Vibration intensive activities are typically limited to demolition of structures and excavation works with hydraulic hammers, rock breaking, and percussive methods of piling installation.

The proposed construction activities include bulk excavation using tracked excavators and trucks, and piling works, which are expected to use non-impact methods such as bored piling. While these activities can generate ground vibration, the magnitude and extent of propagation are highly dependent on equipment type, ground conditions, and separation distance.

Safe working distances for vibration intensive plant and are quoted for both "cosmetic" damage (in accordance with BS 7385) and human comfort (in accordance with Assessing Vibration – a technical guideline), have been provided, based on Transport for NSW's "Construction Noise and Vibration Guideline". The recommended safe working distances for each of the plant listed above are provided in Table 24.

Table 24: Recommended safe working distances for vibration intensive plant

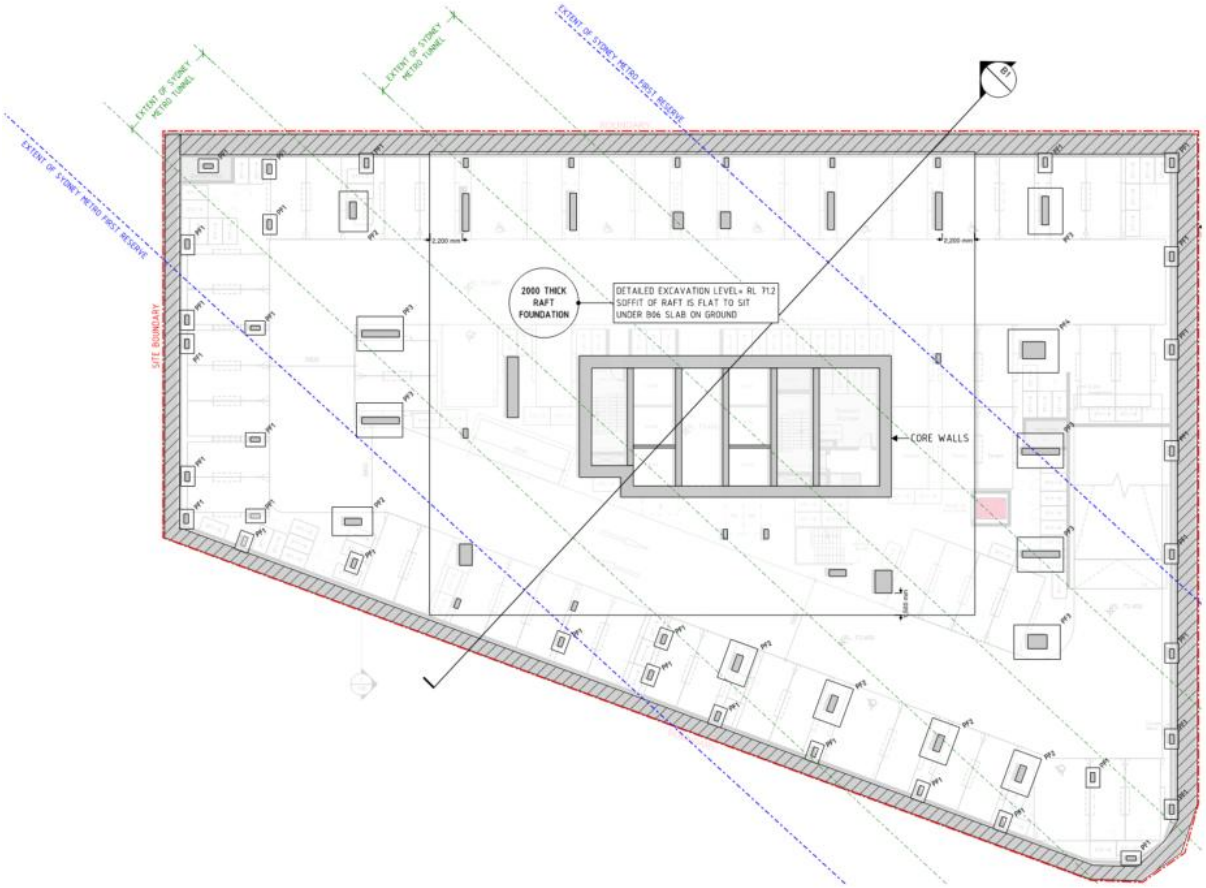
EQUIPMENT	APPROX. SIZE/ WEIGHT/ MODEL	MINIMUM DISTANCE – COSMETIC DAMAGE (BS 7385)	MINIMUM DISTANCE – HUMAN RESPONSE (OH&E VIBRATION GUIDELINE)
Vibratory roller	1-2 tonne	5m	15m to 20m
	2-4 tonne	6m	20m
	4-6 tonne	12m	40m
	7-13 tonne	15m	100m
	13-18 tonne	20m	100m
	> 18 tonne	25m	100m
Small hydraulic hammer	300 kg (5 to 12t excavator)	2m	7m
Medium hydraulic hammer	900 kg (12 – 18t excavator)	7m	23m
Large hydraulic hammer	1600 kg (18 to 34t excavator)	22m	73m
Pile driver – vibratory	Sheet piles	2m to 20m	20m
Piling rig – bored	≤ 800mm	2m (nominal)	N/A
Piling rig – hammer	12t down force	15m	50m
Jackhammer	Handheld	1m (nominal)	Avoid contact with structure

The closest vibration sensitive receivers are considered to be the adjacent existing commercial properties (RC5). Once a construction method is determined at time of head contractor appointment, it is recommended that the contractor engage a specialist to undertake attended vibration measurements at the commencement of work in order to verify the safe working distances.

If the levels are compliant with the vibration limits as listed in Section 6.7, then work may proceed based on the implementation of the measures detailed in this report. If there are exceedances, reasonable and feasible mitigation measures and additional vibration monitoring should be conducted.

Further to above, it is understood that Sydney Metro tunnels exist below the project site which will require special consideration (see Figure 3 for Metro tunnel locations). As per the Sydney Metro Underground Corridor Protection Technical Guideline, vibration monitoring shall be undertaken where the development is considered to be a 'Medium' or 'High' risk level (refer to Table 6.1 of the Sydney Metro Underground Corridor Protection Technical Guideline). Measures to prevent cosmetic damage to surrounding structures are provided in Section 11 and a vibration monitoring strategy has been provided in Section 11.3.

Figure 3: Indicative location of Sydney Metro tunnels (green and blue dotted lines) as extracted from the Structural Drawings for Sydney Metro prepared by BG&E



11 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT

It is noted that a detailed construction plan/methodology is not available at this stage and a contractor has not been appointed. As such, the below recommendations and mitigation measures are indicative and should be further developed as part of a Construction Noise and Vibration Management Sub-Plan.

11.1 PROJECT SPECIFIC RECOMMENDATIONS

11.1.1 Noise

It is predicted that noise levels are expected to be exceeding the "noise affected" management levels at surrounding receivers throughout the stages of construction, namely due to the proximity of receivers and their line of sight to the project site. Having said this, the "highly noise affected" level is not expected to be exceeded.

These predicted noise levels (and exceedances) are considered to be a worst-case scenario without any corrections for shielding or directivity and with all equipment operation simultaneously in a 15-minute period. Noise levels at surrounding sensitive receivers can be expected to be less than those presented in Section 9.4, when works are not occurring simultaneously, when works are further away from the project site boundary, if a solid hoarding is implemented around the boundary, and if works occur internally within the building shell.

Furthermore, it is noted that this is an indicative assessment for a worst-case scenario and shall be refined as part of a Construction Noise and Vibration Management Sub-Plan once detailed construction plan/methodologies are available.

Notwithstanding the above, the following noise mitigation strategies are recommended to protect the amenity of surrounding noise-sensitive receivers during highly concentrated and loud activities:

- At least a one-hour respite period, for example between 12:00pm – 1:00pm (or other period to coincide with construction workers lunch time(s)), should be offered per day during the most intensive periods of noisy activities. Limiting these activities outside of sensitive hours (e.g. no noisy works, such as piling, between 7:00am – 8:00am on weekdays) should also be considered
- Frequent and proactive communication with surrounding residents and neighbours is also encouraged and a Community Consultation Strategy should be developed by the contractor. This will allow occupants of surrounding residents to arrange their schedules to accommodate possible noise sensitive activities (like online meetings and conferencing). More details regarding communication with the community can be found in Section 11.2.3
- For exceedances of less than 3dB(A), careful selection and maintenance of plant equipment will ensure that disruptions to adjacent receivers are minimised.

11.1.2 Vibration

It is expected that the main vibration inducing activities could be from bored piling or rock/slab breaking and other activities are generally considered to not be highly vibration intensive activities. It is recommended that the contractor engage a specialist to undertake attended vibration measurements at the commencement of work in order to verify the safe working distances.

If the levels are compliant with the vibration limits as listed in Section 6.7, then work may proceed based on the implementation of the measures detailed in this report. If there are exceedances, reasonable and feasible mitigation measures and additional vibration monitoring should be conducted. Measures to prevent cosmetic damage to surrounding structures are provided in Section 11 and a vibration monitoring strategy has been provided in Section 11.3.4.

Upon any complaints from surrounding residents, the following shall be undertaken:

- Vibration monitoring is recommended to be conducted at surrounding sensitive receivers (or at the location of complaint) in accordance with the monitoring program strategy proposed in Section 11.3
- Reasonable and feasible measures should be considered to lessen the impact, such as alternative methods or equipment for activities which are causing complaints to achieve the vibration levels required

To further diminish the vibration impact, the one-hour respite period, for example between 12:00pm – 1:00pm (or other period to coincide with construction workers lunch time(s)), recommended for noise mitigation shall also apply for vibration mitigation.

We recommend that dilapidation reports be prepared on surrounding sensitive receivers and buildings which will be in close proximity to heavy machinery. Guidance for this may be provided by the geotechnical engineer and controlled by ground composition.

11.2 GENERAL ACOUSTIC RECOMMENDATIONS

According to AS 2436 the following techniques could be applied to minimize the spread of noise and vibrations to the potential receivers.

11.2.1 Noise

If a process that generates significant noise levels cannot be avoided, the amount of noise reaching the receiver should be minimized. Two ways of achieving this are to either increase the distance between the noise source and the receiver or to introduce noise reduction measures such as screens. Practices that will reduce noise from the site include:

- Increasing the distance between noise sources and sensitive receivers.
- Reducing the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers (stockpiles, shipping containers and site office transportables can be effective barriers).
- Constructing barriers that are part of the project design early in the project to introduce the mitigation of site noise.
- Installing purpose-built noise barriers, acoustic sheds and enclosures.

Physical methods to reduce the transmission of noise between the site works and residences, or other sensitive land uses, are generally suited to works where there is longer-term exposure to the noise. A few of these methods have been introduced below.

Screening

Hoarding: Another way of implementing screening is to build hoarding that includes a site office on an elevated structure. This option offers superior noise reduction when compared with a standard, simple hoarding. The acoustic performance is further enhanced when the hoarding is a continuous barrier.

General remarks: In many cases, it is not practical to screen earthmoving operations effectively, but it may be possible to partially shield a construction plant at the early stages of the project with protective features required to screen traffic noise.

The usefulness of a noise barrier will depend upon its length, its height, its position relative to the source and the receiver, and the material of which it is made. A barrier designed to reduce noise from a moving source should extend beyond the last property to be protected by at least ten times the shortest distance from the said property to the barrier. A barrier designed to reduce noise from a stationary source should, where possible, extend beyond the direct line of sight between the noise source and the receiver by a distance equal to ten times the effective barrier height, which is the height above the direct line between source and receiver.

If the works are already predominantly located within nominally closed structures, careful consideration should be given to reducing noise breakout at any openings.

Cranes

For the early works construction phases, any cranage will be limited to mobile cranes where the engines are typically enclosed in an acoustically treated housing.

Reversing and warning alarms

Community complaints often involve the intrusive noise of alarms commonly used to provide a safe system of work for vehicles operating on a site. Beeper reversing alarm noise is generally tonal and may cause annoyance at significant distances from the work site.

There are alternative warning alarms capable of providing a safe system of work that are equal to or better than the traditional "beeper", while also reducing environmental noise impacts. The following alternatives should be considered for use on construction sites as appropriate (and combined where appropriate):

- Broadband audible alarms incorporating a wide range of sound frequencies (as opposed to the tonal-frequency 'beep') are less intrusive when heard in the neighbourhood.
- Variable-level alarms reduce the emitted noise levels by detecting the background noise level and adjusting the alarm level accordingly.
- Proximity alarms that use sensors to determine the distance from objects, such as people or structures, and generate an audible alarm in cabin for the driver.
- Spotters or observers.

Selection of Alternate Equipment

As part of the Contractor's Construction Methodology and Construction Management Plan, the noise and vibration impact of each equipment / machinery should be considered. Where feasible and practical, quieter equipment (lower Sound Power Level) shall be selected for the task. The Contractor can review the manufacturer's equipment sound data or utilise AS2436 and the TfNSW CNS as guides in understanding what the typical Sound Power Levels are for alternative types of machinery.

Attended short-term noise measurements can also be conducted to either compare the noise levels of machinery, or to understand what the noise level at surrounding noise sensitive receivers are.

The same consideration shall be taken for vibration intensive machinery, which are expected to be only rock hammering and piling. Where feasible and practical, less vibration intensive equipment shall be selected for the task such as favouring pulverising and sawing methods rather than hydraulic hammering for rock breaking.

As with noise, attended short-term vibration measurements can be conducted at start of vibration intensive works to ensure vibration criteria (see Section 6.7) at surrounding receivers are not exceeded.

As a guide, the Contractor can also refer to AS2436 and the TfNSW CNS to use as a guide in understanding vibration intensive activities and their alternate methods, based on minimum working distances.

Machinery shall be selected based on the noise criteria and vibration criteria as presented in Section 6.6 and 6.7.

11.2.2 Vibration

Vibration can be more difficult to control than noise, and there are few generalizations that can be made about its control. It should be kept in mind that vibration may cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement.

Impulsive vibration can, in some cases, provide a trigger mechanism that could result in the failure of building components that had previously been in a stable state. Vibrations can also trigger annoyance, which might get elevated into action by occupants of exposed buildings and should therefore be included in the planning of communication with impacted communities.

It should be remembered that failures, sometimes catastrophic, can occur as a result of conditions not directly connected with the transmission of vibrations, e.g. the removal of supports from retaining structures to facilitate site access. BS 7385-2 provides more information on managing ground-borne vibration and its potential effects on buildings. Where site activities may affect existing structures, a thorough engineering appraisal should be made at the planning stage.

General principles of seeking minimal vibration at receiving structures should be followed in the first instance. Predictions of vibration levels likely to occur at sensitive receivers are recommended when they are relatively

close, depending on the magnitude of the source of the vibration or the distance associated. Relatively simple prediction methods are available in textbooks, codes of practice and standards, however, it is preferable to assess site transmission and propagation characteristics between source and receiver locations through measurements.

Guidance for measures available for the mitigation of vibration transmitted can be sought in more detailed standards, such as BS 5228-2 or policy documents, such as the NSW DEC *Assessing Vibration: A technical guideline*. Identifying the strategy best suited to the control of vibration follows a similar approach to that of noise: avoidance, control at the source, control along the propagation path, control at the receiver, or a combination of these. It is noted that vibration sources can include stationary plants (pumps and compressors), portable plants (jackhammers and pavement vibrators), mobile plants, pile-drivers, tunnelling machines and activities, and blasting, amongst others. Unusual ground conditions, such as a high water-table, can also cause a difference to expected or predicted results, especially when considering the noise propagated from piling.

11.2.3 Community Consultation to be Undertaken

The builder shall directly contact adjacent noise sensitive receivers and provide them with the following information:

- The contact details for a nominated representative in order to make noise / vibration complaints
- Explain the timeframe for the construction works and the proposed activities, i.e. the proposed start / stop dates of work and a description of the noise producing equipment that will be used
- Notify the noise sensitive receivers and relevant local / state authority in a timely manner should there be any need for an extension to the proposed arrangements
- Provide them with a copy of this report as approved by the relevant local / state authority
- Where noise is demonstrated as being compliant with criteria, this should not limit the proponent in undertaking further additional reasonable and feasible steps to reduce noise emissions.

11.2.4 Complaint Handling Procedures and Community Liaison

To assist in the management of noise and vibration complaints various procedures are to be followed. These include:

- Clearly visible signage identifying any key personnel along with their contact details to be erected along the perimeter of the building site including:
    - A 24-hour contact name, phone number and email address provided for the resident to address any complaint. The signage will declare; “For any enquiry, complaint or emergency relating to this site at any time please contact…”
- Give complaints a fair hearing
- Relevant local / state authority should be notified of the nature and details of complaints received (time, complainant etc.) and what remedial action has taken place, if any
- Have a documented complaints process, including an escalation procedure so that if a complaint is not satisfied there is a clear path to follow
- Call back as soon as possible to keep people informed of action to be taken to address noise problems. Call back at night time only if requested by the complainant to avoid further disturbance
- Implement all feasible and reasonable measures to address the source of the complaint
- A register is to be kept by the contractor to keep a record of complaints and detail any information associated with them. The contents of the register will include:
    - The name and the address of the complainant
    - Time and date of the complaint
    - The nature of the complaint (Noise/Vibration)
    - Subsequent details

- Remedial action undertaken

The contents of the register will be maintained and updated on a monthly basis with any new complaint without delay. The complaints will be reported to both the relevant local / state authority and the Contractor. The investigation of the complaint and any remedial actions will be performed by the builder and/or client representative on a monthly basis. In the event of noisy works scheduled, the builder will notify residents 5 business days in advance.

11.3 NOISE & VIBRATION MONITORING STRATEGY

11.3.1 General Methodology

Monitoring may be in the form of regular checks by the builder or indirectly by an acoustic consultant engaged by the builder and in response to any noise or vibration complaints. Where noise and vibration criteria are being exceeded or in response to valid complaints, noise and / or vibration monitoring should be undertaken. This would be performed inside the premises of the affected property and on site adjacent to the affected receivers.

Monitoring is to be undertaken by an experienced noise and vibration monitoring professional or an acoustic consultant. The results of any noise or vibration monitoring are to be provided to the relevant party or person in a timely manner allowing the builder to address the issue and respond to the complaints.

Noise and vibration monitoring can take two forms:

- Short-term monitoring
- Long-term monitoring

Both of these approaches are elaborated below.

11.3.2 Short-term Monitoring

Short-term monitoring consists of attended monitoring when critical stages of the construction are occurring. This normally provides real-time assistance and guidance to the subcontractor on site, telling them when the noise and vibration criteria are exceeded. Thus, the selection of alternative method on construction or equipment selection is allowed in order to minimise noise and vibration impacts.

Short-term monitoring may also be undertaken prior to start of works to ensure noise levels emitted from machinery and equipment are within the manufacturer's tested data / tolerance. This check can be implemented periodically throughout the construction program as a maintenance routine to ensure machinery and equipment stay within the manufacturer's data / tolerance and are not faulty.

11.3.3 Long-term Monitoring

Similarly, to short-term monitoring, long-term monitoring provides real-time alerts to the builder / site manager when the noise and vibration criteria are exceeded. Instead of someone being on site measuring, noise and vibration loggers are used.

Typically, the noise and vibration loggers stay on site for a period of several months for the critical construction stages of the project, such as the demolition and excavation phases.

Both methodologies are complementary and normally used simultaneously providing a significant amount of data via the long-term monitoring but also providing information on the sources of noise and vibration generating exceedances via the short-term or attended monitoring.

Long-term noise monitoring reports shall be prepared and presented in accordance with the recommendations of the NSW ICNG (Section 8.2 of the ICNG).

11.3.4 Proposed Monitoring Programme

A monitoring programme is recommended to be carried out as part of a Construction Noise and Vibration Management Sub-Plan, once construction plans/methodologies are available and a contractor is appointed.

The monitoring programme is to be carried out during the most noise/vibration inducing periods during each construction phase as agreed with the Acoustic Engineer, the Contractor, other relevant consultants and in accordance with any conditions of consent. Locations shall be agreed prior to start of works and shall be reviewed regularly as construction works progress.

Noise/vibration loggers are to be capable of programming trigger levels and sending automatic alerts via emails/SMS once levels are exceeded.

The following vibration monitoring procedures will be followed by personnel suitably qualified and experienced in undertaking vibration measurements. Vibration measurements shall be carried out in accordance with Section 5 – Methods of Noise and Vibration Measurement of AS 2436-2010.

Vibration monitors will include tri-axial vibration sensors measuring over a frequency range from 1 to 500 Hz, in accordance with DIN 4150. The sensors will be mounted in general accordance with Australian Standard AS 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers.

Monitoring locations can be undertaken as a staged approach depending on the location of construction activities respective to receiver locations. Exact locations for all monitors will be agreed upon with the Acoustic Engineer, other relevant Consultants, the Contractor and property owners/tenants.

11.3.5 Metro Infrastructure Specific Monitoring

For construction works with potential noise and vibration impacts to Metro infrastructure, detailed pre-construction phase monitoring plans will be developed once construction level plans and methodologies are available and a contractor is appointed. These plans will be coordinated by all relevant consultants and approved by Sydney Metro. They may be staged to suit different stages of construction including demolition, bulk excavation and main construction works.

Noise and vibration monitoring methodologies, monitoring levels, alert trigger levels and escalation procedures have been established and proposed in the project specific Sydney Metro Tunnel Geotechnical Monitoring Plan prepared by Douglas Partners.

12 CONCLUSION

This Noise and Vibration Impact Assessment has been prepared by E-LAB Consulting and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

The following operational noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Airborne noise intrusion to the development's habitable areas from surrounding roads
- Vibration impact to the development's habitable areas from the below Metro corridor
- Noise emissions associated with carparking and service vehicle activities
- Noise emissions associated with retail and commercial tenancies
- Noise emission from mechanical plant and equipment serving the development
- Noise emissions associated with residential communal spaces
- Noise emission from the residential cinema room
- Noise emission from the residential gym

The following construction noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Noise generated during the construction of the development and associated impacts on the surrounding noise sensitive receivers
- Vibration generated during the construction of the development and associated impacts on the surrounding vibration sensitive receivers

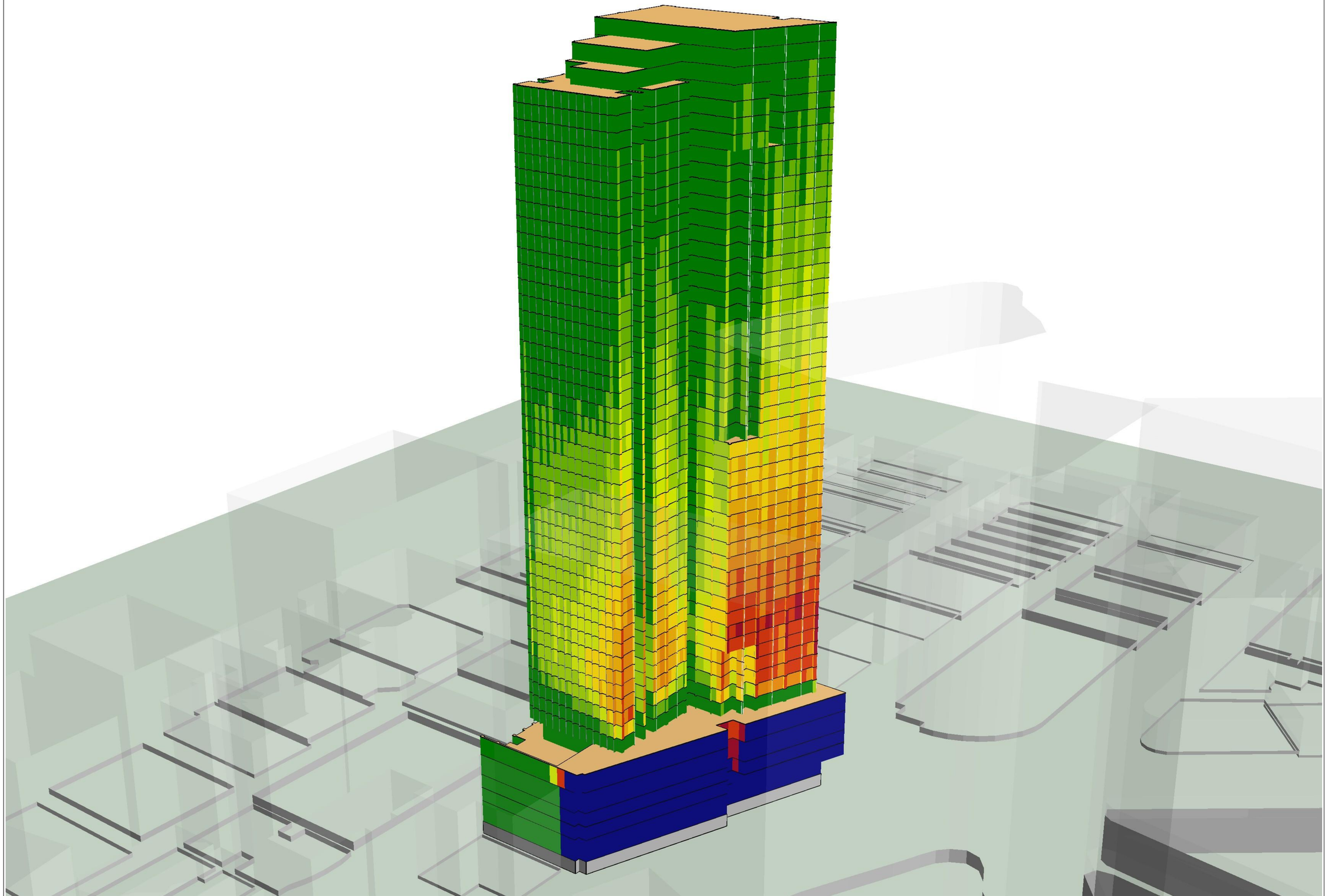
To assess each of the acoustic considerations for the proposed redevelopment, noise and vibration criteria has been established in Section 6 in accordance with the following documents:

- NSW EPA's Noise Policy for Industry 2017, dated October 2017 (NPI)
- NSW EPA's Road Noise Policy, dated March 2011 (RNP)
- NSW's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP 2021)
- NSW EPA's Development Near Rail Corridors and Busy Roads – Interim Guideline, dated December 2008 (Interim Guideline)
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG)
- Assessing vibration: A Technical Guideline 2006 (AVTG)
- British Standard BS5228 – Part 1:1997 "Noise and Vibration Control on Construction and Open Sites."
- British Standard BS7358:1993 "Evaluation and Measurement for Vibration in Buildings"
- German Standard DIN4150 – Part 3: "Structural vibration in buildings – Effects on structures"
- AS 1055:2018 - "Acoustics – Description and measurement of environmental noise"
- Sydney Metro Underground Corridor Protection Technical Guidelines, dated July 2025

Having given regard to the analysis conducted within this report, it is the finding of this noise and vibration impact assessment that the proposed redevelopment is compliant with the relevant noise and vibration criteria controls for this type of development, and it is expected to comply with the applicable regulations with regards to noise and vibration, particularly those listed above.

It is recommended the development application for the proposed redevelopment is approved on the basis of noise and vibration, under the implementation of the mitigation measures outlined within the report.

Appendix A **Façade Noise Levels**



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	21/10/2025	FOR INFORMATION
2	31/10/2025	FOR INFORMATION
3	06/11/2025	FOR INFORMATION
4	09/03/2026	FOR SSDA

LEGEND

Daytime Facade Noise Level, $L_{Aeq,15hour}$ dB(A)

- ≤ 60
- 60-61
- 61-62
- 62-63
- 63-64
- 64-65
- 65-66
- 66-67
- 67-68
- ≥ 68

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

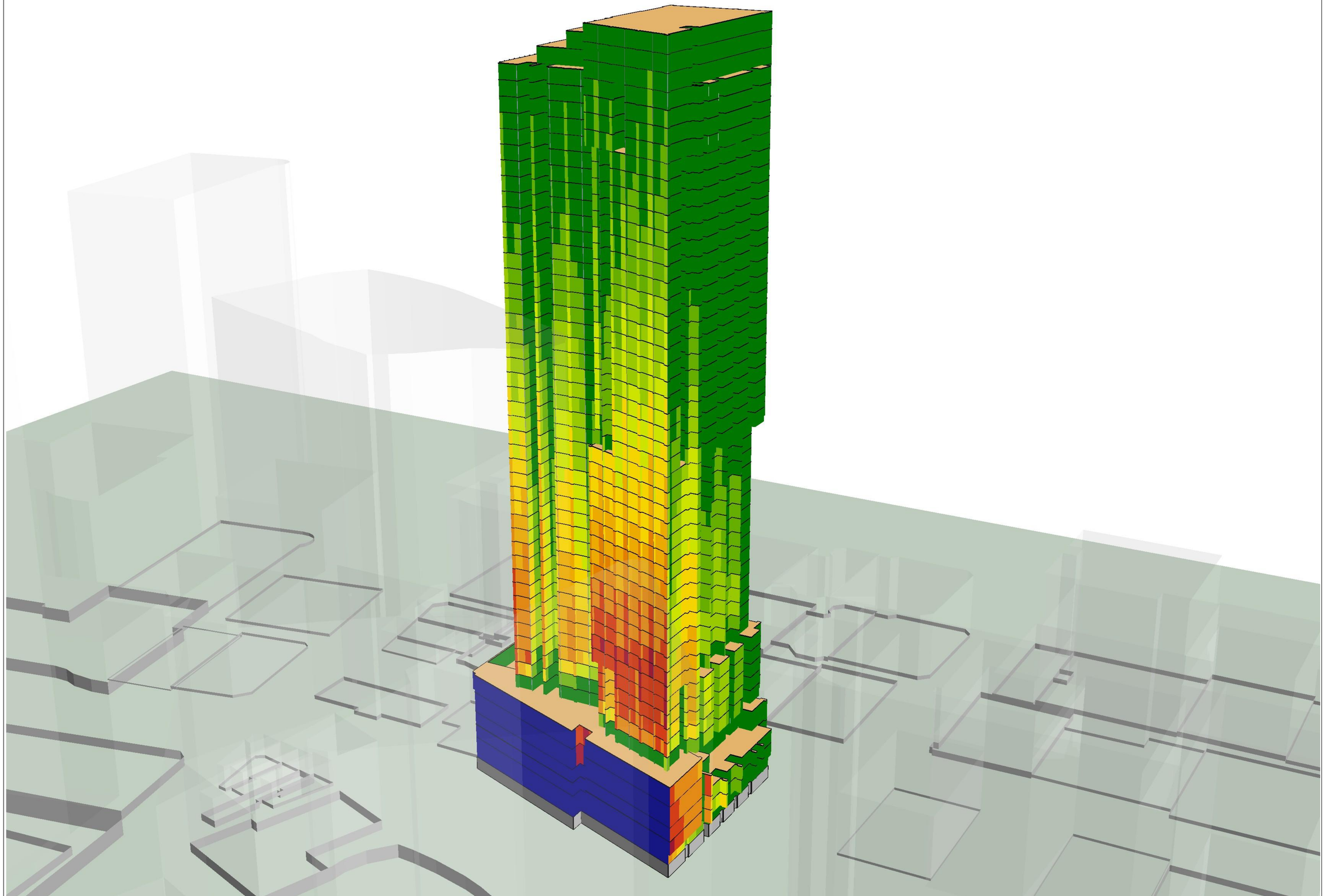
STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - DAYTIME
VIEW 1

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-01-01

REVISION
004



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LEGEND

Daytime Facade Noise Level, $L_{Aeq,15hour}$ dB(A)

- ≤ 60
- 60-61
- 61-62
- 62-63
- 63-64
- 64-65
- 65-66
- 66-67
- 67-68
- ≥ 68

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DRAWING
FACADE NOISE LEVELS - DAYTIME
VIEW 2

DISCIPLINE
ACOUSTICS AND VIBRATION

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AC-DWG-100-01-02

REVISION
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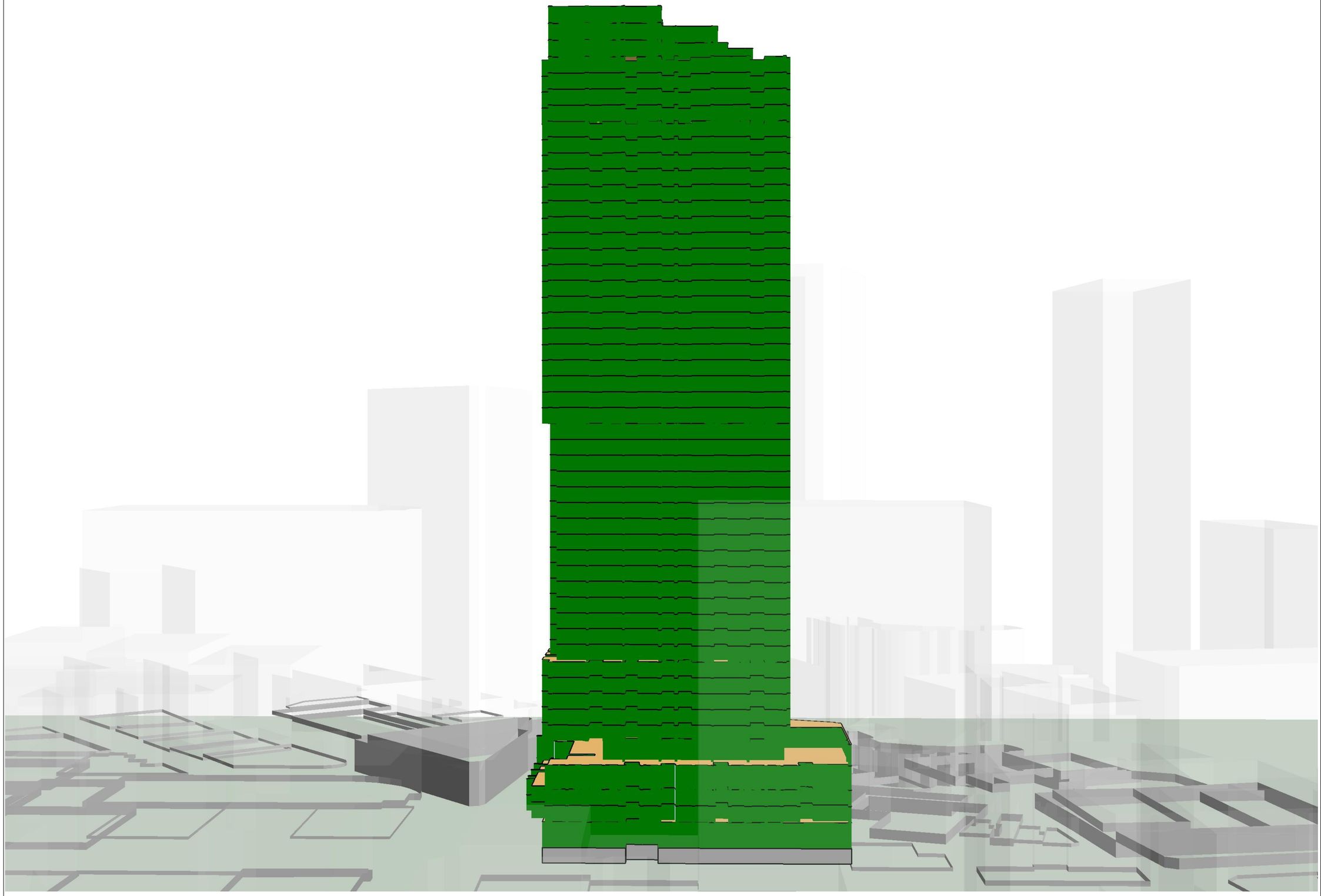

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- ≤ 60
- 60-61
- 61-62
- 62-63
- 63-64
- 64-65
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STOCKLAND

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NTS

STATUS
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DRAWING
FACADE NOISE LEVELS - DAYTIME
VIEW 3

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-01-03

REVISION
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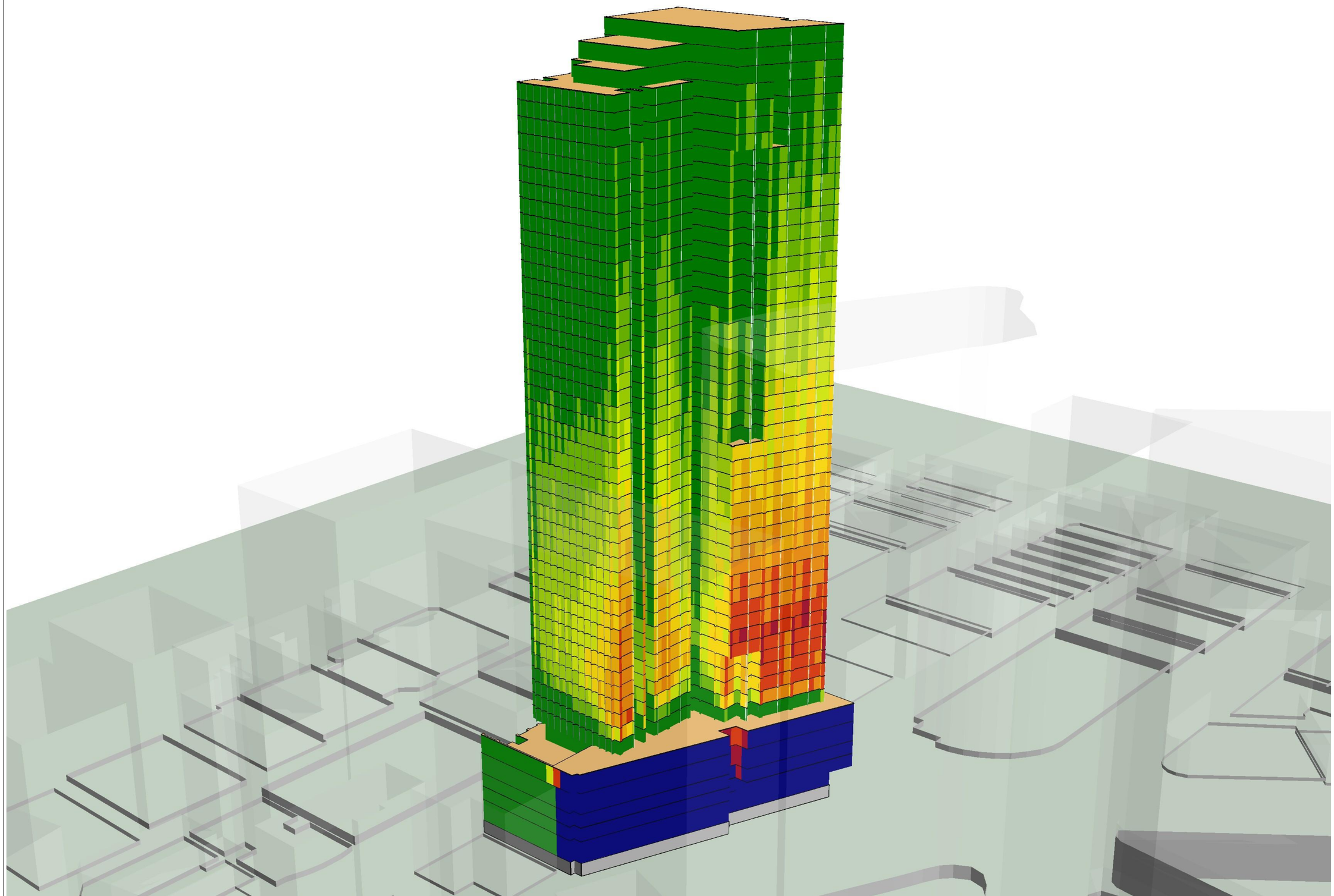

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LEGEND

Night Time Facade Noise Level, $L_{Aeq,9hour}$ dB(A)

- ≤ 55
- 55-56
- 56-57
- 57-58
- 58-59
- 59-60
- 60-61
- 61-62
- 62-63
- ≥ 63

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PROJECT NO.
P02572

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STOCKLAND

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FACADE NOISE LEVELS - NIGHT TIME
VIEW 1

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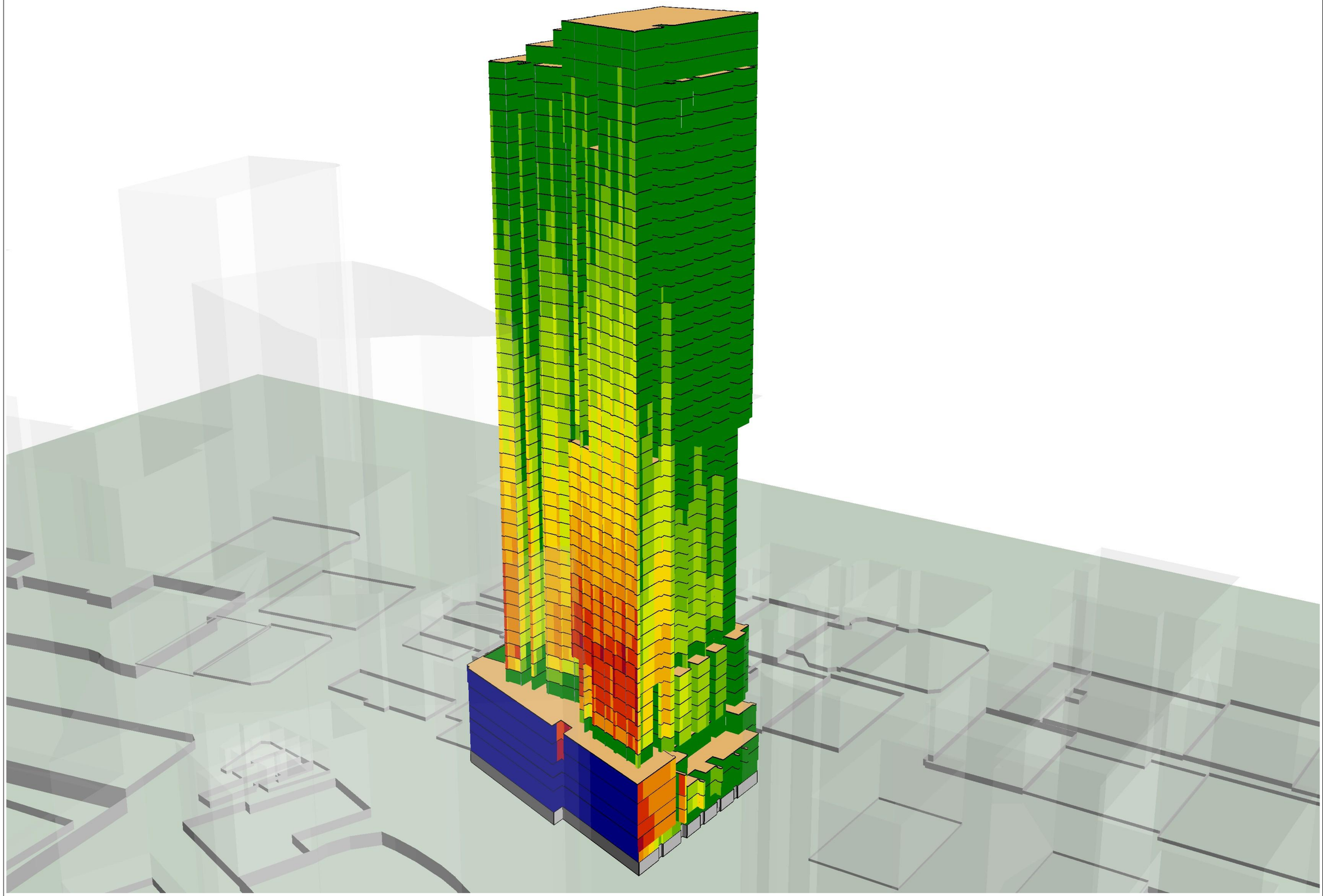

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LEGEND

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- ≤ 55
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- 56-57
- 57-58
- 58-59
- 59-60
- 60-61
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- ≥ 63

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ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - NIGHT TIME
VIEW 2

DISCIPLINE
ACOUSTICS AND VIBRATION

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REVISION
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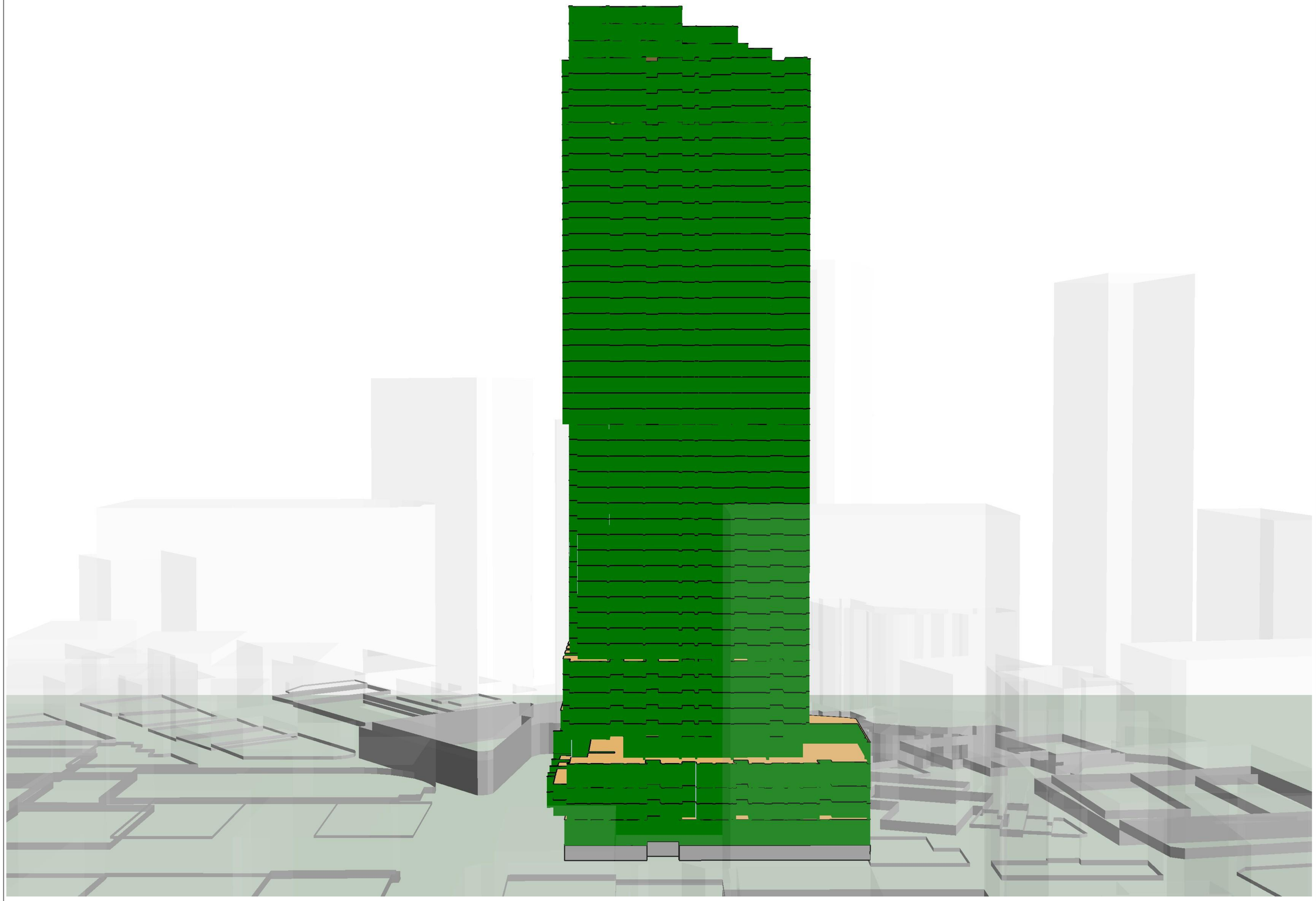

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REVISION
004

Appendix B **Acoustic Façade Types**



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 2

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-02

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 3

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-03

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

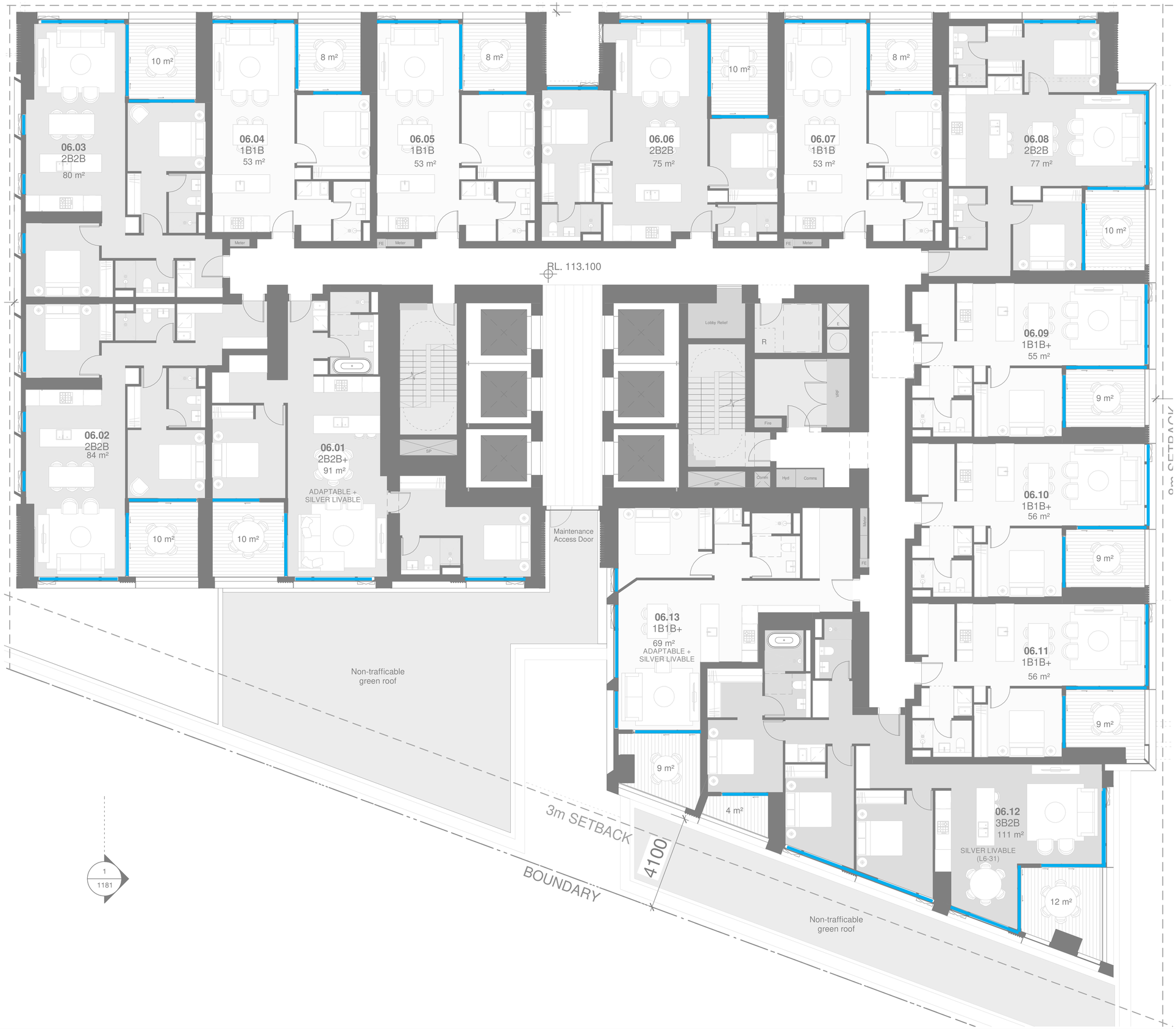
STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 4

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-04

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 6

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-06

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

- Acoustic Facade Type 1
- Acoustic Facade Type 2

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVELS 7 - 24

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-300-01-07	001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

- Acoustic Facade Type 1
- Acoustic Facade Type 2

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 25

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-25

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVELS 26 - 32

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-26

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 33

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-33

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

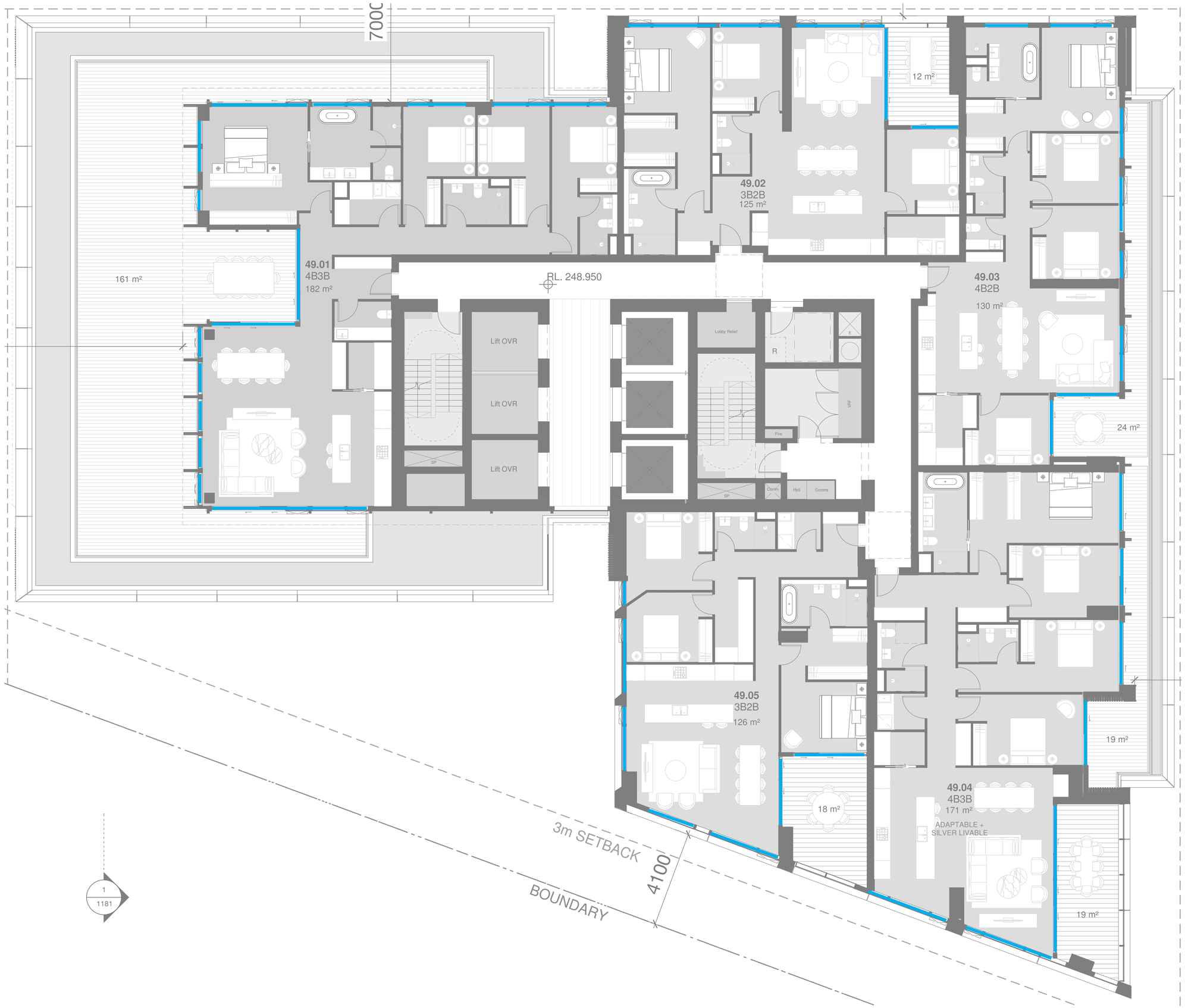
STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVELS 34 - 48

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-34

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

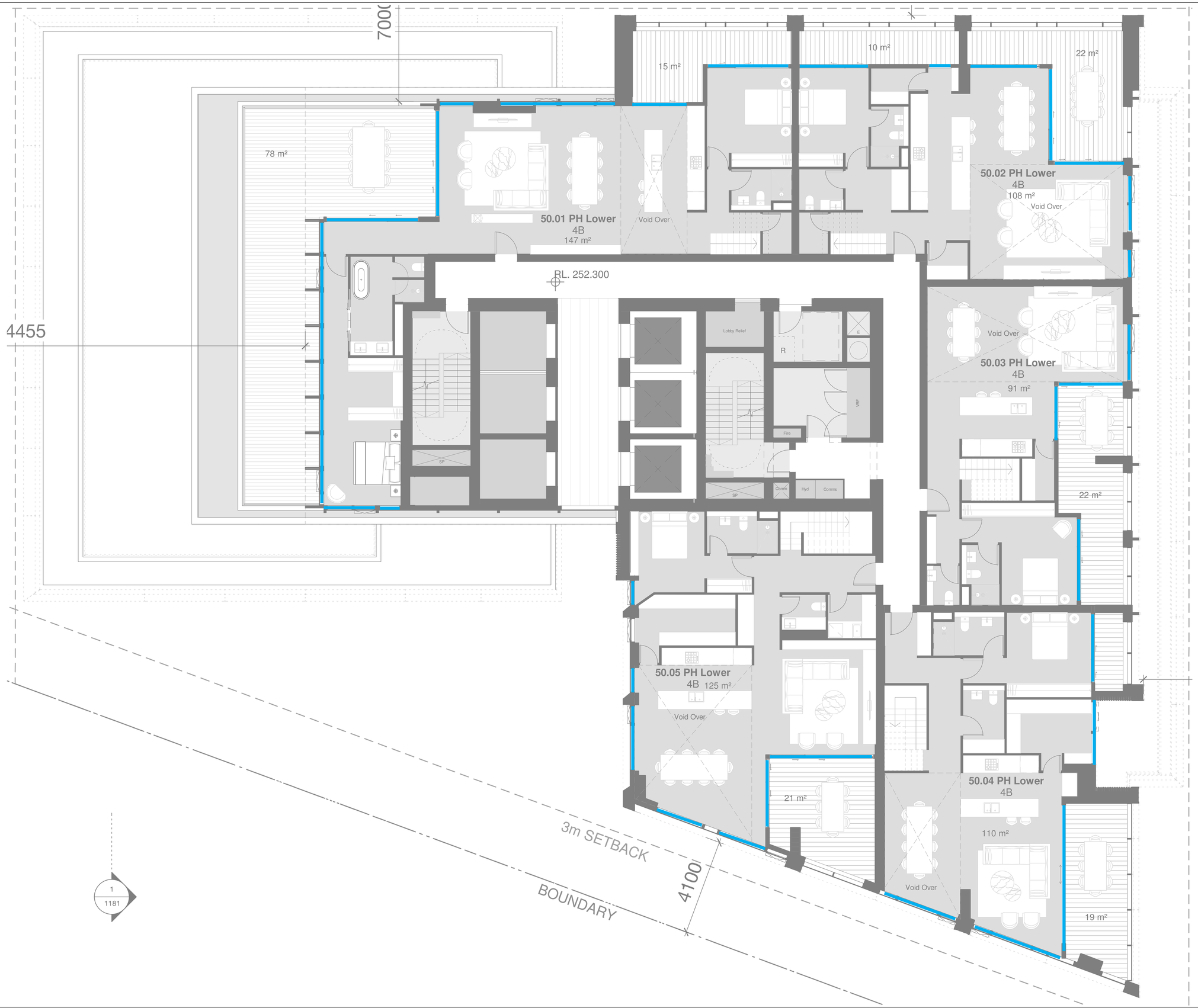
STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 49

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-49

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 50

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-50

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 51

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-51

REVISION
001

Appendix C **Alternate Means of Ventilation Areas**



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION LEVEL 7

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-07

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 8

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-08

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 9 - 17

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-09

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 18

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-18	002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 19

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-19	002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 20

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-20

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 21 - 23

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-21

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 24 - 27

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-24	002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 28

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-28

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 29

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-29

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 30

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-30

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 31 - 32

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-31	002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

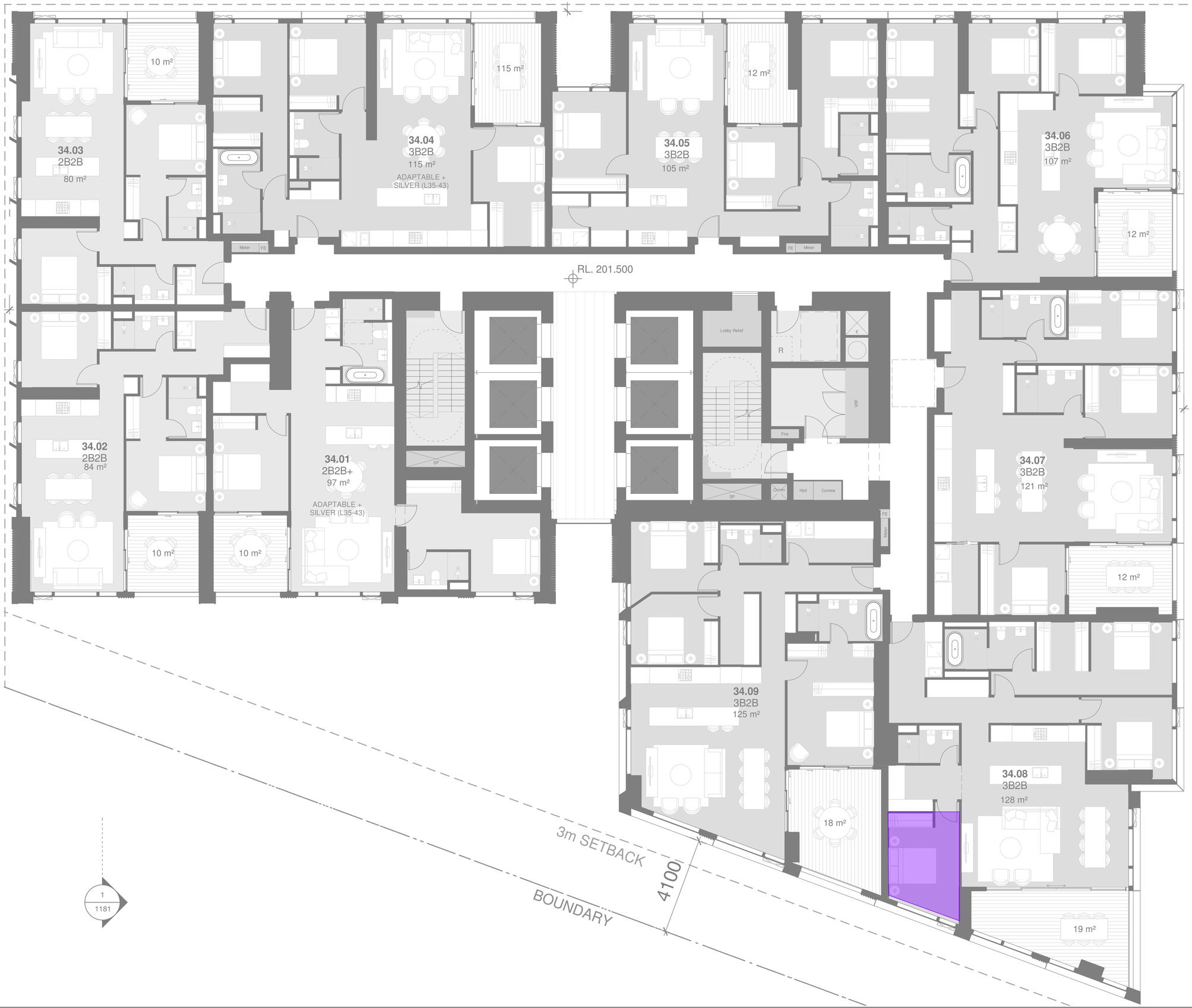
STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 33

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-33

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 34 - 48

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-34

REVISION
002



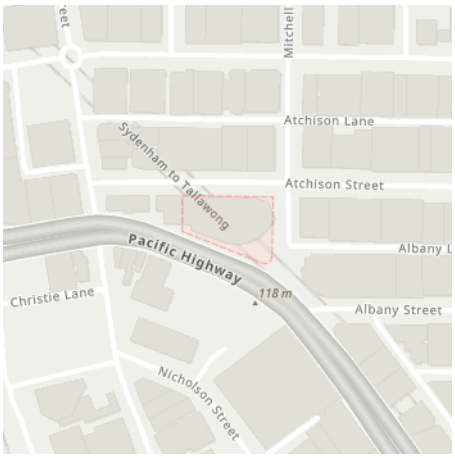
www.e-lab.com.au

Appendix I – BYDA & In Ground Services Investigations

Job ID 52659214

601 Pacific Hwy

Review responses online



Received 16 of 16 responses

All responses received

601 Pacific Hwy, St Leonards NSW 2065

Job dates
24/03/2026 → 01/06/2032

These plans expire on
15 Apr 2026

Lodged by
Marko Djukanovic

Authority	Status	Page
BYDA Confirmation		2
AARNet Pty Ltd Nsw	Received	4
Ausgrid	Received	10
Aussie Broadband Pty Ltd	Received	28
Jemena Gas North	Received	36
NBN Co NswAct	Received	65
Nextgen NCC - NSW	Received	76
North Sydney Council	Received	84
Optus and or Uecomm Nsw	Received	113
Superloop (Australia) Pty Ltd	Received	131
Sydney Metro	Received	138
Sydney Water	Received	158
Telstra NSW Central	Received	166
TPG Telecom (NSW)	Received	175
Transport for NSW	Received	180
Verizon Business (Nsw)	Received	187
Vocus Communications 2	Received	192

Job No 52659214

BEFORE YOU DIG byda.com.au — Look up and Live

Zero damage - Zero harm - Zero disruption

byda.com.au

Contact Details

Contact	Contact number	Company	Enquirer ID
Marko Djukanovic	0475 520 426	Stockland	3831362

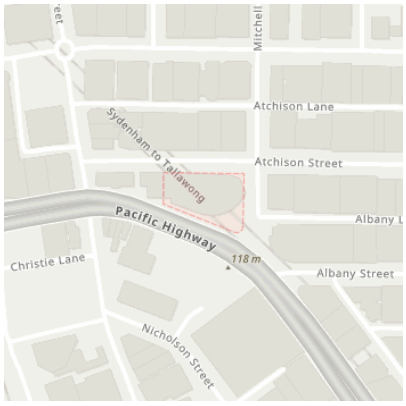
Email
marko.djukanovic@stockland.com.au

Address
Level 25 133-145 Castlereagh Street
Sydney NSW 2000

Job Site and Enquiry Details

WARNING: The map below only displays the location of the proposed job site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.

Enquiry date	Start date	End date	On behalf of	Job purpose	Locations	Onsite activities
18/03/2026	24/03/2026	01/06/2032	Private	Design	Both Road, Nature Strip, Footpath	Planning & Design



Check that the location of the job site is correct. If not, you must submit a new enquiry.

If the scope of works change or plan validity dates expire, you must submit a new enquiry.

Do NOT dig without plans. Safe excavation is your responsibility. If you don't understand the plans or how to proceed safely, please contact the relevant asset owners.

User Reference	Address	Notes/description
601 Pacific Hwy	601 Pacific Hwy St Leonards NSW 2065	-

Your Responsibility and Duty of Care

- **Lodging an enquiry does not authorise project commencement.** Before starting work, you must obtain all necessary information from all affected asset owners.
- If you don't receive plans within 2 business days, contact the asset owner & quote their sequence number.
- Always follow the 5Ps of Safe Excavation (page 2), and locate assets before commencing work.
- Ensure you comply with State legislative requirements for Duty of Care and safe digging.
- If you damage an underground asset, you MUST advise the asset owner immediately.
- By using the BYDA service, you agree to the Privacy Policy and Term of Use.
- For more information on safe digging practices, visit www.byda.com.au

Asset Owner Details

Below is a list of asset owners with underground infrastructure in and around your job site. It is your responsibility to identify the presence of these assets. Plans issued by Members are indicative only unless specified otherwise. Note: not all asset owners are registered with BYDA. You must contact asset owners not listed here directly.

Referral ID (Seq. no)	Authority Name	Phone	Status
269943785	AARNet Pty Ltd Nsw	1300 275 662	NOTIFIED
269943774	Ausgrid	(02) 4951 0899	NOTIFIED
269943777	Aussie Broadband Pty Ltd	(03) 8907 8799	NOTIFIED
269943781	Jemena Gas North	1300 880 906	NOTIFIED
269943787	NBN Co NswAct	1800 687 626	NOTIFIED
269943773	Nextgen NCC - NSW	1800 262 663	NOTIFIED
269943780	North Sydney Council	(02) 9936 8100	NOTIFIED
269943782	Optus and or Uecomm Nsw	1800 505 777	NOTIFIED
269943779	Superloop (Australia) Pty Ltd	(07) 3905 2400	NOTIFIED
269943775	Sydney Metro	(02) 8265 9400	NOTIFIED
269943783	Sydney Water	13 20 92	NOTIFIED
269943788	Telstra NSW Central	1800 653 935	NOTIFIED
269943784	TPG Telecom (NSW)	1800 786 306	NOTIFIED

Referral ID (Seq. no)	Authority Name	Phone	Status
269943778	Transport for NSW	(02) 9983 3030	NOTIFIED
269943776	Verizon Business (Nsw)	(02) 8210 3243	NOTIFIED
269943786	Vocus Communications 2	1800 262 663	NOTIFIED

END OF UTILITIES LIST

The 5Ps of Safe Excavation

Plan

Plan your job. Use the BYDA service at least one day before your job is due to begin, and ensure you have the correct plans and information required to carry out a safe project.

Prepare

Prepare by communicating with asset owners if you need assistance. Look for clues onsite. Engage a skilled Locator.

Pothole

Potholing is physically sighting the asset by hand digging or hydro vacuum extraction.

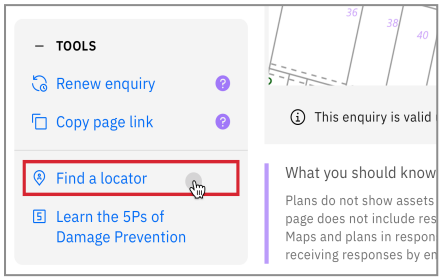
Protect

Protecting and supporting the exposed infrastructure is the responsibility of the excavator. Always erect safety barriers in areas of risk and enforce exclusion zones.

Proceed

Only proceed with your excavation work after planning, preparing, potholing (unless prohibited), and having protective measures in place.

Engage a skilled Locator



When you lodge an enquiry you will see skilled Locators to contact

Visit the Certified Locator website directly and search for a locator near you

certloc.com.au/locators

Get FREE Quotes for Contractors & Equipment Fast

GET QUOTE

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byda.com.au/contact/education-awareness-enquiry-form

Lodge your FREE enquiry online any time at byda.com.au

AARNet Pty Ltd Nsw

Referral
269943785

Member Phone
1300 275 662

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	5
269943785 - AARNet Plan.pdf	7
AARNet - Guidelines for Fibre Optic.pdf	8

aarnet
Australia's Academic and Research Network

GPO Box 5519
Chatswood
NSW, 1515

Date: 18 Mar 2026

To: Marko Djukanovic

Please DO NOT SEND A REPLY to this email as it has been automatically generated and replies are not monitored.

Thank you for your BYDA enquiry (referenced below) - according to our records your enquiry impacts our infrastructure.

This email is in relation to the proposed work at location detailed below, as they may directly impact AARNet underground infrastructure.

SEQUENCE NO.:	269943785
JOB NO.:	52659214
LOCATION:	601 Pacific Hwy St Leonards NSW 2065
COMMENCEMENT DATE:	601 Pacific Hwy 24 Mar 2026

Attached is a map indicating the location of the enquiry area and an approximate location of AARNet's underground infrastructure in the local vicinity.

There may be additional AARNet assets in this area that are contained within Telstra duct. No work is to take place until plans have been obtained from Telstra and reviewed as necessary.

Any information provided is valid for 28 days from the date of issue of this document.

WARNING: When working in the vicinity of AARNet's underground infrastructure you have a legal *Duty of Care* that must be observed.

Please review the map and if you have any further concerns, contact the AARNet NOC on 1300 APL NOC.

If you are proposing to carry out digging in the vicinity of AARNet underground infrastructure you will need to carry out these works in accordance with the attached guidelines.

To best manage the risk of damage and liability, we recommend that you engage the services of a Certified Locator

Important Notice

Where AARNet plans have been attached, they are indicative of the position of AARNet Pty Ltd's (**AARNet**) underground infrastructure **only**. Services belonging to other third parties are not included on these plans.

These plans have been prepared solely for the use of AARNet and any reliance placed on these plans by you is entirely at your own risk. The plans may show the position of our assets relative to fences, buildings, etc, as they existed at the time the underground infrastructure was installed. The plans may not have been updated to take account of any subsequent change in the location or style of those features since the time at which the plans were initially prepared.

AARNet makes no warranty as to the accuracy or completeness of the enclosed plans and does not assume any duty of care to you nor any responsibility for the accuracy, adequacy, suitability or completeness of the plans or for any error, omission, lack of detail, transmission failure or corruption in the information provided. AARNet does not accept any responsibility for any loss that you or anyone else may suffer in connection with the provision of these plans, however that loss may arise (including whether or not arising from the negligence of AARNet, its employees, agents, officers or contractors).

The recipient of these plans must use their own care and diligence in carrying out their works and must carry out further surveys to locate services at their work site. Persons excavating or carrying out other earthworks will be held responsible for any damage caused to AARNet's underground infrastructure.

Disclaimer: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither AARNet nor PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

If you are unable to launch any of the files for viewing and printing, you may need to download and install free viewing and printing software such as Adobe Acrobat Reader (for PDF files)

aarnet
Australia's Academic and Research Network

Sequence No: 269943785
Job No: 52659214
Location: 601 Pacific Hwy, St Leonards, NSW 2065

BEFORE YOU DIG www.byda.com.au



Legend

- Enquiry Area
- AARNet Fibre Optic Assets
- AARNet Power Assets
- Cadastre

N

Scale: 1:1500
Expires: 15 Apr 2026

DISCLAIMER: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither AARNet nor PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

aarnet
Australia's Academic
and Research Network

GPO Box 5519
Chatswood
NSW, 1515

Guidelines for digging in the vicinity of

AARNet Fibre Optic infrastructure

REQUIREMENTS FOR ALL AREAS

Under no circumstances shall construction, digging or excavating work entailing crossing AARNet plant be carried out without first exposing or locating the AARNet asset by an accredited locator and under the supervision of an accredited plant location contractor.

Manual pot-holing needs to be undertaken with extreme care, common-sense and employing techniques least likely to damage cables. For example, orientate shovel blades and trowels parallel to the cable rather than digging across the cable.

Visual location of asset must be carried out by hand digging or using non-destructive water jet method (pot holing) where construction activities may damage or interfere with AARNet assets.

The following minimum clearances must be maintained between mechanical construction activity and the located AARNet asset.

Jackhammers / Pneumatic Breakers	Not within 1.0m of actual location
Vibrating Plate or Wacker Packer Compactor	Not within 0.5m of actual location 300mm compact clearance before compactor can be used over AARNet conduits. 750mm compact clearance cover before compactor can be used Over AARNet Direct Buried cable
Boring Equipment (in-line, horizontal and vertical)	Not within 5.0m of actual location without supervision of accredited plant location contractor onsite OR AARNet asset must exposed via hand dig or nondestructive water jet method (pot holing). AND AARNet asset must not be crossed without first exposing the asset at the crossing point and not without an accredited plant location contractor representative onsite
Heavy vehicle Traffic (over 3 tonnes)	Not to be driven over AARNet conduits or assets with less than 600mm of cover. Depth to be verified via hand digging
Mechanical Excavators, Farm ploughing, Boring, Tree removal, fencing	Not within 1.0m of actual location. Constructor to hand dig or use non-destructive water jet method (pot holing) and expose asset

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and Research Network

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Chatswood
NSW, 1515

REQUIREMENTS FOR URBAN AREAS

Under no circumstances shall construction, digging or excavating work be carried out: within 1.5m of AARNet assets without first locating and identifying the AARNet asset by an accredited locator and under the supervision of an accredited plant location contractor.

REQUIREMENTS FOR RURAL AREAS

Under no circumstances shall construction, digging or excavating work be carried out within 10m of AARNet plant be carried out without first locating and identifying the AARNet asset by an accredited locator and under the supervision of an accredited plant location contractor.

ASSET RELOCATIONS

You are not permitted to relocate, modify or alter any AARNet assets under any circumstances. Please contact AARNet Infrastructure Development Group via email apl-dig@aarnet.edu.au for all enquiries relating to the relocation of AARNet assets.

DAMAGE

AARNet will seek Compensation for any loss caused by damage to its assets. Damage to any AARNet asset must be immediately reported to AARNet NOC on 1300 APL NOC (1300 275 662).

FURTHER ASSISTANCE

Assistance can be obtained by contacting AARNet NOC on 1300 APL NOC (1300 275 662) Where an on-site location is provided by an accredited locator, the owner is responsible for all costs associated with hand digging or use of non-destructive water jet method (pot holing) to visually locate AARNet assets. If plant location drawings or visual location of AARNet assets by digging reveals that the location of AARNet plant is situated wholly or partly within the owner work area, then AARNet Infrastructure Development Group
apl-dig@aarnet.edu.au **must be contacted to discuss possible engineering solutions**.

Ausgrid

Referral
269943774

Member Phone
(02) 4951 0899

Responses from this member

Response received Wed 18 Mar 2026 3.13pm

File name	Page
Response Body	11
How To Read AusGrid Plans.pdf	12
Important Information.pdf	18
N_269943774_GMLA0_Prpsl_1.pdf	19
TR_N_269943774_GMLA0_Prpsl_1.pdf	20
Transmission Letter.pdf	21
Working Near AusGrid Cables.pdf	22

Thank you for contacting Dial Before You Dig (DBYD) prior to engaging in work or activities which may affect the infrastructure of Ausgrid.

WARNING : AUSGRID TRANSMISSION ASSETS FOUND
YOU MUST READ AND UNDERSTAND ALL ATTACHED FILES IN THIS EMAIL BEFORE PROCEEDING WITH ANY WORKS
Please pay special attention to the attached file 'Transmission Letter.pdf'

Job number - 52659214
Sequence number - 269943774

Dig site location -
601 Pacific Hwy
St Leonards
NSW 2065

Attention - Marko Djukanovic

Attached are the files containing information relating to your Dial Before You Dig request.
For further enquiries or assistance with interpretation of plans and search content please contact our DBYD support team via email dbyd.ops@ausgrid.com.au or phone 02 4951 0899.

Please DO NOT SEND A REPLY to this email address as it has been generated by an automated system and replies are not monitored.

If you are unable to launch any of the files for viewing and printing, you may need to download and install free viewing and printing software such as-

Adobe Acrobat Reader (for PDF files).
http://get.adobe.com/reader/
This e-mail may contain confidential or privileged information. If you have received it in error, please notify the sender immediately via return e-mail and then delete the original e-mail. Ausgrid has collected your business contact details for dealing with you in your business capacity. More information about how we handle your personal information, including your right of access is contained at
https://www.ausgrid.com.au/Ausgrid-Privacy-Policy

Reading Ausgrid Plans
COMN0119

1 Property Lines

"property line" (PL), sometimes referred to as **"building line" (BL),** is the standard dimensioning reference point on all Ausgrid plans and represents property boundaries.

Typically, the PL is the boundary between private property and local council's footpath area or nature reserve. Most residential fences and office blocks are erected along the PL.

"kerb line" (KL) is less frequently referred to on Ausgrid plans, and where used will be identified clearly as KL.

Numbers listed within property boundaries should correspond to recognised "street numbers" (refer to figure 1).



Figure 1

2 Datum References

"datum references" identify distances (in metres) from significant features (such as corners of property boundaries) to reference points such as Ausgrid assets (eg: "conduits", "cables", "joints") (refer to figure 2).

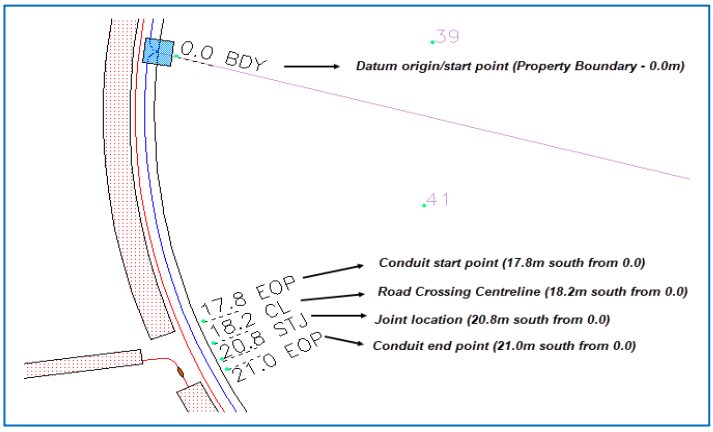


Figure 2

3 Cross Sections

A "cross sections" displayed on Ausgrid plans detail information relating to the relative position (ie: distance from the **"property line",** and the depth of **"cover"**) of Ausgrid assets.

"Cover" is a term used to refer to the depth of cables underground.

A "cross section" leader line will be drawn indicating the location of the displayed **"cable"** or **"conduit"** information on Ausgrid plans.

The distance from **"property line"** (in metres) and depth of **"cover"** (in metres) references are displayed as; ie: 0.6 metres from PL and 0.5 metres underground.

Where distance and cover are not recorded, they will be clearly marked as **"NR".**

NOTE: Distance and cover where indicated may be different to the actual position of the cables (eg: fill may have been placed at site that has changed the ground level).

"PL" distance shown in cross sections is an indicative measure to the centre of the trench allocation from the adjacent property line.

On some plans the "cross sections" may also be shown with a specific number (eg: HR1). This number will match with a cross section detail found in the border of the plot or on a separate plot page (refer to figures 3 and 4).

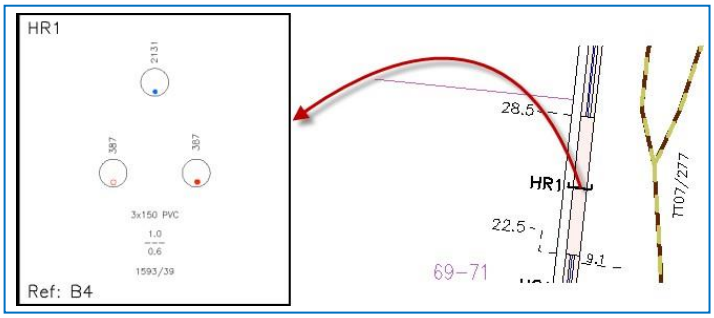


Figure 3

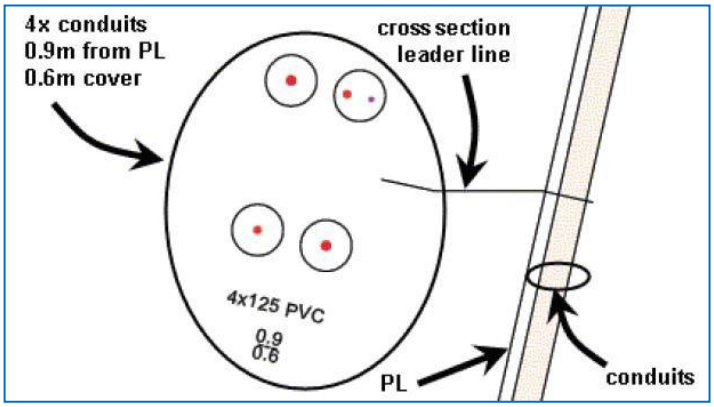


Figure 4

4 Cable Joints and Joint Reports

"cable joints" (numbered individually) and **"joint reports"** (attached to Ausgrid plans) can provide information relating to the relative position of Ausgrid assets, distance from the "property line" (in metres), and the depth of "cover" (in metres) (refer to figures 5 and 6).

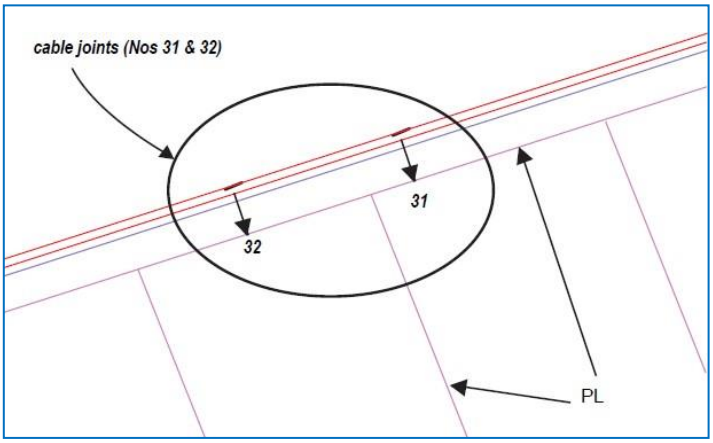


Figure 5

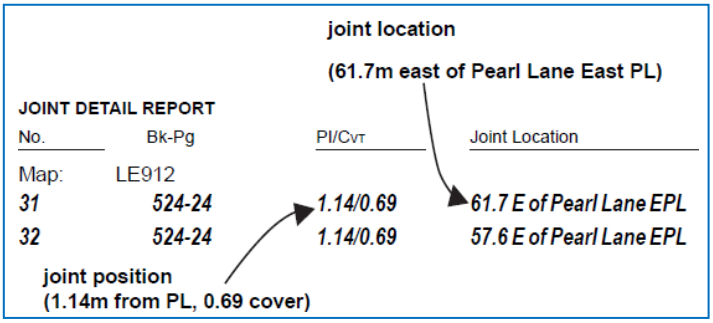


Figure 6

5 Cross Section Detail Boxes

"cross section" detail boxes on the sides of an Ausgrid plan are used when there is insufficient room to display **"cable"** and/or "conduit" information on the Ausgrid plan.

Ausgrid plans (refer to figure 7) are bordered by numeric identifiers along the top and bottom borders and alpha identifiers along the side borders.

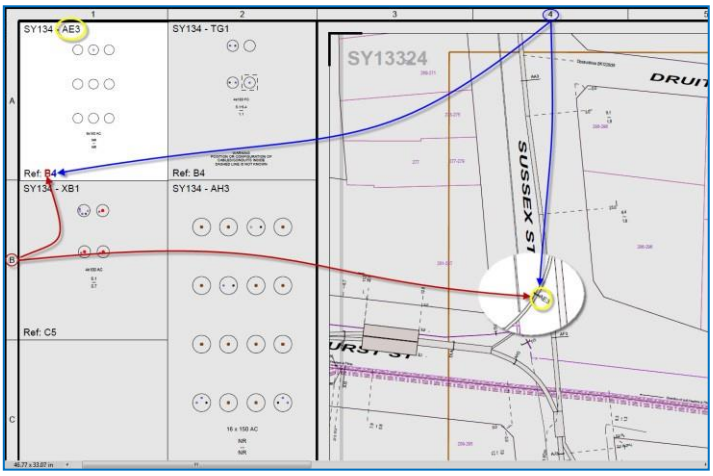


Figure 7

"Cross section" leader line and annotation is drawn on the Ausgrid plan for a reference to **"cable"** and/or **"conduit"** information in the **"cross section"** detail boxes. There are areas where underground work may have been issued for construction by Ausgrid, but details are not yet completely displayed on Ausgrid plans. In such cases a shaded "proposal area" is displayed on the Ausgrid plan, indicating underground work may have commenced in the vicinity but is not yet complete.

6 Pits

Underground **"pits"** are numbered on Ausgrid plans, positioned relative to the **"property line" (PL)**, and can be found on either the footpath (nature strip) or the road (refer figure 8).

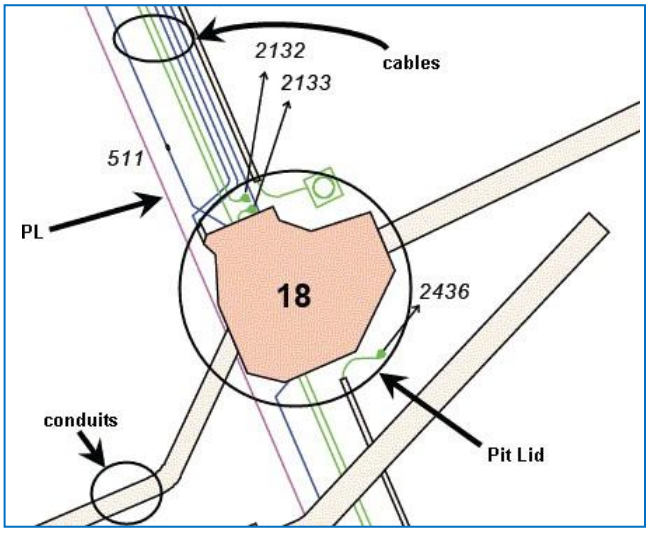


Figure 8

7 Proposal Areas

In some instances, cables and other assets within the shaded **"proposal area"** will be shown in a **bright magenta** colour, indicating that the proposed new work displayed within the shaded area is based on initial planning documentation (refer to figure 9).



Figure 9

In other instances, the shaded **"proposal area"** itself may be shown as a blue colour, indicating that the new work displayed within the shaded area on the Ausgrid plan is yet to include details regarding final depths and dimensioning (refer to figure 10).

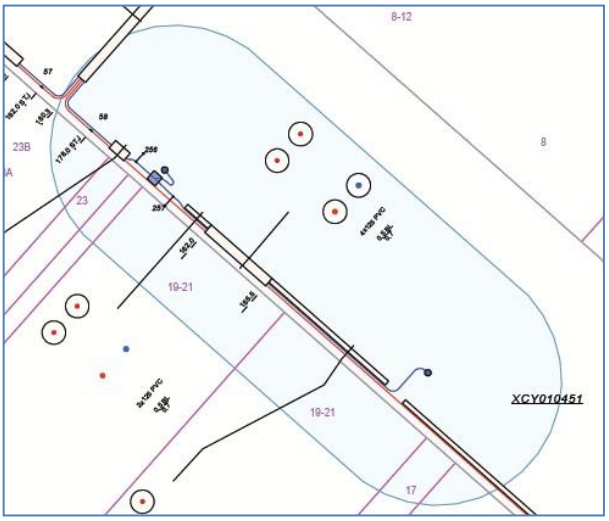


Figure 10

NOTE: In cases where these shaded **"proposal areas"** are displayed on Ausgrid plans.

"Ausgrid's design plans showing the proposed position of its underground cables, overhead lines and structures have been prepared solely for Ausgrid's own planning use. They show the proposed position of such underground cables, overhead lines and structures as proposed at the time of planning and have not necessarily been corrected to take into account any changes to road widths, road levels, fences and buildings subsequent to proposed installation.

Actual installations may vary from proposed installations as it may be necessary to take account of unforeseen above ground or subterranean constructions. Therefore, Ausgrid does not hold out that the design plans show more than the proposed presence or absence of its underground cables, overhead lines and structures in the street and will accept no liability for inaccuracies in the information shown on such design plans from any cause whatsoever."

Any further information regarding information displayed for "proposal areas" can be obtained by contacting the Ausgrid Before You Dig Australia (BYDA) office at the number indicated on the response to your BYDA enquiry for further information.

8 Ausgrid Maps

Depending on the size of the BYDA request, the response will either be a **single map area** or **a cover sheet** and several standard maps.

8.1 Single Map Area Response

The single map area response will have a buffer area shown on the plan that should relate to the original Before You Dig Australia request.

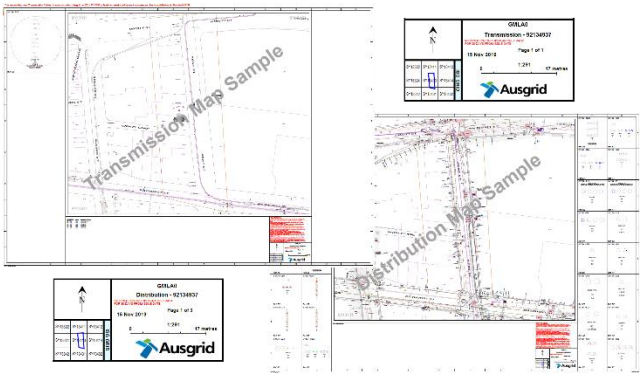


Figure 11

The **map grid index box** on Ausgrid plans should be used when reading the **"joint report"** (see part 4 of this document for more detail) to accurately locate underground cables. The buffer area will display on the grid index box for single map area responses

There are two different size maps that can be produced – A3 will be issued if there are no cross sections in the area, and an A0 will be issued if there are cross sections that are required to be displayed in the detail boxes on the side.

A single map area response could include two maps in the Sydney region. Ausgrid plans are separately labelled as "**Distribution – nnnnnnn"** and **" Transmission – nnnnnnn"**, where **"nnnnnnn"** refers to the BYDA sequence number quoted. If the request does not include any Transmission assets, then only one Distribution map will be issued.

In the Hunter region, the Ausgrid plans show combined **"distribution"** and **"transmission"** voltage assets, are clearly labelled as **"Distr + Trans – nnnnnnn"** where **"nnnnnnn"** refers to the BYDA sequence number.

Some Hunter plans may have transmission cables in the area, when these cables are present there will be a warning printed at the top of the plan supplied: "**"You are working near Transmission Cables. You must contact Ausgrid on (02) 4951 9200 at least two weeks before work commences. See Ausgrid Network Standard NS156"**

8.2 Cover Sheet Response

On a response that includes a cover sheet, the buffer area will only be shown on the cover sheet and it will not appear on the standard maps. The cover sheet will indicate which standard maps have been included and provide a high-level view of the location of the underground details (Figure 12). The standard maps will have the detail of the underground assets (Figure 13).

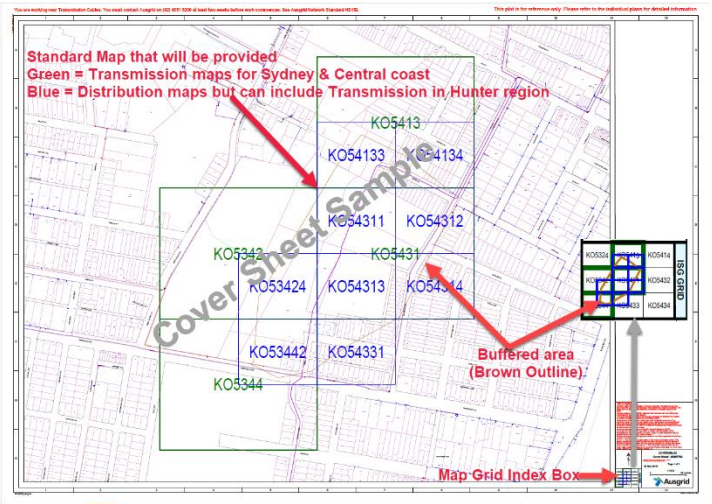


Figure 12

A **map grid index box** has been included in the cover sheet and on the standard maps. The buffer area will only display on the grid index box on the cover sheet and not on standard maps (Figure 12 + Figure 13).

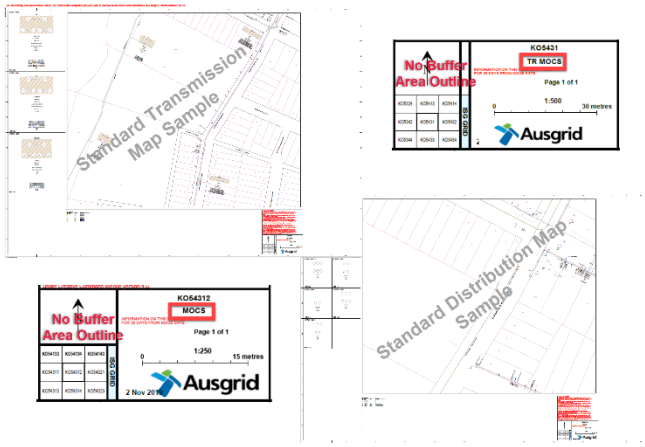


Figure 13

9. Shifting Land Base" on Ausgrid Distribution and Transmission Plans

In some instances, the plans supplied may indicate road or property outlines that appear to have shifted in relation to the Ausgrid assets displayed (refer to figure 14).

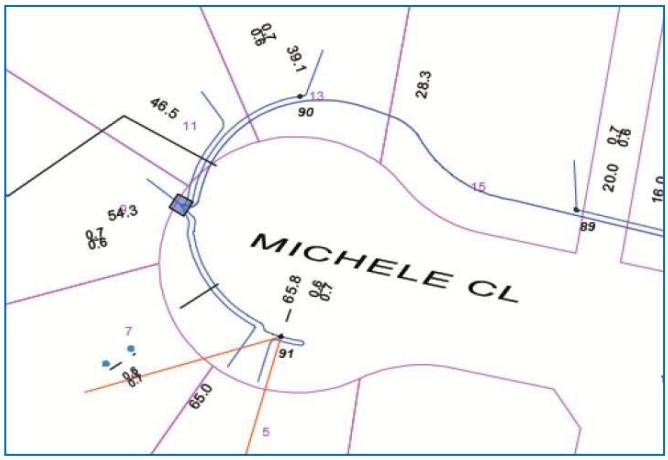


Figure 14

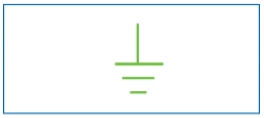
In such instances, always refer to the **"property line"** (in metres) and depth of **"cover"** (in metres) references displayed on the nearest relevant **"cross sections"** to obtain Ausgrid asset location information (*see* Reading Ausgrid Plans, clause 3, Cross Sections for more detail).

10. "Underground Earthing Infrastructure"

In some instances, the plans supplied may also indicatethe presence of underground earthing infrastructure associated with underground and/or overhead Ausgrid assets.

The **"Earth Point"** symbol (refer to figure 15) will be shown on plans to minimize risk of disturbance or damage to any Ausgrid underground earthing infrastructure in the vicinity.

Figure 15



11. Hazardous Cables – Specific Excavation Hazard

Certain low voltage cables are susceptible to deterioration or defects that may pose a risk of electric shock when working near them particularly in damp ground. Other low voltage cables may have an exposed conductive sheath or armour which may, under certain conditions, become energised. These cables may pose a significant risk and will be illustrated as in figures 15 and 16 below. For all work on or near Ausgrid's network where workers have been trained in Ausgrid's "Working near or around underground cables" course the work practices outlined in NS156 "Working near or around underground cables", Technical Guide T0155 "Low Voltage Underground Cables - Degradation of Insulation" for low voltage cables susceptible to deterioration and the Electrical Safety Rules for low voltage exposed conductive sheath or armoured cables must be adhered to. All other persons must contact Ausgrid before excavating near or accessing areas where these cables are present to arrange for appropriate precautions to be applied.

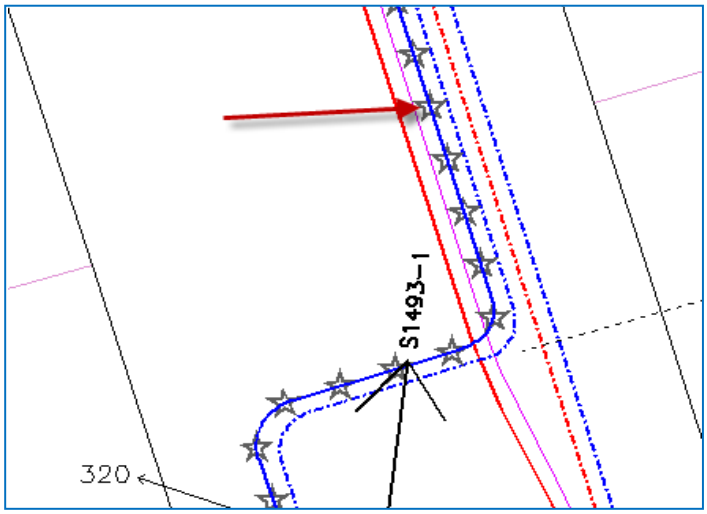


Figure 15

The **"star"** symbols over the cable indicates that it may be susceptible to deterioration or defects or the cable may contain an exposed conductive sheath or armour which could pose an electrical risk to workers.
Cables that are in duct lines have this symbology covered so an at-risk cable is indicated only within a cross section by a **"#"** appended to its cable code as illustrated below.

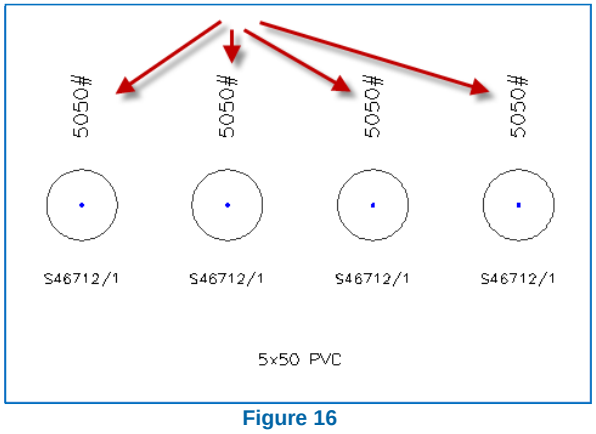


Figure 16

Ausgrid Underground Map Symbology

NOTE: Please note symbology is subject to change. This document provides underground (UG) related objects only. In cases where you are unsure of the data presented, please contact Ausgrid's BYDA for clarification *prior* to any planning/excavation works.

Object		Symbol
HV Cable	HV (High Voltage) 5kV-22kV	In Service / Out of Service
	TR (Transmission) 33kV – 330kV	In Service / Out of Service
LV Cable (Low Voltage)	Mains (Dark blue)	In Service / Out of Service
	Street Lighting (Green) Note: Mains Connector also used as Street Lighting (dark blue)	In Service / Out of Service
	Service (Light blue)	In Service / Out of Service
	Stars are used to highlight At Risk cables	In Service Risk / In Service Risk / In Service Risk
	Unknown	
Auxiliary Cable	Data	In Service / Out of Service
	Comms	
	Telco	
	Protection	
	Fibre Optic	
	Pilot	

Object		Symbol
HV UG Joint	Straight Through, Parallel Branch or Tee	
	Switchgear, End Box or Transition	
HV UG Termination	Sealed end	
	Pot End	
	UGOH	
HV Cable Repair	5kV-330kV (HV & TR)	
LV UG Joint	Straight Through, Parallel Branch, Tee or Service	
	Network Box	
LV UG Termination	Switchgear, End Box or Transition	
	Sealed end	
	Pot End	
	UGOH	

Object		Symbol
Auxiliary Fix	Pilot Window	
Auxiliary Joint	Straight Through, Parallel Branch or Tee	
Auxiliary Termination	UGOH or Pole Termination	
	Pilot	P
	UGOP-ADSS Termination	
Cable Pit (Can be various shapes)	Auxiliary	
	Distribution	
	Transmission	
LV Pillar	Distribution	
	Switch	1-3 WAY / 4+WAY
	SL Pillar	NO SLCP / SLCP
	SL Cubicle	
	Fargo	F
	Private	P
LV Auxiliary Pillar	All Types	
LV Link Box	2 Way & 4 Way	

Ausgrid Underground Map Symbology

Object		Symbol
Substation	Cottage & Chamber	
	Ground & Subtransmission Ground	
	Kiosk & Subtransmission Kiosk	
	Zone	
	Transmission	T
	Bulk Supply Point	BSP
	Metering Station & Subtransmission Metering	
Switching Station	Isolating & Earth	
	Other – OH & UG	
	Ring Main Unit	
Earthing	UG Earth Cable	
	Earth Point	
Frequency Marker	Distribution and Transmission Power	FM Ball or Disc Type Marker
	Auxiliary Communications	FM Ball or Disc Type Marker
	Distribution and Transmission Power	Tape Marker
	Auxiliary Communications	Tape Marker

Object		Symbol
Trench	Centreline	
Conduit (Can be various shapes)	Coverage (Distribution)	
	Coverage (Transmission)	
	Coverage (Underbore – cross hatched)	
Cross Section	Marker (Staple)	
	User Line	
Measure-ment Point		
Miscella-neous Point Feature	Cable Clamp	
	Cable Core split (Trifurcation)	
	Cable Marker	
	Electrolysis Point	E
	End Of Pipe	
	Frequency Injection Unit	IU
	Gas Charger	G
	Gas Control Cabinet	
	Gas Control Kiosk	
	Gas Control Point	
	Gas Control Valve	GV
	Gatic Pit lid	

Object		Symbol
Miscella-neous Point Feature	Inspection Box	
	Link point	
	Oil Control Valve	
	Oil Gauge	
	Oil Tank	
	Sniffer Box	
	Thermocouple Box	
	Transmission Cable Marker	
	Transmission Link Point	
Miscella-neous Linear Feature	All Geometries	
Map Note	Location & Text	Text about note
Dimension Feature	Placement Change	
Lead Cable	Oil/Gas/ Thermocouple	
	Bonding	
	Electrolysis	

Ausgrid

Ausgrid

Emergency Phone Number 131388

IMPORTANT INFORMATION

YOU MUST BE AWARE THAT:

1. There may be underground cables owned by other utilities, in the vicinity of your work, about which Ausgrid has no information.

2. Ausgrid does not usually keep plans of privately owned underground cables or its underground service cables on private property. (Refer NS 156 for further information.)

YOU MUST MAKE YOUR OWN ENQUIRIES IN RESPECT OF THESE CABLES.

YOU MUST UNDERSTAND THAT:

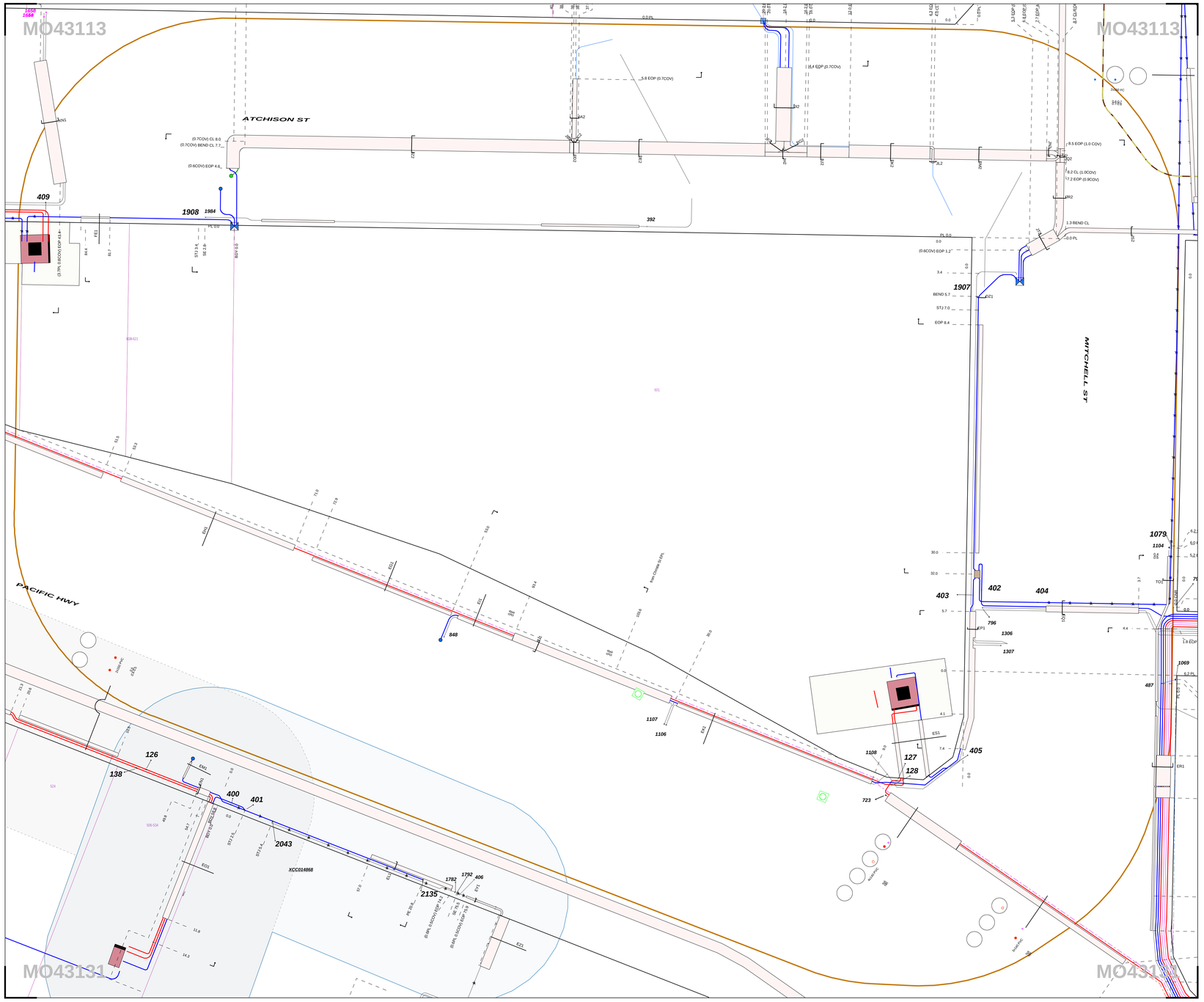
1. Ausgrid takes all reasonable care in providing details of its underground cables. However, owing to changes in road and footway alignments and levels, and the age and incompleteness of some records, it is not possible to conclusively specify the location of all of Ausgrid's underground cables. The accuracy and completeness of the information provided to you cannot be guaranteed. It is intended to be indicative only. It must not be **solely** relied upon when undertaking underground works.

2. Except to the extent that liability may not be capable of lawful exclusion, Ausgrid, its servants and agents will be under no liability whatsoever to any person for loss or damage (including indirect or consequential loss or damage) however caused (including without limitation, for breach of contract, negligence and breach of statute) which may be suffered or incurred from or in connection with the advice provided.

3. Due to the inherent dangers associated with **excavation, under boring and directional drilling** in the vicinity of underground cables, precautions must always be taken when undertaking any underground works. Ausgrid's Network Standard NS 156 specifies standards for working in the vicinity of underground cables. It is deemed to be part of this Advice, and it must be read by you.

4. Due to the inherent risk of compromising the stability of Ausgrid's power poles during excavation which could lead to pole movement or collapse, precautions must always be taken. If excavation is to be carried out within 1m from a power pole, Ausgrid must be contacted at construction.works@ausgrid.com.au for advice. Do not proceed until you have received such advice from Ausgrid.

YOU MUST READ NETWORK STANDARD NS 156, *WORKING NEAR OR AROUND UNDERGROUND CABLES.* IT IS PART OF THIS ADVICE.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You are working near Transmission Cables. You must contact Ausgrid on (02) 4951 9200 at least two weeks before work commences. See Ausgrid Network Standard NS156.



WARNING

Ausgrid's plans show the position of assets at the time of installation and may not account for subsequent changes to road alignments, fences or buildings. The plans show no more than the presence or absence of Ausgrid assets in the street.
Persons working near electricity networks must exercise care and will be held responsible for any damage caused.
You must excavate by hand or use vacuum excavation to establish the location of Ausgrid underground cables and associated assets.
Cables may be live and can cause injury or death by electric shock even if no contact is made. Any work in the vicinity of any cable should only be performed using safe work methods developed in accordance with the recommendations included in SafeWork NSW Code of Practice for Excavation and SafeWork NSW Guide for Work Near Underground Assets
as well as recommendations of Ausgrid's Network Standard NS156.
Overhead: Do not excavate near poles or towers until the stability of the foundation has been assessed by Ausgrid. Cables or earth conductors may be present close to substations, poles or towers.
Workers must maintain safe approach distances and follow applicable SafeWork NSW Codes of Practice.
NOTE: 1. You must keep Ausgrid plans on site during excavation works. If the people actually performing the excavation works do not know how to read and interpret Ausgrid's plans, then the work must be directed by a person who knows how to read and interpret Ausgrid's plans. 2. This information includes data from the NSW Digital Cadastral Database by Land and Property Information (c) 2016, used under Creative Commons Licence version 4.0

N

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GL64224	MO43113	MO43114
GL64242	MO43131	MO43132

GDA 2020

GMLA0

Transmission - 269943774

INFORMATION ON THIS PLAN ONLY VALID FOR 30 DAYS FROM ISSUE DATE

Page 1 of 1

18 Mar 2026

1:151

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Ausgrid

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TR_N_269943774_GMLA0_1.mapf

If further information is required, please contact:
Ausgrid BYDA
Phone: (02) 4951 0899
Fax: (02) 4951 0729

Emergency Phone Number 131388

Underground Cable Location Search Advice

-- Ausgrid Assets Affected including TRANSMISSION --

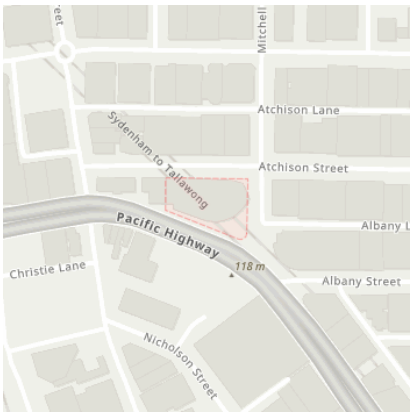
Warning !! There are **TRANSMISSION** cables in the vicinity of your work area. You **must** contact Ausgrid on **(02)4951 9200** to organise an assessment prior to any work commencing. Should Ausgrid deem you may be working within 2m of the **TRANSMISSION** cables you will be required to have an Ausgrid Standby person on site. Please note the Transmission Team require a minimum of **2 week's notice** if required on site.

To:	Marko Djukanovic Stockland Level 25,133-145 Castlereagh Street Sydney NSW 2000		
		Phone No:	+61475520426
		Issue Date:	18/03/2026

In response to your enquiry, Sequence No: 269943774 the records of Ausgrid disclose that there **are** Ausgrid underground cables in the defined search location and relevant Ausgrid plans have been provided.

This search is based on the geographical position of the dig site as denoted in the Before You Dig Australia caller confirmation sheet and an overview is provided:

Address:	601 Pacific Hwy St Leonards NSW 2065
Job #:	52659214



Important

- All information provided to you is **ONLY VALID FOR 30 DAYS** from the date of issue
- You must keep Ausgrid plans on site during excavation works. If the people actually performing the excavation works do not know how to read and interpret Ausgrid's plans, then the work must be directed by a person who knows how to read and interpret plans.
- If you require a full size print of A0 plans and don't have the resources to do so please contact our office on 49510899 to request a hard copy to be posted. **Please allow 3 working days for delivery.**
- Please note you will ONLY receive portions of your search area that contain Ausgrid Underground Assets

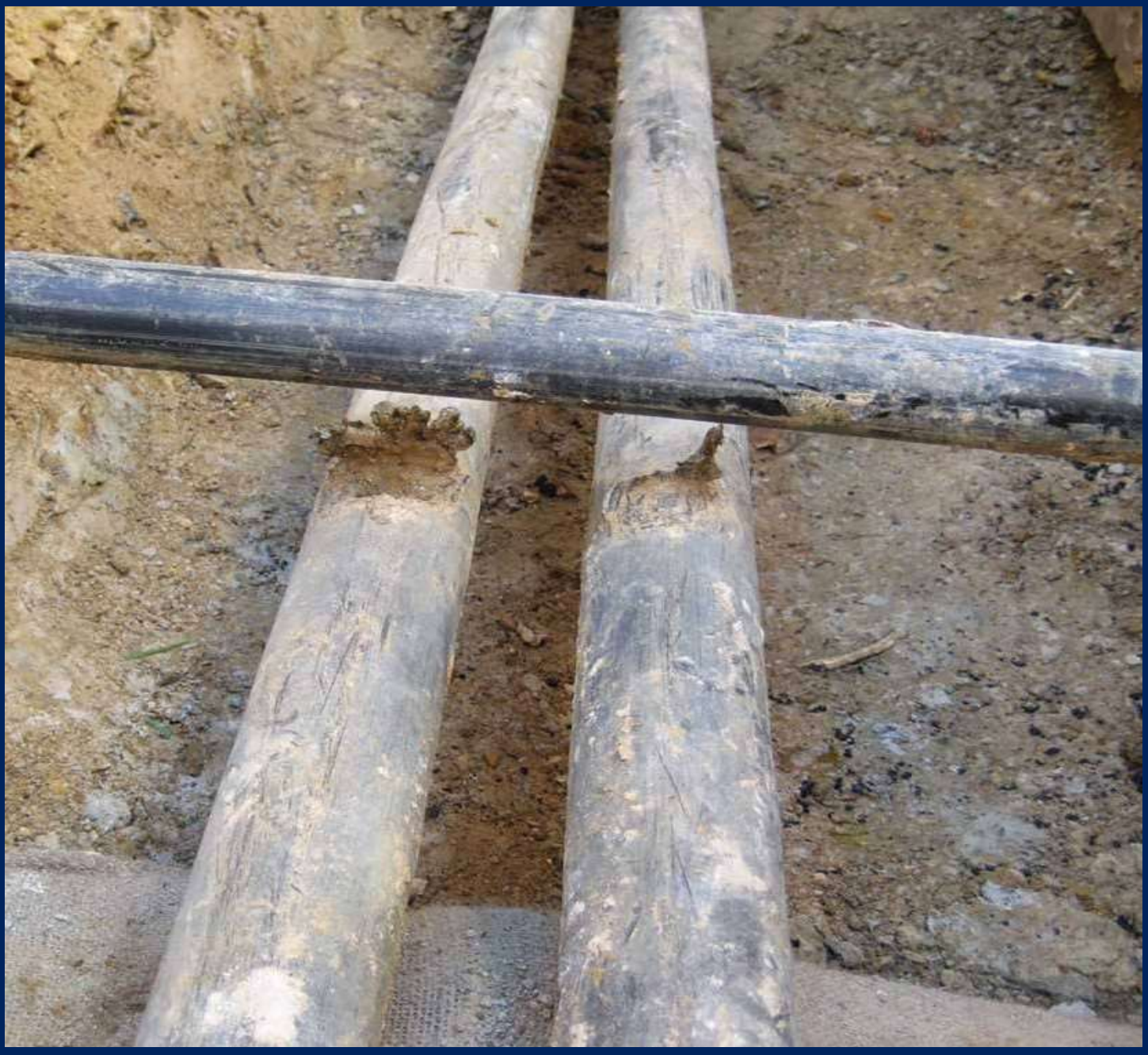
YOU MUST READ AND UNDERSTAND THE *SUPPLEMENTARY MATERIAL* CONTAINED IN THIS ADVICE BEFORE PROCEEDING WITH ANY WORKS.

Summary of Supplementary Information:

Material	Purpose	Location
Important Information.pdf	Details important information	Attached
Working near Ausgrid Cables.pdf	Summary of NS156	Attached
COMN0119 How to Read Ausgrid Plans.pdf	Details how to read Ausgrid plans	Attached
SafeWork NSW "*Work near underground assets: Guide*"	To assist you in deciding appropriate measures to eliminate or control risks when working near underground assets.	Web Link [Click Here]
Ausgrid's Network Standard NS156	For important information for work near or around underground cables	Web Link [Click Here]
Ausgrid's Network Standard NS199	This Network Standard applies to specific work on Ausgrid Low Voltage Underground Assets and Associated Hazards	Web Link [Click Here]
Working in Confined Spaces	For important information when working in confined spaces	Web Link [Click Here]

Working near
Ausgrid cables

Finding out what's below the surface can save your life.
Contact Before You Dig Australia @ www.byda.com.au or call 1100



Ausgrid

Changes in the Law.

NSW legislation now requires people who are planning to do excavation work to obtain copies of underground electricity cable plans through Before You Dig Australia (Phone 1100) and to make sure that the plans are no more than 30 days old when excavation commences.

The aim of the legislation is to ensure that when workers dig near electricity cables, they will establish the exact location of the cables and thus avoid coming into contact with them or damaging them. This will ensure worker safety and also prevent disruption to Ausgrid's electricity network.

This brochure gives you a brief overview of how to prepare for excavation works near or around electricity cables. It is important that you also consult our guide How to Read Ausgrid Plans and make sure that workers engaged in excavation works fully understand how to read the plan. If the people actually doing the digging can't read the plans, it is essential that the work is directed by a person who has been trained to read Ausgrid's plans.

You must also consult Ausgrid's Network Standard NS156, which contains comprehensive information concerning all the issues that arise when excavating near underground cables (such as safety hazards from asbestos conduits and organochlorine pesticides).

Excavating near transmission cables.

If any cable plan you receive says "You are working near transmission cables" it is compulsory to notify Ausgrid two weeks before work is scheduled to begin. Ausgrid will then arrange for an Ausgrid representative to attend the site during excavation work.

Phone the Ausgrid Transmission enquiries line on (02) 4951 9200 to arrange for an Ausgrid representative in your region.



Be prepared. Wise words for safety at work.

Here are some simple precautions you and your workers need to follow to be as safe as possible.

- Make sure that your Before You Dig Australia (BYDA) plan is less than 30 days old
- Keep a copy of the cable plan on site at all times
- Make sure the excavation work is conducted or directed by staff who are trained to read the plan
- Hand dig until the exact location of the cable has been established
- Have on site at all times a first aid kit and a person trained in resuscitation
- Wear protective clothing, including safety footwear and safety helmet
- Have emergency contact numbers on site
- Set up safety barriers, witches hats and warning lights to reduce the risk of injury to the general public
- Comply with all SafeWork NSW requirements and codes.

See also:

- **SafeWork NSW Guidelines: Work Near Underground Assets**
- **SafeWork NSW Code of Practice: Excavation Work**
- **SafeWork NSW Code of Practice: Work Near Overhead Powerlines (if applicable).**

Before you start. Complete the checklist. Stop and look around.

Before you start excavating, consult the flow chart and fill in the checklist at the end of this brochure.

Then, be sure to look for clues where cables might be located on the site: for example, pits, distribution pillars (green and other colours), cables attached to the side of poles, street lights without overhead wires.







Do all power cables look the same?

No. Power cables come in different sizes, colours and coverings. They may be covered in black plastic sheath, steel wires in a sticky bitumen like material, or even a simple lead or steel wire/tape sheath.

What else should I look for below ground level?

Cables may also be buried in orange PVC or PE conduits or even in earthenware or steel pipes. A bank of cables may be covered with electrical bricks, plastic warning markers or protective covers, or they may not be covered at all. If they have been buried close to the surface, they may be covered by concrete slabs or steel plates.

When in doubt, ask Ausgrid.

If you have any questions about excavating near Ausgrid cables, read **NS156** (available at ausgrid.com.au).
For further information call 13 13 65.

You've taken every precaution, but accidents still happen. What now?

If you damage an electricity cable, it is compulsory to notify Ausgrid on **13 13 88**.

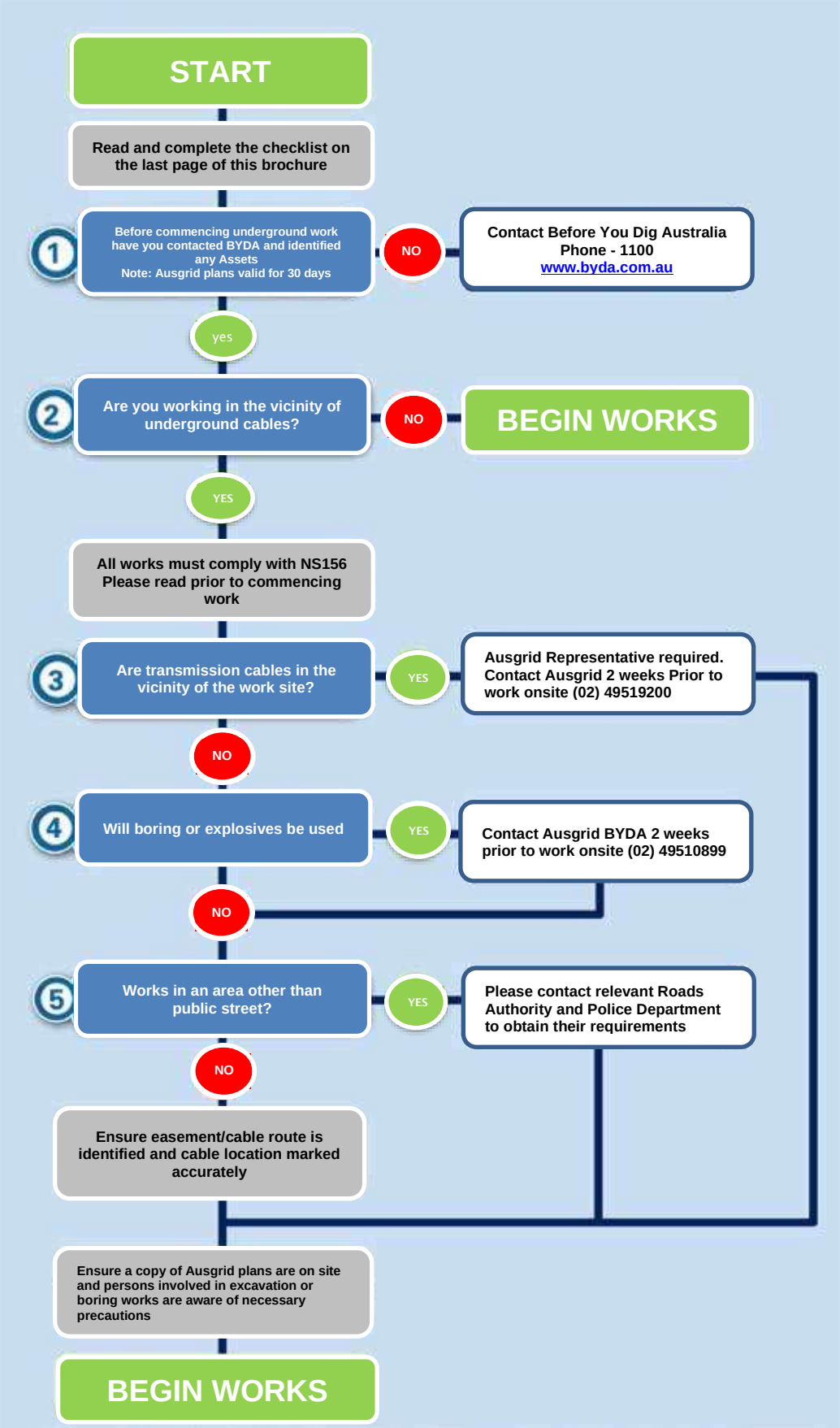
Striking power cables can cause serious damage to the cables and endanger the lives of anyone who comes in contact with them. Machinery and hand operated plant such as jack hammers can become alive if it is in contact with electrical cables or equipment. Keep people well away from machinery and the work site if contact is made with a cable.







Flow Chart for work near Ausgrid Cables



Ausgrid Checklist for work near or around underground cables

It is the responsibility of the Constructor to ensure that underground pits, ducts and cables are not damaged as a result of construction work. It is also your duty to protect your workers from harm or injury. This Checklist is intended to be used as a guide to what Constructors should do to make sure they have satisfied the minimum requirements to minimise damage to underground networks.

PLANS, LOCATION and NOTIFICATIONS	Completed
All relevant utilities plans obtained from Before You Dig Australia? (call 1100 – allow at least 5 working days for plans).	
Checked issue date on all the above plans to ensure issue was within the last 30 days?	
Examined plans and assessed all possible impacts on Ausgrid's network?	
Do you have both Underground Distribution and Transmission Plans (if applicable), on site at all times?	
All cables and conduits shown on the Ausgrid plans been located and marked on the ground?	
If you are planning to use a bore, have you ensured that the equipment is calibrated?	
Have you read and understood the requirements of NS 156? (For copies of NS 156 visit Ausgrid's Website or phone Ausgrid BYDA Office (02) 4951 0899) **www.ausgrid.com.au**	
Have you notified Ausgrid as specified by NS 0156 and complied with requirements? Where an Ausgrid representative is required, two weeks notice is required before work commencing on site. Contact phone number for Transmission cable enquiries is (02) 4951 9200. For all other cases contact Ausgrid BYDA Office: (02) 4951 0899.	
INSPECTION OF WORK BY Ausgrid's REPRESENTATIVE	
Is the Ausgrid representative on site for any work near or around* any transmission cable before you start? (*Refer to NS 156.)	
For proposed work near or around* cables other than transmission and/or conduits, are any requirements specified by Ausgrid's representative clearly understood and ready to be applied before you start the work? (*Refer to NS 156.)	
PROTECTION	
Check that all people on-site have been made aware of the presence and location of ALL Ausgrid underground cables and/or conduits; especially boring, drilling and trenching machine operators?	
Is there any asbestos or asbestos containing material in Ausgrid's underground network assets?	
Have you checked for the presence of any Organo-Chloride Pesticides (OCP) in transmission trenches?	
Is the site supervisor monitoring all machine operators working near or around Ausgrid's underground cables and/or conduits?	
Are the requirements specified by Ausgrid's representative being followed?	
Are Ausgrid's requirements in place for any exposed cables and/or conduits to be supported and protected?	
Have you marked all exposed underground cables and/or conduits with flags that are clearly visible from within all machinery used on-site?	
Have safety barriers, fencing or para-webbing been erected to protect staff and the public as well underground cables and/or conduits in areas that are at risk?	
Have safety barriers, fencing or para-webbing been erected to protect staff and the public as well underground cables and/ conduits in areas that are at risk?	

In the event of DAMAGE to Ausgrid's cable or conduits, call 13 13 88 immediately.

PROCEED with CAUTION

It is your responsibility to protect Ausgrid's cables and conduits from damage and your Duty of Care to protect your workers from harm or injury.

Signed: _____ **Date:** _____ **/** _____ **/** _____

Responsible person on site

For more information call 13 13 65 or visit www.ausgrid.com.au

Aussie Broadband Pty Ltd

Referral
269943777

Member Phone
(03) 8907 8799

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	29
ABB LETTER 269943777.pdf	30
ASSET 269943777.pdf	35

Attention: Marko Djukanovic

Thank you for your Before You Dig (BYDA) enquiry.

Job Number: **52659214**
Sequence Number: **269943777**
Dig Site Location: **601 Pacific Hwy St Leonards**

According to our records your enquiry with the following details **impacts our infrastructure**. Please ensure that you read the attached documents, it contains important information including essential steps that must be undertaken prior to commencing construction activities.

This enquiry is valid for 30 days from the enquiry date.

If you require further information or assistance with interpretation of plans, please contact Aussie Broadband on dbyd@team.aussiebroadband.com.au

This enquiry response, including any associated documentation, has been assessed and compiled from the information detailed within the BYDA enquiry outlined above. Please ensure that the BYDA enquiry details and this response accurately reflect your proposed works.

18 March 2026

Marko
Djukanovic
Stockland
Level 25 133-145 Castlereagh Street
Sydney NSW 2065

Dear Marko Djukanovic

BEFORE YOU DIG AUSTRALIA - JOB: 52659214 SEQ: 269943777

Thank you for your enquiry regarding the below mentioned area.

Enquiry Date: 18 March 2026
Address: 601 Pacific Hwy
Suburb: St Leonards
State: NSW, 2065

Additional Information:

YES - We can confirm, Aussie Broadband has Fibre Optic Services within the vicinity.

Please find attached a copy of the services plan for the location you have specified.
These plans are valid for 30 days from the date requested.

IMPORTANT INFORMATION

Drawings and plans provided by Aussie Broadband are reference diagrams which were correct at the time the asset was built. Exact ground cover and alignments cannot be provided with any certainty, as these may alter over time. Depth of the Telecommunications asset can vary considerably as can alignments. The plans provided are to be used as a guide only.

Identifying Aussie Broadband asset visually is critical. Information on how this can be arranged is provided in this document.

Please email **dbyd@team.aussiebroadband.com.au** for general enquiries about the information provided within this response.

Yours sincerely,
Aussie Broadband Team

DUTY OF CARE

The Constructor has a legal "Duty of Care" that must be observed when working in the vicinity of any Aussie Broadband asset.

It is the responsibility of the Constructor to design their works with no impact to the Aussie Broadband asset.

The Constructor must;

a. Obtain and review plans for a specified area through Before You Dig Australia within a reasonable timeframe before construction begins.

b. Visually locate the Aussie Broadband asset, using a Aussie Broadband Accredited Locator who will vacuum excavate (potholing) where construction activities may damage or interfere with the Aussie Broadband asset.
Refer to "Clearances for Work in the Vicinity of the Aussie Broadband Asset" section below for more information.

c. Contact Aussie Broadband if the Aussie Broadband asset is wholly or partly located near planned construction activities.

NOTE: Plans are provided free of charge from BYDA. Request for plans of a larger area may incur a cost.

DAMAGE

The Constructor will be held responsible for all asset damage when work commences prior to obtaining the Aussie Broadband plans, or failure to follow instructions.

ANY DAMAGE TO The Aussie Broadband ASSET MUST BE REPORTED TO 03 8907 8799 IMMEDIATELY

Aussie Broadband reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

ASSET RELOCATIONS

The Constructor is not permitted to relocate or alter any Aussie Broadband asset or network under any circumstance.

For all enquiries relating to the relocation of a Aussie Broadband asset please email fibre.relocations@team.aussiebroadband.com.au

RESOLUTION OF POINTS OF CONFLICT

Should asset location and potholing reveal points of conflict between the Constructors planned works and the existing Aussie Broadband asset, the Constructor should contact Aussie Broadband for advice and to discuss possible solutions.

Please contact the Fibre Operations Team
Phone: 03 8907 8799 • Email: dbyd@team.aussiebroadband.com.au

ASSESSMENT OF RISK AND PROTECTIVE ACTIONS

Where "Protective works" are required around existing Aussie Broadband asset, a solution will be confirmed on a case by case basis. The cost of the Protective works are the responsibility of the Constructor and the works will be carried out by a Aussie Broadband Accredited Contractor.

Where "Relocation works" of the Aussie Broadband asset is part of an agreed solution, a Project Manager will be assigned to work with the Constructor. The cost of the Relocation works are the responsibility of the Constructor and the works will be carried out by a Aussie Broadband Accredited Contractor.

If any of the above numbers are uncontactable and your call is urgent, please call the Aussie Broadband Network Security and Operations Centre (NSOC) on 03 8907 8700

Aussie Broadband accepts no liability for the information provided to the Constructor by the Locators listed above.

Further to this, the Constructor acknowledges that the Locator is the agent of the Constructor and that Aussie Broadband takes no responsibility for the Locators' acts or omissions.

- For all work within 2.5 metres of nominal location, the Constructor is required to prove the actual location of the asset by potholing and exposing before commencing work.
- Potholing to expose and locate the Aussie Broadband asset is required before work commences and every 3 metres where the Constructors works are parallel to the Aussie Broadband asset.
- The Constructor is responsible for all asset damages when works commence without the Aussie Broadband plans or by failure to follow advice and/or instructions from Aussie Broadband.

NOTE: No machinery shall be used within 1 metre of the Aussie Broadband asset until the actual location has been determined by potholing using hand tools.

NOTE: No heavy earth working machinery shall be used within 5 metres of the Aussie Broadband asset until the actual location has been determined by potholing using hand tools.

CLEARANCES FOR WORK IN THE VICINITY OF The Aussie Broadband ASSET

These figures represent the minimum clearance cover to be maintained over the Aussie Broadband asset. Please note that the actual cover over existing asset may be greater or less than recommended figures. Exact alignment and depths cannot be given with certainty as such levels can change over time

Footpath and Verge Areas	450mm
Roadways	600mm

These figures represent the minimum clearance between construction and actual location of the Aussie Broadband asset.

Jackhammers / Pneumatic Breakers	450mm
Vibrating Plate or Wacker Packer Compactors	600mm
Heavy Vehicle Traffic	Not to be driven across the Aussie Broadband asset with less than 600mm cover. The Constructor is to check the depth by potholing using hand tools.
Mechanical Excavators	Not within 1 metre of actual location. The Constructor is to pothole and expose the asset using hand tools.
Boring Equipment (in-line, horizontal and vertical)	Not within 2.5 metres of actual location. The Constructor is to pothole and expose the asset.

Access to the Aussie Broadband pits must remain accessible and at ground level at all times.

Any information provided is valid for 30 days only from the date of issue of this document.
If the works extend beyond this period, or if the designs are altered in any way, you are requested to re-submit your proposal for re-assessment by contacting Before You Dig Australia.

Phone 1100 or check the website for more details http://www.1100.com.au

Schedule The Criminal Code
Chapter 10 National infrastructure
Part 10.6 Telecommunications Services Division 474
Telecommunications offences

474.6 Interference with facilities

(1) A person is guilty of an offence if the person tampers with, or interferes with, a facility owned or operated by:

(a) a carrier; or
(b) a carriage service provider; or
(c) a nominated carrier.

Penalty: Imprisonment for 1 year.

(2) For the purposes of an offence against subsection (1), absolute liability applies to the physical element of circumstance of the offence, that the facility is owned or operated by a carrier, a carriage service provider or a nominated carrier.

(3) A person is guilty of an offence if:

(a) the person tampers with, or interferes with, a facility owned or operated by:

(i) a carrier; or
(ii) a carriage service provider; or
(iii) a nominated carrier; and

(b) this conduct results in hindering the normal operation of a carriage service supplied by a carriage service provider.

Penalty: Imprisonment for 2 years.

(4) For the purposes of an offence against subsection (3), absolute liability applies to the following physical elements of circumstance of the offence:

(a) that the facility is owned or operated by a carrier, a carriage service provider or a nominated carrier;

(b) that the carriage service is supplied by a carriage service provider.

(5) A person is guilty of an offence if:

(a) the person uses or operates any apparatus or device (whether or not it is comprised in, connected to or used in connection with a telecommunications network); and

(b) this conduct results in hindering the normal operation of a carriage service supplied by a carriage service provider.

Penalty: Imprisonment for 2 years.

Aussie Broadband

Job # 52659214
Seq # 269943777
Provider: Aussie Broadband Pty Ltd
Telephone: (03) 5165 0073

BEFORE YOU DIG www.byda.com.au



Legend

BYDA Enquiry

Disclaimer: The plan is provided in response to a Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of Aussie Broadband's infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation are recommended before commencement of any project based on this data.

In an emergency contact Aussie Broadband on 03 5165 0073

Index Sheet

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Plans generated by SmarterWX™ Automate

Referral
269943781

Member Phone
1300 880 906

Responses from this member

Response received Wed 18 Mar 2026 4.50pm

File name	Page
Response Body	37
GAS-9899-GL-CN-001 Guideline for constructing around AS4645 assets (rev 1).pdf	38
image1	Excluded
Jemena_BYDAResponse_SEC_52659214_269943781.pdf	61
JGN_BYDA_Coversheet_2025_High_Pressure_Secondary.pdf	63

Dear Marko Djukanovic

REF: BYDA JOB:52659214 SEQ:269943781 - 601 Pacific Hwy St Leonards NSW 2065

Thank you for your BYDA inquiry. For a detailed response from Jemena, please refer to the attached documents.

WARNING - HIGH PRESSURE GAS MAINS MAY BE IN YOUR WORK AREA.

For your safety and to further reduce the risk of accidental hit to Jemena's services, the attached plans will now show lines from the mains to the serviced properties, representing Jemena's Gas Service Pipes. This new detail is explained further on the attached legend.

To arrange a Jemena Representative please log a request via https://myportal.jemena.com.au/ and choose 'Gas Mains' application type and 'High Pressure Standby Service'. If you do not have an account, you will need to choose 'register' and follow the prompts.

Please review the attached Construction Guidelines - ***'GAS-9899-GL-CN-001 Guideline for construction around AS4645 assets'*** and ensure that you meet the minimum construction requirements in this document. If the minimum requirements cannot be achieved, submit your proposal in the form of an Application via **https://myportal.jemena.com.au/** and choose 'Gas Mains' application type and select 'Encroachments', an Engineering review will be conducted to address the considerations. Please allow up to 10 working days for the application to be reviewed.

Kindly note that a duty of care exists to ensure that Jemena assets are not compromised or damaged during any future development or construction work.

Jemena's expectation is that the excavator operator holds a current Verification of Competency (VOC) or equivalent for the machine to be used near a Jemena Gas Transmission Asset.

For further standby enquiries, contact High Pressure Coordinator via infrastructureprotection@jemena.com.au or call 1300 665 380

This information is valid for 28 days from the date of enquiry.

Regards

BYDA Admin, Jemena
Level 10, 99 Walker Street North Sydney, NSW 2060
PO Box 1220, North Sydney, NSW 2059
1300 880 906
www.jemena.com.au |
www.gonaturalgas.com.au

Natural Gas Jemena bringing energy to life

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****

GUIDELINE

GUIDELINE TO DESIGNING, CONSTRUCTING AND OPERATING AROUND THE EXISTING AS4645 NATURAL GAS NETWORK

GAS-9899-GL-CN-001

Revision Number: 1
Revision Date: 11/03/2025

AUTHORISATION

Reviewed by

Name	Job Title	Signature	Date
Richard Chawa	Principal Engineer – Distribution	R Chawa	12 / 03 /2025

Approved by

Name	Job Title	Signature	Date
John Martin	Engineering Support Manager – Gas Distribution	John Martin	13/03/2025

PUBLIC

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Jemena
bringing energy to life

DOCUMENT HISTORY

Revision	Date	Author	Description of Changes
A	30/05/2022	Andrew Walker	Draft
0	22/07/2022	Andrew Walker	Final
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OWNING FUNCTIONAL GROUP & DEPARTMENT / TEAM

Gas Distribution : Asset Management

REVIEW DETAILS

Review Period:	Review Date + 3 years
Next Review Due:	December 2025

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1 INTRODUCTION

1.1 GAS NETWORKS AND MANAGING RISK

Jemena operates and maintains gas distribution networks throughout NSW and ACT. These networks operate at gas pressures ranging from 2kPa to 1050kPa. Failure to follow the guidelines listed in this document may lead to damage to these gas distribution networks, resulting in Catastrophic consequences, loss of life, and major damage to property and infrastructure as well as loss of gas supply to thousands of gas consumers.

To manage the risk of damage to gas networks from construction activity, Jemena participates in the Before You Dig Australia (Visit: www.byda.com.au) system and provides information to Third Parties planning to perform work around Jemena networks. Our Secondary and Critical gas mains are continuously patrolled via ground patrol, and monitored 24/7 by a Control System.

To make an encroachment enquiry for any work potentially near a gas main, the first step is to lodge a BYDA enquiry. If the BYDA enquiry identifies work near a Jemena asset, you will be issued with a response document by the BYDA system. This response document will provide detail on the process to proceed.

For Jemena Gas Networks (NSW) and EVO Energy Network (ACT) assets, this next step will be to book a Jemena Representative to attend site and to review the proposed work. Depending on the complexity of the job, this may result in further detail being required by Jemena before the proposed work can proceed. To progress this step, an enquiry must be registered via the Jemena Gas Portal located at the following address:

myportal.jemena.com.au

For the remainder of Jemena's gas assets, the process to proceed with Jemena assessment and approval of your proposed work is to review the response document. A Jemena representative will then make contact regarding your proposed work, however, if this contact is not received, the Third Party is not authorised to undertake any work and written Jemena consent must be sought by contacting the appropriate Jemena representative listed on the BYDA response.

1.2 PURPOSE

This document has been developed to provide general guidelines to assist the Third Party in their design/construction proposal prior to submitting it to Jemena for review.

This document does NOT authorise the Third Party to carry out any construction activities unless the design/construction proposal has been reviewed, assessed and accepted by Jemena.

1.3 SCOPE

This document shall be limited to AS/NZS 4645 assets (mains, services, and district regulator sets with an operating pressure ≤1050kPa).

For AS/NZS 2885 assets (>1050kPa), please refer to GAS-960-GL-PL-001 – Designing, Constructing and Operating Assets Near Jemena Gas Pipelines.

For Boundary Regulator Sets, Meter Sets, and services within properties, with an operating pressure ≤400kPa, please refer to the Jemena Network Operator Rules.

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1.4 TERMS & DEFINITIONS

Term	Definition
Compaction	Backfilling and compaction of pipe in accordance with Jemena's requirements.
Concrete capping	A physical protection measure made of concrete placed above the gas asset, applied when normal depths of cover cannot be achieved.
Concrete slab	A concrete surface layer, e.g. Driveway, footpath, roadway.
CP	Cathodic Protection
Critical Main	A gas main that is a single source of supply to a large number of gas customers.
BYDA	Before You Dig Australia
DRS	District Regulator Set
Easement	An easement is a form of tenure that is acquired by Jemena to provide protection to its high pressure gas assets. Easements give Jemena the right to use the land for operating its assets and include mandatory requirements for any landholder and third party undertaking work on, over or near the easement.
EvoEnergy Gas Network	A Gas Distribution Network operated by Jemena in Nowra and the Australian Capital Territory (and surrounds)
Encroachment	Any design or construction activity and changes in operating condition that may impact on the integrity of the pipeline.
Gas Main	A Jemena owned/operated natural gas pipeline that operates between 2 kPa and 1050 kPa pressure.
HDD	Horizontal Directional Drilling
High pressure gas main	A gas main with a pressure of 1050 kPa or greater which includes Secondary, Primary and Trunk mains, or that has been identified as high risk.
High Voltage	Voltage that is greater than or equal to 11 kV
Jemena Pipeline (AS2885 pipeline)	A Jemena owned/operated natural gas pipeline that operates above 1050 kPa pressure.
Jemena Representative/Standby	An individual who has been authorised by Jemena as having undertaken the appropriate training and meets the competency requirements. A Jemena Representative will be present on site while third party work is undertaken and will issue the Third Party Works Notice prior to commencement of this work.
Low Pressure Main	A gas main that operates at a pressure no greater than 7kPa.

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Term	Definition
MAOP	Maximum Allowable Operating Pressure
Medium Pressure Main	A gas main that operates at pressures between 30kPa and 400kPa.
NAPTHA main	An isolated Jemena owned asset that shall be treated as a Jemena Secondary Main
PE Slabbing	A layer of polyethene material approved as a procedural and physical protection measure for gas mains
PPE	Personal Protective Equipment
Road Reserves	Road Reserves are as defined by the relevant states Land Act and typically include footpath, stormwater drains, roadways, median strips, bus lanes and cycleways.
Secondary Main	A gas main that operates at a pressure of 1050kPa.
Shall	Designates a mandatory action
SWMS	Safe Work Method Statement
TfNSW	Transport for New South Wales
Third Party	Developer, Builder, Owner, Contractor or Customer planning or conducting works in the vicinity of Jemena Gas Networks.
Work site	The location of the intended work that the requestor is requesting a standby for.

1.5 REFERENCE DOCUMENTS

- AS/NZS 4645 (Series) Gas Distribution Networks
- AS 2885 (Series) Pipelines - Gas and liquid petroleum
- AS 4853 Electrical hazards on metallic pipelines

1.6 EMERGENCY CONTACT DETAILS

For faults and emergencies only:

- Jemena Gas Network (NSW) / EVO Energy Distribution (NSW/ACT) **132 909**

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2 DUTY OF CARE FOR WORKING AROUND JEMENA GAS NETWORKS

Working near gas mains is extremely dangerous if appropriate controls are not introduced and followed. You should always exercise due care and caution when working near any gas infrastructure. In addition to your general duty of care, there may be other obligations under relevant state legislations which require you to maintain safe practices.

Due care **must** be exercised at all times to ensure there is no damage to any Jemena gas main, gas service, regulator set, asset (marker post, fencing, structure), or land.

Any damage shall be reported to Jemena immediately (see SECTION 1.6 for emergency contact numbers).

On the Jemena Gas Network, a Jemena Standby is required when working within 3m of a:

- Secondary main, or
- Critical gas main, or
- District Regulator Set, or
- Naptha main

To book a Jemena Standby for the Jemena Gas Network, please go to myportal.jemena.com.au, Select a “New Application” / “Gas Mains” / “High Pressure Standby Service”.

On the EvoEnergy Gas Network, a Jemena Standby is required when working within 3m of a:

- Secondary main, or
- Medium pressure gas main with a diameter of 75mm or greater, or
- District Regulator Set

Please note, to book a Jemena Standby / Representative on the EvoEnergy Gas Network, please call **1300 503 237** only.

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3 APPROVAL PROCESS

3.1 JEMENA GAS PORTAL

The Third Party shall contact Jemena via the Jemena Customer Portal, myportal.jemena.com.au when:

a) works are proposed within 3m of a Secondary or Critical main, or
b) proposed works will encroach within 500mm of a Medium or Low pressure main, or
c) there are proposed changes to the depth of cover over Jemena assets, or
d) High Voltage (HV) cables are proposed to be installed within **5m** of a steel main, or
e) Extra High Voltage (EHV) cables are proposed to be installed within 20m of a steel main
f) Vibration activity as per section 4.17.
g) Proposed tree canopy will encroach the gas main alignment in its full maturity.
h) There are proposed changes to the ground conditions. For e.g from non-trafficable to trafficable.

A site meeting may also be requested via the Jemena Customer Portal.

If it is determined that the proposed design/work is a **Standard Encroachment**, a discussion and an agreement of the next step will be undertaken to ensure a Jemena Representative/Standby will be available to oversee that the works are undertaken.

If the proposed design/construction does not meet the minimum requirements of this document, then it is considered a **Non Standard Encroachment**. The Third Party may be required to submit their plans to the Jemena Portal, raising a New Gas Application, and selecting Gas Mains, then Encroachments in order for the works to be reviewed. Please note, that there is a fee associated for Non Standard Encroachment reviews.

3.2 JEMENA ENGINEERING REVIEW

If a review of the proposed design/construction is required, the third party shall provide the following information via a New Gas Application in Jemena's Gas Portal for review:

a) Scope/Description of the project impacting on Jemena's assets
b) Site layout drawings which shall include the following:
    i. The location/address of the proposed work.
    ii. Existing and proposed depth of cover
c) Design drawings which shall include the following:
    i. Plan drawings showing the location of Jemena's assets and the proposed works, including horizontal separation distances;
    ii. Cross sectional drawings showing the vertical separation distances as well as existing and proposed depths of cover over Jemena's assets.
    iii. Proposed pavement details where applicable;
d) Size of plant or equipment to be used;
e) Electrical Hazard Assessment in accordance with AS/NZS 4853 for any HV works.

Additional information may be requested as required.

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4 GENERAL PRINCIPLES FOR CONSTRUCTION ACTIVITIES

Unless stipulated by Jemena Engineering, the following principles are to be followed.

4.1 ROAD RESERVES AND PARK LAND

Where the gas assets are in road reserves and park lands, the TfNSW or Council are required to notify Jemena when construction works are proposed.

Gas mains shall cross roads at or close to a right angle.

4.2 CONSTRUCTION VEHICLES CROSSING GAS ASSETS

a) Where the minimum depth of cover over a gas asset is 600mm from the top of a sealed area (eg. road/driveway) to top of pipe to of a gas main/service, the acceptable load for vehicles or plant crossing over gas assets is 8 tonnes/axle.
b) Where any construction vehicle crosses a gas main in an unsealed area (e.g. footpaths, park land, road works etc.), the location and depth of the gas main shall be confirmed. All information (ie. depth, weight of vehicle, protection measures, etc.) shall be sent to Jemena Engineering for review.
c) Where a crane needs to set up over a gas main, the location and depth of the gas main shall be confirmed. All information (ie. depth, weight of vehicle, protection measures, etc.) shall be sent to Jemena Engineering for review.
d) Heavy construction vehicles must cross over gas assets **only** at designated locations at right angles.

4.3 EXCAVATION

a) Where a construction activity is required within 3m of a secondary or critical main, a Jemena Standby/Representative shall be present. Excavation shall not commence until the Jemena Standby/Representative is present.
b) If the excavator is greater than a 20 tonne class machine, advice must be sought from Jemena Engineering (via the Gas Portal Application).
c) Ensure the locations of all third party assets have been clearly identified and marked.
d) Locating of the gas mains shall be performed via potholing. Where potholing of a Secondary or critical main is required, a Jemena Standby/Representative shall be present.
e) If a valve is identified at the location, gauges points are likely to be present approximately one metre either side of the centreline of the valve. Gas marker stones may or may not be present at the valve. Hand excavation shall be carried out to locate the valve and gauge points. Note, all valves 200mm or greater are offset to the centreline of the main, but gauge points will still be on the centreline of the main.
f) If syphon risers are identified at the location, gas marker stones may or may not be present at the riser. Hand excavation shall be carried out to locate the riser.
g) Where the excavation is carried out near the gas asset using an excavator, the excavator shall use a toothless (gummy) or mud bucket.
h) If permissible, use HydroVac equipment to positively and visually identify the gas main location and depth along the proposed excavation area, measure the depth and mark the centreline on the ground. Refer to Appendix 7.1 for water pressure limits. AirVac may also be permissible, subject to Jemena approval.

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i) No mechanical excavation is permitted within 600mm of a gas main, unless permission has been given by Jemena Engineering or a Jemena Standby/Representative.
j) No piling or augers shall be within 1m of the gas main unless permission has been given by Jemena Engineering or a Jemena Standby/Representative. Continuous vibration monitoring shall be required for any auger or piling works within 5m of a gas main.
k) If the gas asset is going to be exposed for more than one day, physical protection methods shall be used such as:
    i. Hessian
    ii. Rock shield
    iii. Sand or sand bags
    iv. Steel road plates
    v. Site fencing or barriers

4.4 STOCKPILING

The third party shall **not** stockpile machinery, construction, or waste materials directly over gas assets, or within three metres of the gas asset without obtaining Jemena approval.

4.5 SEPARATION DISTANCES

The following minimum separation distances shall be maintained between the gas asset and other services. If these requirements cannot be met, then the proposed design shall be sent to Jemena Engineering via the Jemena Gas Portal Encroachments Application for an Engineering assessment.

4.5.1 UTILITIES

4.5.1.1 Trenching (Open Cut)

Unless otherwise stated, the following minimum separation distances shall apply to both horizontal and vertical separation between a gas asset and another utility:

a) When possible and within reason, other utilities shall cross underneath gas mains.
b) From Secondary and medium pressure steel mains that are 150mm or smaller in diameter:
    i. 300mm when parallel or crossing over the gas asset.
    ii. 500mm when crossing under the gas asset.
c) 500mm from Secondary and medium pressure steel mains that are 200mm or greater in diameter.
d) 300mm from low and medium pressure plastic mains.
e) 500mm from DRSs.
f) 500mm between steel mains and any electrical cables. In addition, for High Voltage electrical cables (≥11kV), an Electrical Hazard Assessment as per AS/NZS 4853 shall be prepared by Third Party and forwarded to Jemena Engineering for review and acceptance. Refer to Section 4.6.
g) For Extra High Voltage electrical cables (≥100kV) near steel gas mains, 4000mm horizontal separation when in parallel, and 1500mm vertical separation when crossing the gas main. In addition an Electrical Hazard Assessment as per AS/NZS 4853 shall be prepared by Third Party and forwarded to Jemena Engineering for review and acceptance. Refer to Section 4.6.
h) 500mm from Thermal Stabilising Backfill (TSB).
i) 300mm from Stabilised Sand

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4.5.1.2 Trenchless (Horizontal Direction drill, Horizontal Bore, etc)

If a trenchless activity is proposed to be carried out near or across gas assets, the Jemena representative shall discuss with the Third Party the following details:

a) Drill path profile
b) Depth of drill under the gas assets
c) Separation distance between the new service and the existing gas assets
d) Drill head control and monitoring methodology and accuracy
e) Detailed drill location

Once the gas asset is positively identified and before drilling commences, a slit trench must be excavated parallel to the gas asset on the side from which the drill is approaching to a depth of 500mm below the bottom of gas asset to prove the drill head will not encroach near it. If possible, the slit trench must be one metre away from the gas asset. In addition, physical barriers such as steel plates may be installed down the side of the gas asset to ensure the drilling machinery does not come close to or damage the gas asset and provides the Jemena representative an opportunity to stop works if necessary.

If directional drill activity is proposed to be carried out parallel to gas assets, the gas asset shall be positively identified before drilling commences and the drill path shall be no closer than one metre from the side of the gas asset. Where a one metre separation cannot be kept, Jemena Engineering/Management must be contacted to assess the proposed drill path.

4.5.2 STRUCTURES

Buildings shall be at least 1000mm from any gas main. Other structures, including stormwater pits, shall be at least 500mm from any gas main. Structures shall not be built over gas mains. If these requirements cannot be met, then the proposed design is to be submitted for review via the Jemena Gas Portal Encroachments Application.

Electrical substations shall be at least 3000mm from any steel gas main. In addition an Electrical Hazard Assessment as per AS/NZS 4853 shall be prepared by Third Party and forwarded to Jemena Engineering for review and acceptance. Refer to Section 4.6.

4.6 HIGH VOLTAGE ELECTRICAL INSTALLATION

For any High Voltage Electrical installation, defined as voltage above 10kV, the Electricity Asset Owner or representative shall perform an Electrical Hazard Assessment study on Jemena's steel mains in accordance with the latest version of AS/NZS 4853 (Electrical Hazards on Metallic Pipelines). The study shall be completed by a certified practitioner. The types of electrical hazards that need to be covered are as follows:

- Low frequency induction (LFI);
- Earth potential rise (EPR);
- EPR due to lightning current;
- Capacitive coupling on the pipeline due to adjacent high voltage power lines; and
- Accidental contact of pipeline with other electrical systems.

This report shall be submitted to Jemena for acceptance prior to implementing any design. The report should clearly state the standards it refers to, e.g. AS/NZS 4853:2012, details of the proposed electrical infrastructure, the hazards that have been assessed, the assessment, findings and

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Jemena's pipe details (diameter, length, and distance to nearest pipeline facility where contact by personnel is expected, such as Cathodic Protection Test Points).

For Low Voltage Electrical installation defined as voltage below 10kV, the Electricity Owner or representative shall perform a Level 1 assessment on Jemena's steel mains in accordance with the latest version of AS/NZS 4853 (Electrical Hazards on Metallic Pipelines). The study shall be completed by a certified practitioner.

4.7 ISOLATED MAINS

Some gas assets that do not appear on BYDA may be isolated gas mains. Jemena Engineering shall be contacted for approval if relocation or removal of these assets is required.

4.8 REMOVAL OF CONCRETE CAPPING

If cutting or removal of concrete capping is required, then the activity is to be assessed by Jemena Engineering, which may require a special procedure. All existing gas asset protection methods such as pre-cast or poured concrete slabs shall be retained and/or reinstated.

4.9 GAS MAIN MARKERS

All existing gas asset markers shall be retained and/or reinstated. Where gas main markers are affected by construction works, they shall be re-located by Jemena (costs shall be paid by the third party). Additional gas main markers shall be installed at gas asset crossings for all new services or roads.

4.10 CP TEST POINTS, CP GROUND BEDS, CP CABLES AND KIOSKS

Where any CP assets are affected by construction works, all existing CP assets and equipment shall be retained, relocated or reinstated by Jemena and the costs shall be paid by the third party.

Any electrical or earthing works which may affect the CP system must comply with AS/NZS 4853 (Electrical Hazards on Metallic Pipelines) and shall be submitted to Jemena Engineering for review via the Jemena Gas Portal Encroachments Application.

4.11 BLASTING

Blasting is **not allowed within 50m** of Jemena Gas Networks without prior written approval from Jemena.

If the Third Party has a requirement to conduct blasting activities within 50m of Jemena Gas Networks, an engineering review of the design proposal shall be requested from the Third Party.

The following information shall be included in the design package for review:

a. The blasting distance from the pipeline and drawings, map references;
b. Depth of the blast;
c. Shot size (kg);
d. Shot sequence and delay; and

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e. Shot strength.
f. Information on Peak Particle Velocity (PPV) and the measures in place during blasting to monitor PPV.

4.12 SUBSIDENCE

Where any ground subsidence is predicted as a result of tunnelling, underground mining, etc, which may impact our gas mains, the risk of subsidence shall be mitigated in accordance with the table in Appendix 7.4. A leakage survey may be required prior to commencement of works to provide a baseline. Regular ground level monitoring will be required during works to highlight any significant changes in height which may result in additional leakage surveys.

4.13 PROLONGED JEMENA PIPELINE EXPOSURE

If the Jemena Pipeline is to be exposed for more than one day, suitable barricades and steel plates shall be installed to ensure the security of the exposed Jemena Pipeline from accidental (construction or vehicle impact) or deliberate damage (vandalism). In addition, the pipeline shall be wrapped in hessian in order to prevent UV damage.

Damage to Jemena Pipeline due to sagging shall be prevented. For any unsupported span of pipe exceeding 6 m, written approval from Jemena will be required.

4.14 DEPTH OF COVER

The minimum depth of cover of a gas main is detailed in the table below. Depth of cover shall not exceed 1500mm. Where there is a proposed change to the existing depth of cover of a gas main, the design shall be sent to Jemena Engineering for review and acceptance.

	Secondary and Critical Mains	**MP and LP Mains (non-critical)**
Arterial roads and their adjacent road reserves	1200mm	1200mm
Other roads	900mm	750mm
Road reserve	900mm	600mm
Railway Reserve (other than under railway)	2000mm	2000mm
Under Railway	Refer to AS4799 – Installation of underground utility services and gas mains within railway boundaries.	

Table 1: Minimum depth of cover for gas mains

4.15 BACKFILLING

The following shall apply when backfilling over our gas mains:

- No stabilised sand, roadbase, or concrete within 300mm of the gas main;
- The gas main shall be in a bed of washed river sand (no recycled material allowed) with a maximum particle size of 2mm with a neutral PH value.

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  - For steel mains, the river sand shall extend to a height of 300mm above and below the main, and 300mm either side of the main;
  - For plastic mains, the river sand shall extend to a height of 75mm above and below the main, and 75mm either side of the main;
- Sandbags are not to be used as permanent bedding.

4.16 COMPACTION OVER GAS ASSETS

Compaction shall be in accordance with the diagram in Appendix 7.2.

4.17 VIBRATION

Vibrations from any equipment or processes including vibrating compaction equipment, jack hammers, rock hammers, seismic measuring processes, blasting, etc. are not to exceed the following peak particle velocity readings at the nearest surface of the buried pipeline:

a) 20mm/s for Steel mains.
b) 10mm/s for plastic and cast iron mains.

In the event that such vibrating equipment is to be used close to the pipeline or in blasting operations, suitable trials are to be conducted prior to proceeding with the proposed development to ensure that the stipulated peak particle velocities will not be exceeded.

Suitable vibration monitoring equipment is to be used to record the tests and works as they progress in accordance with agreed procedures with Jemena.

4.18 TREE PLANTING

Any trees proposed to be planted near Jemena's assets shall be in accordance with Appendix 7.3.

4.19 POST CONSTRUCTION PROTECTION MEASURES

All existing Jemena Gas Network's protection measures including but not limited to concrete slabs, marker posts, marker tape and Cathodic Protection Systems shall be retained. Any protection measure that was temporarily removed with Jemena's approval as part of construction is to be reinstated to its original condition post construction.

5 TERMS & DEFINITIONS

Abbreviation	Definition
Compaction	Backfilling and compaction of pipe in accordance with Jemena's requirements.
Concrete capping	A physical protection measure made of concrete placed above the gas asset, applied when normal depths of cover cannot be achieved.

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Abbreviation	Definition
Concrete slab	A concrete surface layer, e.g. Driveway, footpath, roadway.
CP	Cathodic Protection
Critical main	A plastic main that has been deemed “critical” due to internal factors. It shall be treated as a secondary main.
BYDA	Before You Dig Australia
DRS	District Regulator Set
Encroachment	An Encroachment is any unauthorised 3rd party activity within three metres of a Secondary main or Critical Medium Pressure main.
Extra High Voltage	Voltage that is greater than or equal to 100 kV
Gas main	All secondary mains, medium pressure mains and low pressure mains covered under AS4645.
HDD	Horizontal Directional Drilling
High pressure gas main	A gas main with a pressure of 1050 kPa or greater which includes Secondary, Primary and Trunk mains, or that has been identified as high risk.
High Voltage	Voltage that is greater than or equal to 11 kV
Jemena Standby/ Representative	A suitably qualified person assigned to carry out a standby on a Secondary or critical medium pressure main. This includes Secondary Standby Officers and Pipeline Patrol Officers.
kPa or MPa	Units of pressure measurement
LP	Low Pressure
Low Pressure gas main	2, 7 kPa
MAOP	Maximum Allowable Operating Pressure
Medium Pressure gas main	30, 100, 210, 300, 400 kPa
MP	Medium Pressure
PE Slabbing	A layer of polyethene material approved as a procedural and physical protection measure for gas mains
PPE	Personal Protective Equipment
TfNSW	Transport for New South Wales

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Abbreviation	Definition
Secondary gas main	1050 kPa.
SWMS	Safe Work Method Statement
Work site	The location of the intended work that the requestor is requesting a standby for.

6 REFERENCES

6.1 INTERNAL

GAS-960-GL-PL-001 – Designing, Constructing and Operating Assets Near Jemena Gas Pipelines

Jemena Network Operator Rules

6.2 EXTERNAL

AS 4645 Series – Gas Distribution Networks

AS 4853 – Electrical Hazards on Gas Pipelines

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7 APPENDICES

7.1 OPERATING LIMITS FOR THE APPLICATION OF VACUUM EXCAVATION AROUND BURIED NATURAL GAS MAINS

The use of vacuum excavation (or hydro-excavation) on gas mains shall be limited to the water pressures set out in the table below.

Pipe material	**Maximum allowable water pressure, psig***	
	Rotating nozzle	**Fixed nozzle**
Nylon	2000	1500
PE	2500	2500
Uncoated steel pipe	3000	3000
PE coated steel pipe (yellow jacket)	2000	2000
Fusion bonded epoxy (FBE) coated steel	2000	2000
Coal tar enamel coated steel	0	0
Petroleum tape coated steel	1000	1000
Tek-Rap coated steel	1000	1000
Coated steel pipe (unknown coating)	1000	1000

* Notes:

1. The pressure of the water must be measured at the lance, NOT the truck.
2. The nozzle shall be kept at least 300 mm from the surface of the gas asset at all times.
3. In the case of steel pipe only, the minimum water pressure the equipment is capable of delivering must be applied when starting the excavation process until the nature of the pipe coating is identified, then the pressure may be increased to the relevant pressure specified in the table.
4. Vacuum excavation is not permitted on coal tar enamel coated gas mains.

The use of vacuum excavation around buried high-pressure natural gas pipes will require the presence of a Jemena or Zinfra representative.

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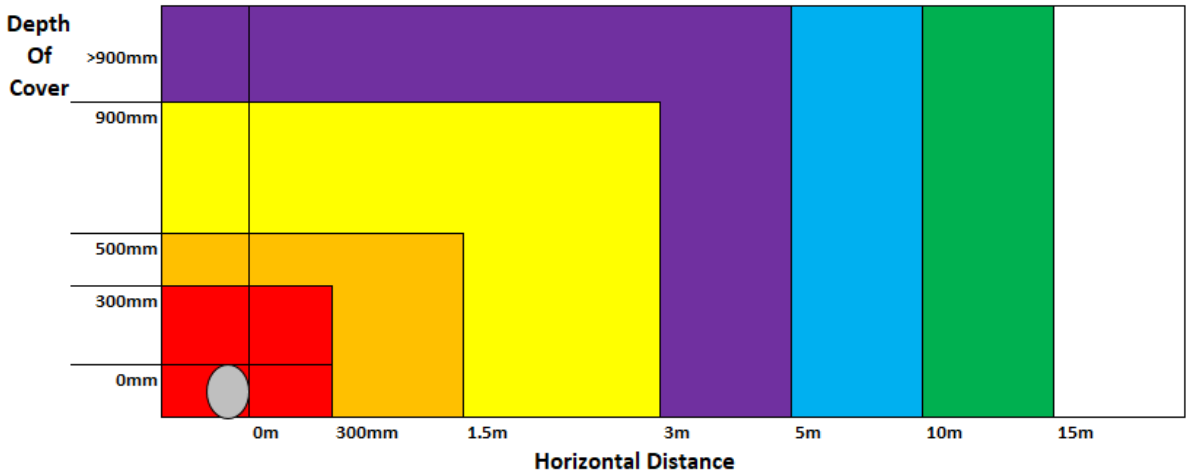
7.2 COMPACTION REQUIREMENTS

Compaction Requirements



Maximum Allowable Compaction

- No compaction permitted. Hand tamping only.
- Hand-held class 60kg compacter only.
- 8T tandem-drum static roller (no vibration), or a hand-held larger plate compacter at any vibration setting.
- 8T tandem-drum roller set at low-amplitude vibration, or 10T vibratory roller set to static roller only (no vibration).
- 8T tandem-drum roller at any vibration setting, or 10T vibratory roller set to low-amplitude vibration.
- 10T tandem-drum roller at any vibration setting.
- No restrictions.

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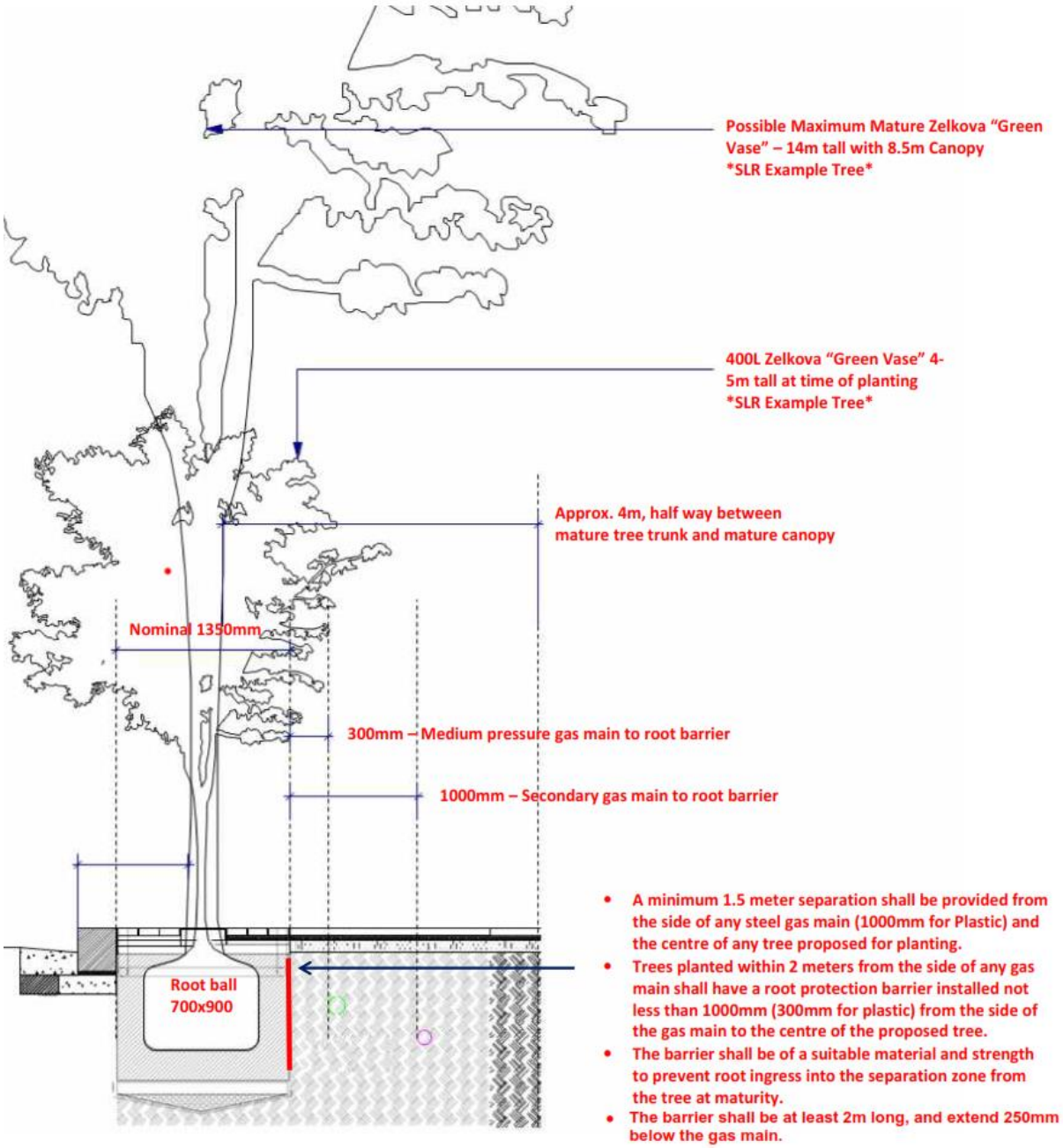
7.3 TREE PLANTING REQUIREMENTS

Note: *The diagram below is restricted to specific tree species, and is subject to Jemena Engineering approval. Other tree species may require additional separation.*



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7.4 SUBSIDENCE RISK CONTROL PROCEDURES

Level	Control Measures	Frequency	Analysis	Trigger Level	Action
1	Baseline Gas Detection Survey Required Undertake a pre-tunnelling gas detection survey of pipes within the area potentially affected.		Jemena reviews: - 2D ground surveys report - pipe integrity - ground conditions report		
	Ground inspections: - 2D survey - ground inspection	Ground surveys by contractor: - Monthly 2D survey along centreline of tunnel for pegs located within active subsidence zone after the length of the tunnelling exceeds 200 metres. - Weekly surveys from when tunnelling exceeds 800 metres, until one month after completion of tunnel. - Weekly surveys along roads where mains exists when within active subsidence zone. Ground inspections by contractor:	Contractor surveys and provides Jemena with: - ground surveys - ground movements / features reports	Ground movement survey and measurements: - Radius of ground curvature greater than 4 (km) - Ground strain 0 to 2 (mm/m) - Ground movements rate of change steady Ground conditions monitoring: - ground cracks reported - ground subsidence reported --- - ground movements showing a step change indicating shear and / or discontinuity in humps near the gas services	Go to LEVEL 2 if LEVEL 1 limit is exceeded: - normal ground patrol by Jemena pipeline officer Jemena actions following receipt of reported incidents: inspects site to confirm operation of gas facilities not affected Assess potential for impacts on pipe crossings due to valley closure. Consider trigger level for Level 2. ---

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		- Weekly inspection including at the creek crossings within the active subsidence zone.			- undertake additional inspection e.g. exposing and inspecting gas service as applicable to determine gas facilities integrity - based on above findings, undertake corrective action per Level 3 activities where gas services integrity affected
	Ground subsidence validations: - Observed against predictions	On receipt of data: verify and track results against predictions	Contractor analyses and reports findings to stakeholders		
2	Ground inspections: - 2D survey - ground inspection	Submit data within 24 hours duration Twice weekly 2D survey	Contractor surveys and provides Jemena with: - ground surveys - ground movements / features reports	Ground movement survey and measurements: - Radius of ground curvature 2 to 4 (km) - Ground strain 2 to 5 (mm/m) - Ground movements rate of change increasing with increasing upward trend - Subsidence is delayed (such as subsidence not developing within expectations, and/or reports of no caving underground)	Go to LEVEL 3 if LEVEL 2 limit is reached: - weekly ground patrol by Jemena pipeline officer Jemena actions following receipt of reported incidents: inspects site to confirm operation of gas facilities not affected
	Ground subsidence validations: - Observed against predictions	Twice weekly: verify and track results against predictions	Contractor analyses and reports findings to stakeholders		
			Jemena reviews: - 2D ground surveys report - pipe integrity - ground conditions report	Ground conditions monitoring: - ground cracks reported - ground subsidence reported _____ - ground movements showing a step change indicating shear	_____ based on above findings, undertake corrective action per Level 3 activities where gas services integrity affected - if no immediate corrective actions required, Jemena may put field construction on standby

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<table>
<tr><td></td><td colspan="2"></td><td></td><td>and / or discontinuity in humps near the gas services</td><td></td></tr>
<tr><td rowspan="3">3</td><td>Ground inspections:
- 2D survey
- ground inspection</td><td>Submit data within 24 hours duration
Daily 2D survey</td><td>Contractor surveys and provides Jemena with:
- ground surveys
- ground movements / features reports</td><td rowspan="3">Ground movement survey and measurements:
- Radius of ground curvature less than 2 (km)
- Ground strain greater than 5 (mm/m)
- ground movements showing a step change indicating shear and / or discontinuity in humps near the gas services.</td><td rowspan="3">Jemena’s field corrective actions:
- mobilisation construction in the field
- excavate affected area
- inspect gas facilities to confirm integrity
- repair and / or replace gas services as applicable
- to maintain supply and safe operation</td></tr>
<tr><td>Ground subsidence validations:
- Observed against predictions</td><td>Daily: verify and track results against predictions</td><td>Contactor analyses and reports findings to
stakeholders</td></tr>
<tr><td colspan="2"></td><td>Jemena reviews:
- 2D ground surveys report
- pipe integrity
- ground conditions report (as applicable)</td></tr>
</table>

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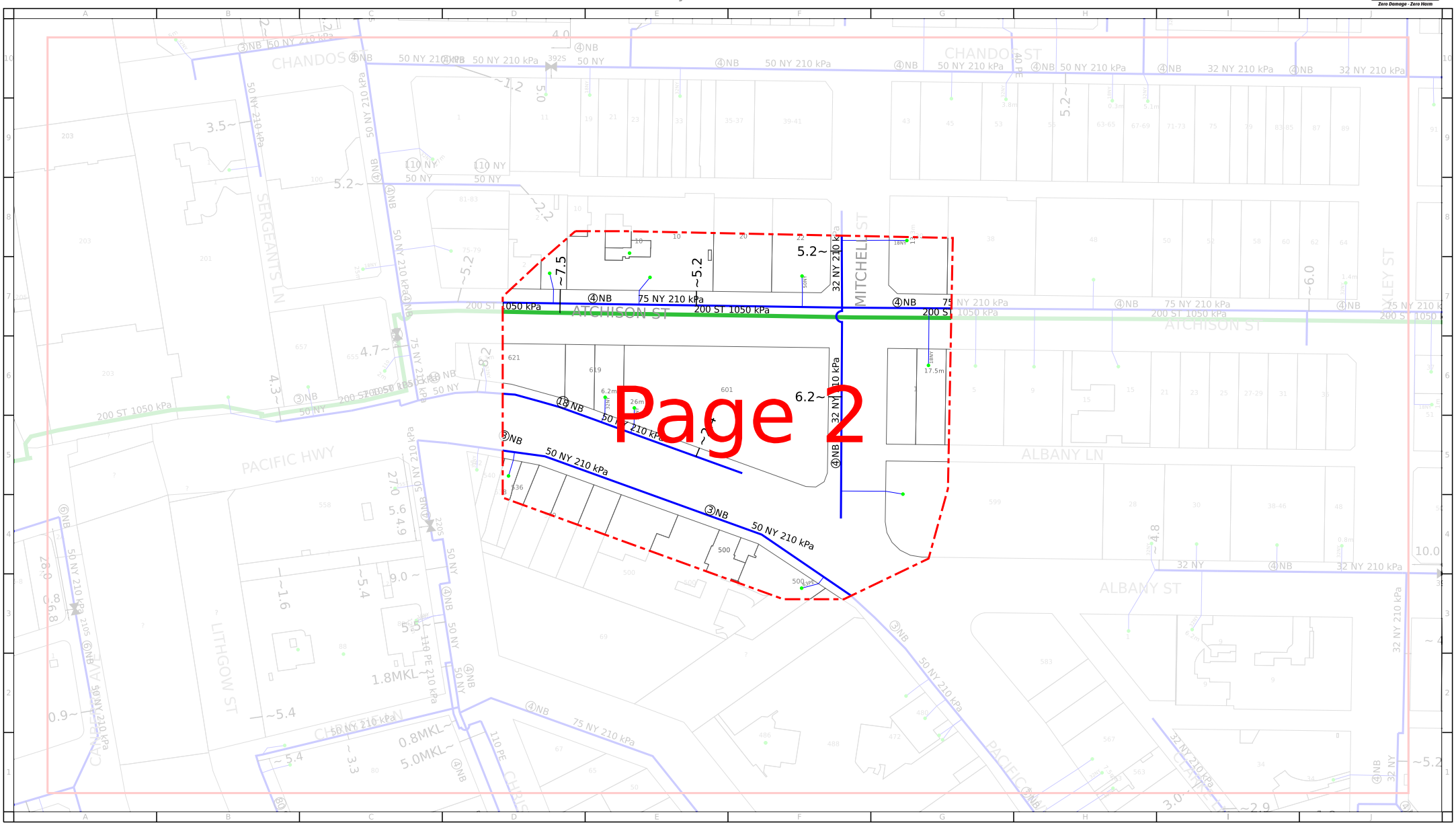
BYDA Authority: Jemena Gas Networks (NSW)

BYDA Location: 601 Pacific Hwy St Leonards NSW, 2065



Jemena
ABN 87 003 004 322

For legend details, please refer to the Coversheet attachment provided as part of this BYDA response.

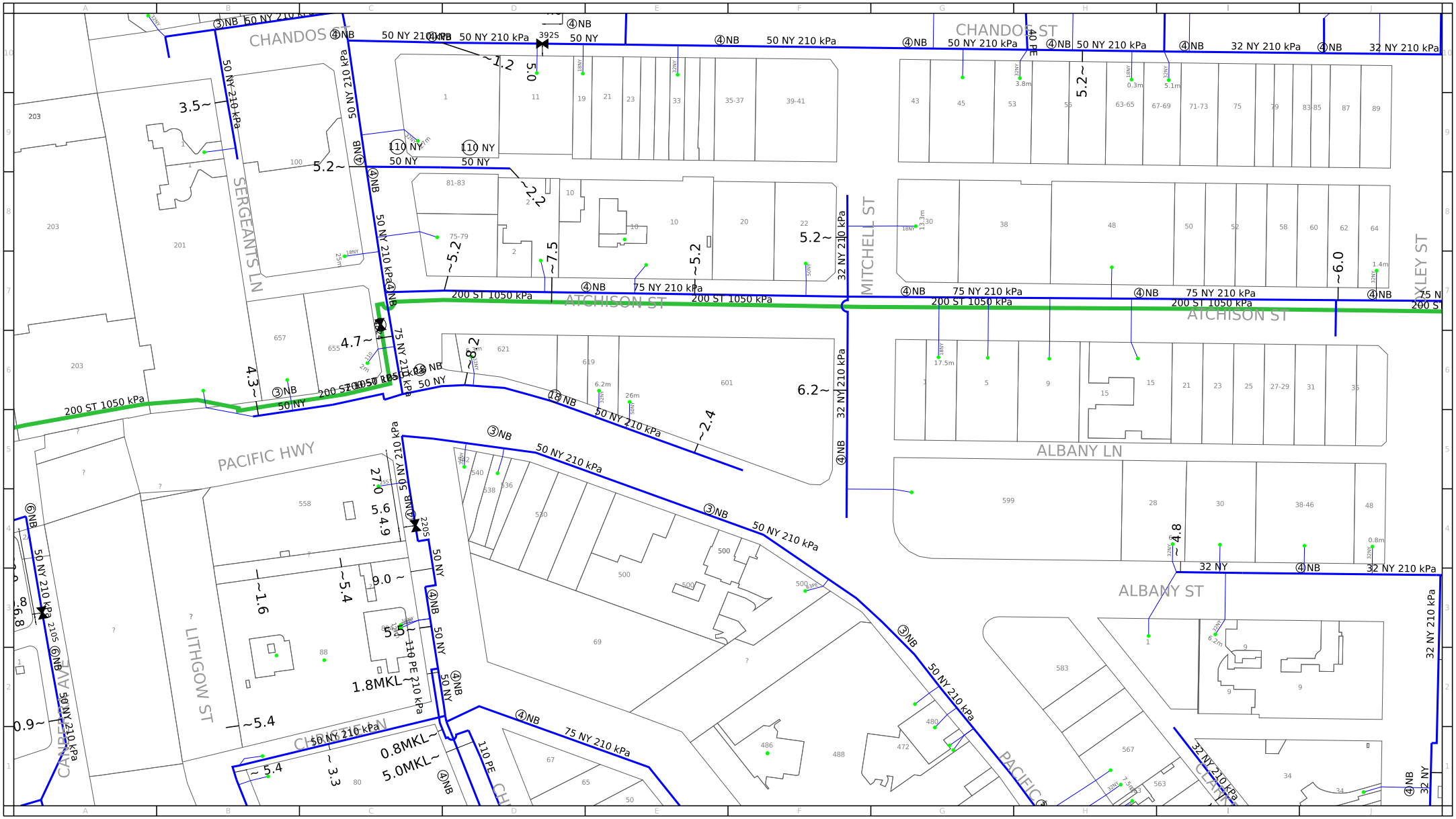
Scale: 1:2101

Issue Date: 18/03/2026
BYDA Seq No: 269943781
BYDA Job No: 52659214
Overview Page:

WARNING: This is a representation of Jemena Gas Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions.
The information contained on this plan is only valid for 28 days from the date of issue.

BYDA Authority: Jemena Gas Networks (NSW)

BYDA Location: 601 Pacific Hwy St Leonards NSW, 2065



Jemena
ABN 87 003 004 322

For legend details, please refer to the Coversheet attachment provided as part of this BYDA response.

Scale: 1:2000

Issue Date: 18/03/2026
BYDA Seq No: 269943781
BYDA Job No: 52659214

0m 10m 20m 30m 40m 50m 60m 70m 80m

WARNING: This is a representation of Jemena Gas Networks underground assets only and may not indicate all assets in the area. It must not be used for the purpose of exact asset location in order to undertake any type of excavation. This plan is diagramatic only, and distances scaled from this plan may not be accurate. Please read all conditions and information on the attached information sheet. This extract is subject to those conditions. The information contained on this plan is only valid for 28 days from the date of issue.

Jemena Gas Network Protection

Jemena Asset Management Pty Ltd ABN 53 086 013 461
for and on behalf of Jemena Gas Networks (NSW) Ltd ABN 87 003 004 322

HIGH PRESSURE - ASSETS AFFECTED

This information is only valid for 28 days from the date of issue

There are **High Pressure Gas Mains and Services** in the vicinity of your intended work, as generally illustrated on the attached map. There may also be other mains or services at the location. For an explanation of the map, please see the legend attachment and read the Important Information.

Excavation Guidelines

To arrange a Jemena Representative please log a request via www.myportal.jemena.com.au and choose 'Gas Mains' application type and "High Pressure Standby Service". If you do not have an account, you will need to choose 'register' and follow the prompts.

Please review the attached Construction Guidelines – ***'GAS-9899-GL-CN-001 Guideline for construction around AS4645 assets'*** and ensure that you meet the minimum construction requirements in this document. If the minimum requirements cannot be achieved, submit your proposal in the form of an Application via www.myportal.jemena.com.au and choose 'Gas Mains' application type and select 'Encroachments', an Engineering review will be conducted to address the considerations. Please allow up to 10 working days for the application to be reviewed.

Please note that a duty of care exists to ensure gas assets are not compromised or damaged. Jemena's expectation is that the excavator operator holds a current Verification of Competency (VOC) or equivalent for the machine to be used near Jemena High Pressure Gas Assets.

Further standby enquiries can be directed to the High Pressure Coordinator via:
E: infrastructureprotection@jemena.com.au or PH: 1300 665 380.

Appointments will be coordinated with availability of a Jemena Representative to arrange a site meeting / standby. For all works in the vicinity of High Pressure Gas Mains you must arrange for a Jemena Representative to attend and supervise all excavations. Charges may apply.

Important Information:

1. The enclosed plans have been prepared solely for the use of Jemena Gas Networks (NSW) Ltd and Jemena Asset Management Pty Ltd (together "Jemena") and show the position of Jemena's underground gas mains and installations in public gazetted roads. If the enclosed plans show gas assets located on private property or other third party property, these are approximate locations.
2. There may be underground assets owned by other utilities in the vicinity of your work and it is your responsibility to identify and locate such assets.
3. The plans may show the position of underground mains and installations relative to fences, buildings and other structures as they existed at the time the assets were installed and may not have been updated to take account of any subsequent change in the location or style of those features. Depth of underground assets may also vary as a result of changes to road, footpath or surface levels subsequent to installation.
4. While Jemena takes all reasonable care to ensure the accuracy and completeness of the information provided, it makes no warranty as to the accuracy or completeness of the enclosed plans and does not assume any duty of care to you nor any responsibility for the accuracy, adequacy, suitability or completeness of the plans or for any error or omission. It is intended to be indicative only and must not be solely relied upon when undertaking underground works.
5. Except to the extent that liability may not be capable of being lawfully excluded, Jemena, its employees, agents, officers and contractors will not be liable to any person for loss or damage (including indirect and consequential loss or damage) which may be suffered or incurred in connection with the provision of this information.
6. Persons excavating or carrying out other earthworks will be held responsible for any damage caused to Jemena's underground mains, service lines and equipment. In accordance with the *Work Near Underground Assets – Guide* published in 2007 by Work Cover Authority*, Jemena recommends that you carry out potholing by hand to accurately confirm the location of gas mains and installation prior to commencing excavations.

Jemena BYDA Administration: 1300 880 906 *Guide available via: www.safework.nsw.gov.au

In case of Emergency Phone 131 909 (24 hours)

WARNING ACTION REQUIRED

Jemena Gas Networks

Before You Dig Australia Map Legend
Nov 2022

Network Mains

- Proposed New Main (coloured as per kPa)
- Proposed Isolate (coloured as per kPa)
- Unknown kPa
- 2kPa Low Pressure gas main
- 7kPa Low Pressure gas main
- 30kPa Medium pressure gas main
- 100kPa Medium Pressure gas main
- 210kPa Medium Pressure gas main
- 300kPa Medium Pressure gas main
- 400kPa Medium Pressure gas main
- 1050kPa High Pressure gas main
- 3500kPa High Pressure gas main
- 7000kPa High Pressure gas main
- >7000kPa Transmission pipeline
- Isolated Service - Former Med/High Pressure
- Isolated Steel Main -**Treat as High Pressure**

100 PVC — Conduit or Casing
Size & Material (see conduit material codes)

Critical Main -**Treat as High Pressure**
(Main coloured as per kPa)

EXPOSED — Exposed Main section

SHALLOW-SP — Shallow Main section: see Protection Code below, no code assume no protection

SP	Steel Plate	CE	Concrete Encased
PP	PE Plate	UNK	Unknown Type
CS	Concrete Slab		

Network Assets

- Siphon
- Network Valve
- High Pressure Main Line Valve (=>1050kPa)
- High Pressure Automatic Line Break Valve (>1050kPa)
- Boundary Regulator Set (=<1050kPa)
- Distribution Regulator Set (=<1050kPa)
- High Pressure Regulating Station (>1050kPa)

Annotations

Pipe and Conduit Material Codes

NY	Nylon	NB	Nominal Bore – Cast Iron
PE	Polyethylene	ST	Steel
P/PL	Plastic (undefined)	C/CO	Copper
PVC	Polyvinyl Chloride		

Pipe code combinations and dimension references

6 **NB 50MM NY** — 50mm Nylon main inserted into 6 inch (Nominal Bore) Cast Iron pipe

50 **MM 32MM NY** — 32mm Nylon main inserted into 50mm Steel pipe

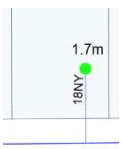
~1.5 — Distance (in metres) of main from Boundary Line (MBL)

MBK	Distance in Metres Back of Kerb
MKL	Distance in Metres from Kerb Line
MEBL	Distance in Metres from Eastern Boundary Line (North/South/West)
MCL	Distance in Metres from Centre Line of Road
MFL	Distance in Metres from Fence Line

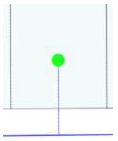
Gas Services

- Gas service – coloured by kPa
- Serviced Site indicator

Jemena has created service pipe features programmatically based on known pipe characteristics and cartographic principles. They may provide guidance to identify assets whilst in the field in addition to existing processes.



Distance (in metres) of service from side Boundary where the service pipe crosses from the road reserve into the private lot
Service placed towards left or right boundary
Service pipe size & material where known



For connected sites with insufficient asset details, service is shown down the centre of the lot with no attributes plotted

NBN Co NswAct

Referral
269943787

Member Phone
1800 687 626

Responses from this member

Response received Wed 18 Mar 2026 4.19pm

File name	Page
Response Body	66
269943787_20260318_051834025536_1.pdf	67
4678_NBN_Dial_Before_You_Dig_Poster_20170517.pdf	70
Disclaimer_269943787_20260318_051834025536.pdf	72

Hi Marko Djukanovic,

Please find attached the response to your DBYD referral for the address mentioned in the subject line.
The location shown in our DBYD response is assumed based off the information you have provided. If the location shown is different to the location of the excavation then this response will consequently be rendered invalid.
Take the time to read the response carefully and note that this information is only valid for 28 days after the date of issue.
If you have any further enquiries, please do not hesitate to contact us.

Regards,
Network Services and Operations
NBN Co Limited
P: 1800626329
E: dbyd@nbnco.com.au
www.nbnco.com.au

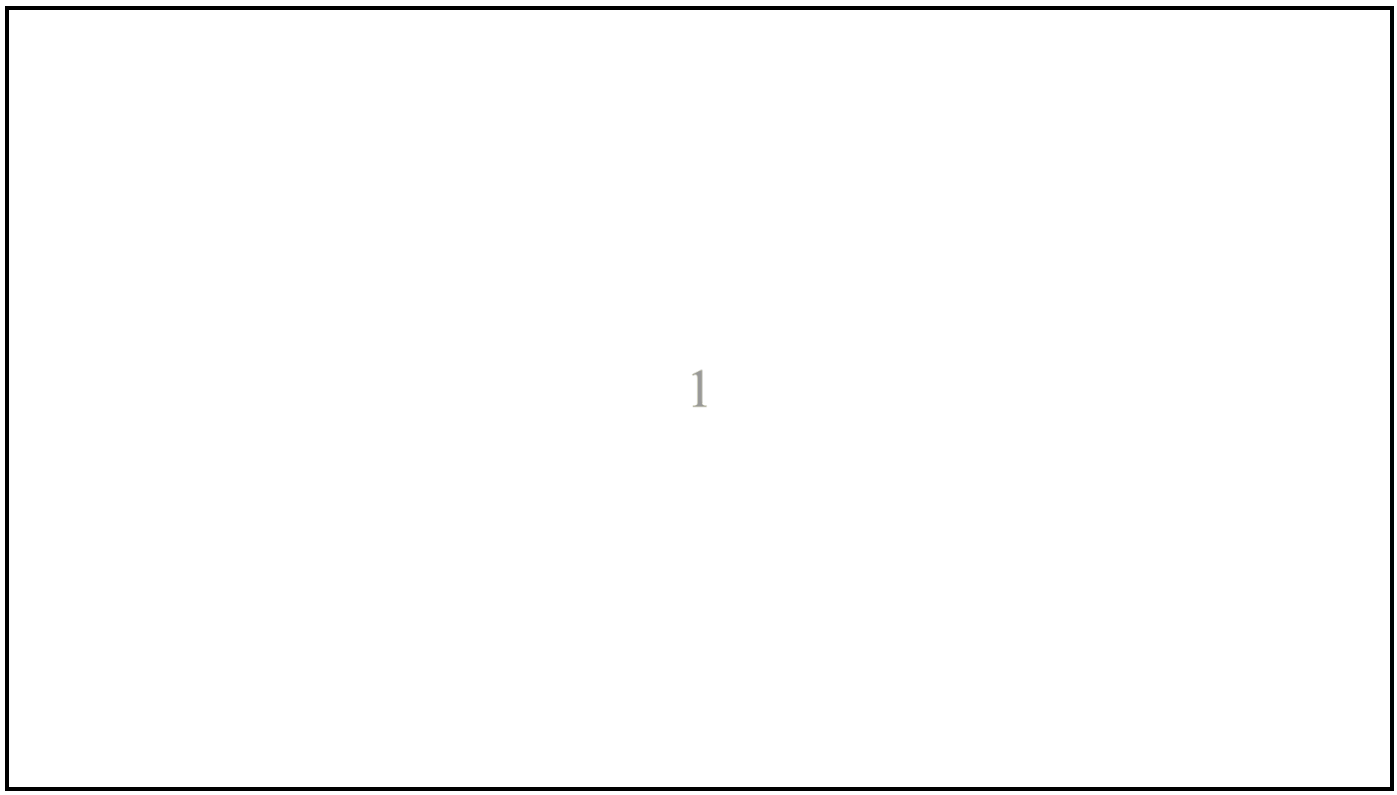
Confidentiality and Privilege Notice
This e-mail is intended only to be read or used by the addressee. It is confidential and may contain legally privileged information. If you are not the addressee indicated in this message (or responsible for delivery of the message to such person), you may not copy or deliver this message to anyone, and you should destroy this message and kindly notify the sender by reply e-mail. Confidentiality and legal privilege are not waived or lost by reason of mistaken delivery to you. Any views expressed in this message are those of the individual sender, except where the sender specifically states them to be the views of NBN Co Limited

Please Do Not Reply To This Mail

To:	Marko Djukanovic
Phone:	Not Supplied
Fax:	Not Supplied
Email:	marko.djukanovic@stockland.com.au

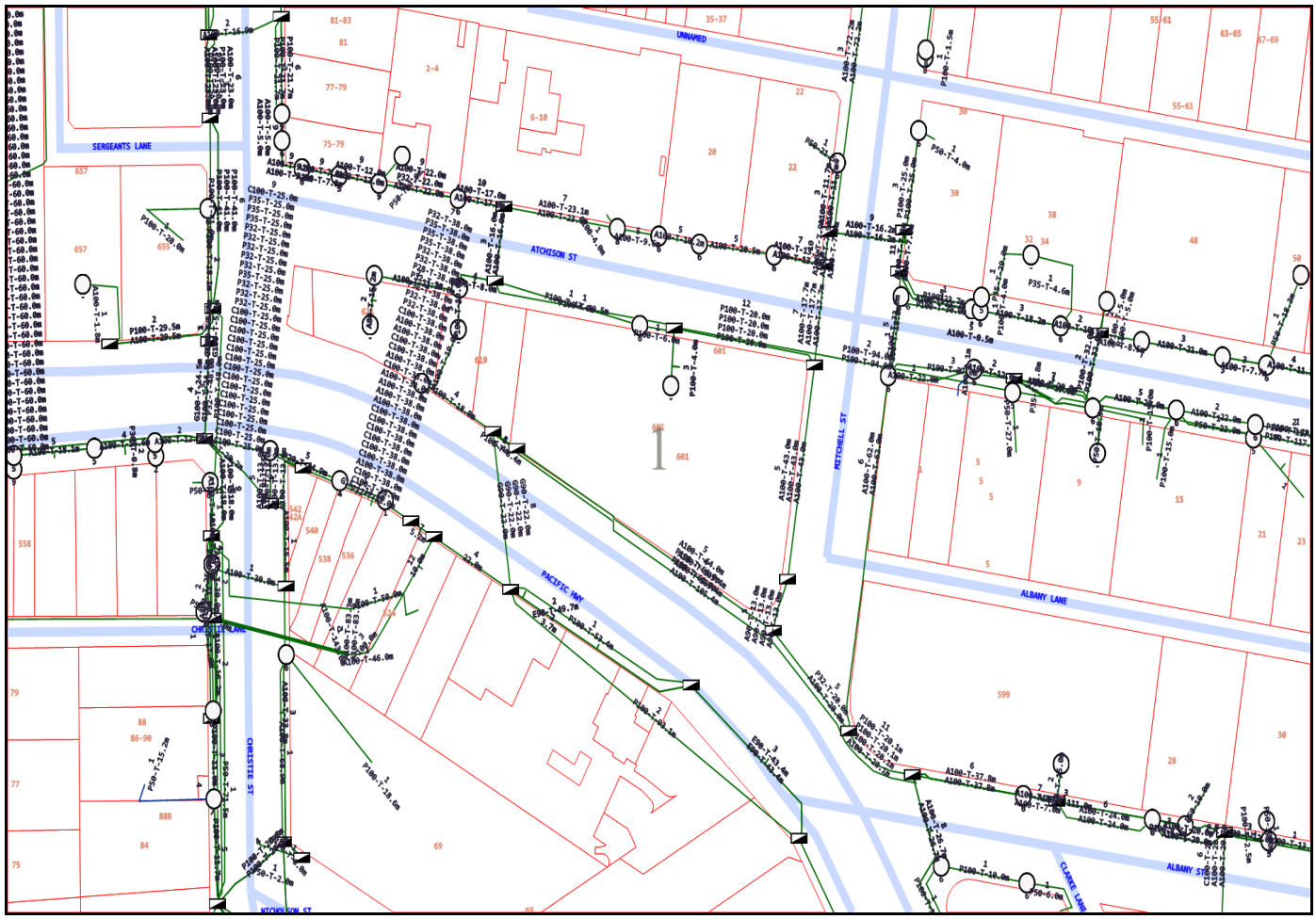
Dial before you dig Job #:	52659214	BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm
Sequence #	269943787	
Issue Date:	18/03/2026	
Location:	601 Pacific Hwy , St Leonards , NSW , 2065	

Indicative Plans are tiled below to demonstrate how to layout and read nbn asset plans



LEGEND

34	Parcel and the location
5	Pit with size "5"
2E	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
2 PO – T- 25.0m P40 – 20.0m 5 9	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
2 10.0m 5 9	2 Direct buried cables between pits of sizes ,"5" and "9" are 10.0m apart.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
5 9	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
BROADWAY ST	Road and the street name "Broadway ST"
Scale	0 20 40 60 Meters 1:2000 1 cm equals 20 m



Emergency Contacts

You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.



Working near nbn™ cables

nbn has partnered with Dial Before You Dig to give you a single point of contact to get information about **nbn** underground services owned by **nbn** and other utility/service providers in your area including communications, electricity, gas and other services. Contact with underground power cables and gas services can result in serious injury to the worker, and damage and costly repairs. You must familiarise yourself with all of the Referral Conditions (meaning the referral conditions referred to in the DBYD Notice provided by **nbn**).

Practice safe work habits

Once the DBYD plans are reviewed, the Five P's of Excavation should be adopted in conjunction with your safe work practices (which must be compliant with the relevant state Electrical Safety Act and Safe Work Australia "Excavation Work Code of Practice", as a minimum) to ensure the risk of any contact with underground **nbn** assets are minimised.

Plan: Plan your job by ensuring the plans received are current and apply to the work to be performed. Also check for any visual cues that may indicate the presence of services not covered in the DBYD plans.

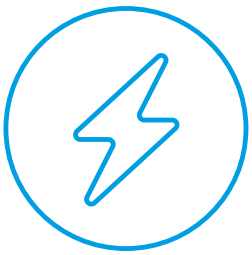
Prepare: Prepare for your job by engaging a DBYD Certified Plant Locator to help interpret plans and identify on-site assets. Contact **nbn** should you require further assistance.

Pothole: Non-destructive potholing (i.e. hand digging or hydro excavation) should be used to positively locate **nbn** underground assets with minimal risk of contact and service damage.

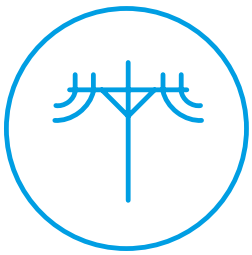
Protect: Protecting and supporting the exposed **nbn** underground asset is the responsibility of the worker. Exclusion zones for **nbn** assets are clearly stated in the plan and appropriate controls must be implemented to ensure that encroachment into the exclusion zone by machinery or activities with the potential to damage the asset is prevented.

Proceed: Proceed only when the appropriate planning, preparation, potholing and protective measures are in place.

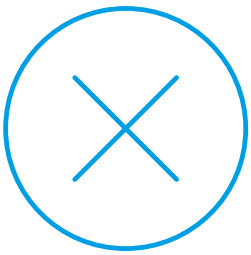
Working near nbn™ cables



Identify all electrical hazards, assess the risks and establish control measures.



When using excavators and other machinery, also check the location of overhead power lines.



Workers and equipment must maintain safety exclusion zones around power lines.

Once all work is completed, the excavation should be re-instated with the same type of excavated material unless specified by **nbn**. Please note:

- Construction Partners of **nbn** may require additional controls to be in place when performing excavation activities.
- The information contained within this pamphlet must be used in conjunction with other material supplied as part of this request for information to adequately control the risk of potential asset damage.

Contact

All nbn™ network facility damages must be reported online here.
For enquiries related to your DBYD request please call 1800 626 329.

Disclaimer

This brochure is a guide only. It does not address all the matters you need to consider when working near our cables. You must familiarise yourself with other material provided (including the Referral Conditions) and make your own inquiries as appropriate.

nbn will not be liable or responsible for any loss, damage or costs incurred as a result of reliance on this brochure.

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DIAL BEFORE YOU DIG
www.1100.com.au

To:	Marko Djukanovic
Phone:	Not Supplied
Fax:	Not Supplied
Email:	marko.djukanovic@stockland.com.au

Before You Dig Australia Job #:	52659214
Sequence #	269943787
Issue Date:	18/03/2026
Location:	601 Pacific Hwy , St Leonards , NSW , 2065

BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm

Information

The area of interest requested by you contains one or more assets.

nbn™ Assets	Search Results
Communications	Asset identified
Electricity	No assets

In this notice **nbn™ Facilities** means *underground fibre optic, telecommunications and/or power facilities, including but not limited to cables, owned and controlled by* ***nbn™***

Location of **nbn™** Underground Assets

We thank you for your enquiry. In relation to your enquiry at the above address:

- **nbn's** records indicate that there **ARE nbn™** Facilities in the vicinity of the location identified above ("Location").
- **nbn** indicative plan/s are attached with this notice ("Indicative Plans").
- The Indicative Plan/s show general depth and alignment information only and are not an exact, scale or accurate depiction of the location, depth and alignment of **nbn™** Facilities shown on the Plan/s.
- In particular, the fact that the Indicative Plans show that a facility is installed in a straight line, or at uniform depth along its length cannot be relied upon as evidence that the facility is, in fact, installed in a straight line or at uniform depth.
- You should read the Indicative Plans in conjunction with this notice and in particular, the notes below.
- You should note that, at the present time, the Indicative Plans are likely to be more accurate in showing location of fibre optics and telecommunications cables than power cables. There may be a variation between the line depicted on the Indicative Plans and the location of any power cables. As such, consistent with the notes below, particular care must be taken by you to make your own enquiries and investigations to precisely locate any power cables and manage the risk arising from such cables accordingly.
- The information contained in the Indicative Plan/s is valid for 28 days from the date of issue set out above.You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators, e.g BYDA Certified Locators, at your cost to locate **nbn™** Facilities during any activities you carry out on site).

We thank you for your enquiry and appreciate your continued use of the Before You Dig Australia Service. For any enquiries related to moving assets or Planning and Design activities, please visit the **nbn** Commercial Works website to complete the online application form. If you are planning to excavate and require further information, please email dbyd@nbnco.com.au or call 1800 626 329.

Notes:

1. You are now aware that there are **nbn™** Facilities in the vicinity of the above property that could be damaged as a result activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (CoA) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
3. Any information provided is valid only for **28 days** from the date of issue set out above.

Referral Conditions

The following are conditions on which **nbn** provides you with the Indicative Plans. By accepting the plans,you are agreeing to these conditions. These conditions are in addition, and not in replacement of, any duties and obligations you have under applicable law.

1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators, e.g BYDA Certified Locators, at your cost to locate **nbn™** Facilities during any activities you carry out on site).
2. You acknowledge that **nbn** has specifically notified you above that the Indicative Plans are likely to be more accurate in showing location of fibre optics and telecommunications cables than power cables. There may be a variation between the line depicted on the Indicative Plans and the location of any power cables.
3. You should not assume that **nbn™** Facilities follow straight lines or are installed at uniformed depths

along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.

4. In carrying out any works in the vicinity of **nbn™** Facilities, you must maintain the following minimum clearances:
   - 300mm when laying assets inline, horizontally or vertically.
   - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates.
   - 1000mm when operating mechanical excavators.
   - Adherence to clearances as directed by other asset owner's instructions and take into account any uncertainty for power cables.
5. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn™** fibre optic,copper and coaxial cables,and power cable feed to **nbn™** assets).Damage to underground electric cables may result in:
   - Injury from electric shock or severe burns, with the possibility of death.
   - Interruption of the electricity supply to wide areas of the city.
   - Damage to your excavating plant.
   - Responsibility for the cost of repairs.
6. You must take all reasonable precautions to avoid damaging **nbn™** Facilities. These precautions may include but not limited to the following:
   - All excavation sites should be examined for underground cables by careful hand excavation. Cable cover slabs if present must not be disturbed. Hand excavation needs to be undertaken with extreme care to minimise the likelihood of damage to the cable, for example: the blades of hand equipment should be aligned parallel to the line of the cable rather than digging across the cable.
   - If any undisclosed underground cables are located, notify **nbn** immediately.
   - All personnel must be properly briefed, particularly those associated with the use of earth-moving equipment, trenching, boring and pneumatic equipment.
   - The safety of the public and other workers must be ensured.
   - All excavations must be undertaken in accordance with all relevant legislation and regulations.
7. You will be responsible for all damage to **nbn™** Facilities that are connected whether directly, or indirectly with work you carry out (or work that is carried out for you or on your behalf) at the Location. This will include, without limitation, all losses expenses incurred by **nbn** as a result of any such damage.
8. You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.
9. Except to the extent that liability may not be capable of lawful exclusion, **nbn** and its servants and agents and the related bodies corporate of **nbn** and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any plans(including Indicative Plans) attached hereto. Except as expressly provided to the contrary in this information sheet or the attached plans(including Indicative Plans), all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

All works undertaken shall be in accordance with all relevant legislations, acts and regulations applicable to the particular state or territory of the Location. The following table lists all relevant documents that shall be considered and adhered to.

State/Territory	Documents
National	Work Health and Safety Act 2011
	Work Health and Safety Regulations 2011
	Safe Work Australia - Working in the Vicinity of Overhead and Underground Electric Lines (Draft)

	Occupational Health and Safety Act 1991
NSW	Electricity Supply Act 1995
	Work Cover NSW - Work Near Underground Assets Guide
	Work Cover NSW - Excavation Work: Code of Practice
VIC	Electricity Safety Act 1998
	Electricity Safety (Network Asset) Regulations 1999
QLD	Electrical Safety Act 2002
	Code of Practice for Working Near Exposed Live Parts
SA	Electricity Act 1996
TAS	Tasmanian Electricity Supply Industry Act 1995
WA	Electricity Act 1945
	Electricity Regulations 1947
NT	Electricity Reform Act 2005
	Electricity Reform (Safety and Technical) Regulations 2005
ACT	Electricity Act 1971

Thank You,

nbn BYDA

Date: 18/03/2026

This document is provided for information purposes only. This document is subject to the information classification set out on this page. If no information classification has been included, this document must be treated as UNCLASSIFIED, SENSITIVE and must not be disclosed other than with the consent of nbn co. The recipient (including third parties) must make and rely on their own inquiries as to the currency, accuracy and completeness of the information contained herein and must not use this document other than with the consent of nbn co.

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Referral
269943773

Member Phone
1800 262 663

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	77
269943773 - Nextgen 3rd Party Duct Plan.pdf	78
269943773 - Nextgen Cable Plan.pdf	79
269943773 - Nextgen Letter.pdf	80

ATTENTION: Marko Djukanovic

Please DO NOT SEND A REPLY to this email as it has been automatically generated and replies are not monitored.

Thank you for your DBYD enquiry.

Job No: 52659214
Sequence No: 269943773
Enquiry location:
601 Pacific Hwy
St Leonards
NSW 2065

Attached are the files containing information relating to your recent DBYD request. Please read and understand all the attached documentation and contact Nextgen Networks on 1800 032 532 or dbyd@nextgengroup.com.au if you have any queries.

Note: If you have received this email in error, please advise us by calling 1800 032 532 and quote the Sequence Number listed above.

If you are unable to launch any of the files for viewing and printing, you may need to download and install free viewing and printing software such as:

Adobe Acrobat Reader (for PDF files) - http://get.adobe.com/reader



Sequence Number: 269943773

Date: 18/03/2026

DISCLAIMER: THIS DRAWING SHOULD NOT BE SCALED TO LOCATE CABLES. NO WARRANTY IS GIVEN THAT THE INFORMATION IS ACCURATE OR COMPLETE. IF YOU REQUIRE INFORMATION REGARDING LOCATING THE CABLE PLEASE CALL NEXTGEN. THIS DOCUMENT HAS BEEN PREPARED SOLELY FOR DIAL BEFORE YOU DIG USE. THIS PLAN CONTAINS COMMERCIALLY SENSITIVE INFORMATION AND IS TO BE TREATED ACCORDINGLY. NO SUCH INFORMATION IS TO BE PASSED ONTO OTHER PARTIES WITHOUT WRITTEN CONSENT FROM NEXTGEN PTY LTD.

nextgen GROUP

LEGEND

Digsite	Assets
Area	Cable
	3rd Party Duct
	Marker Post



Sequence Number: 269943773

Date: 18/03/2026

DISCLAIMER: THIS DRAWING SHOULD NOT BE SCALED TO LOCATE CABLES. NO WARRANTY IS GIVEN THAT THE INFORMATION IS ACCURATE OR COMPLETE. IF YOU REQUIRE INFORMATION REGARDING LOCATING THE CABLE PLEASE CALL NEXTGEN. THIS DOCUMENT HAS BEEN PREPARED SOLELY FOR DIAL BEFORE YOU DIG USE. THIS PLAN CONTAINS COMMERCIALLY SENSITIVE INFORMATION AND IS TO BE TREATED ACCORDINGLY. NO SUCH INFORMATION IS TO BE PASSED ONTO OTHER PARTIES WITHOUT WRITTEN CONSENT FROM NEXTGEN PTY LTD.

nextgen GROUP

LEGEND

Digsite	Assets
Area	Cable
	3rd Party Duct
	Marker Post

Plant Location Details

18/03/2026

Marko Djukanovic
Stockland
Level 25 133-145 Castlereagh Street
Sydney NSW 2000
Phone: +61475520426

Nextgen Networks Pty Ltd
Level 6, 333 Collins Street
Melbourne VIC 3000
T 1800 032 532
E Damage.Relocations@vocus.com.au

Dear Marko Djukanovic

The following is a response to your Dial Before You Dig enquiry

Assets Affected: Nextgen Assets
Sequence No: 269943773
Location: 601 Pacific Hwy, St Leonards NSW 2065

IMPORTANT:

- Please read and understand all the information and disclaimers provided below
- Sketches and Plans provided by Nextgen Networks are circuit diagrams only and indicate the presence of telecommunications plant in the general vicinity of the geographical area shown; exact ground cover and alignments cannot be given with any certainty and cover may alter over time. Telecommunications plant seldom follow straight lines and careful on site investigation is essential to uncover and reveal its exact position
- The accuracy and/or completeness of the information in the plans can not be guaranteed often due to changes in the surrounding land subsequent to Nextgen's deployment and, accordingly the plans are intended to be indicative only

"DUTY OF CARE"
When working in the vicinity of telecommunications plant you have a legal "Duty of Care" that must be observed. The following points must be considered:

1. It is the responsibility of the owner and any consultant engaged by the owner, including an architect, consulting engineer, developer, and head contractor to design for minimal impact and protection of Nextgen Networks plant. Nextgen Networks will provide free plans and sketches showing the presence of its network to assist at this design stage.
2. It is the owner's (or constructor's) responsibility to:
   a) Request plans of Nextgen Networks plant for a particular location at a reasonable time before construction begins
   b) Visually locate Nextgen Networks plant by vacuum excavation (pot-holing) where construction activities may damage or interfere with Nextgen Networks plant (see "Essential Precautions and Approach Distances" section for more information)
   c) Contact Nextgen Networks Network (see below for details) if Nextgen Networks plant is wholly or partly located near planned construction activities

DAMAGE
ANY DAMAGE TO Nextgen Networks NETWORK MUST BE REPORTED TO 1800 032 532 IMMEDIATELY

- The owner is responsible for all plant damage when works commence prior to obtaining Nextgen Networks plans, or failure to follow agreed instructions
- Nextgen Networks reserves all rights to recover compensation for lose or damage to its cable network or other property including consequential losses

CONCERNING NEXTGEN NETWORK PLANS

- Phone 1100. Dial Before You Dig for free plans of Nextgen Networks plant locations. Please give at least 2 business days notice
- Nextgen Networks plans and information provided are valid for 30 days from the date of issue
- Nextgen Networks retains copyright in all plans and details provided in conjunction with your request. These plans and or details should be disposed of by shredding or any other secure disposal method after use
- Nextgen Networks plans or other details are provided for the use of the applicant, its servants, or agents, and shall not be used for any unauthorised purpose
- Please contact the Network Help Desk (see below for details) immediately should you locate Nextgen Networks assets not indicated on these plans
- Nextgen Networks, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Nextgen Networks against any claim or demand for any such loss or damage
- Please ensure Nextgen Networks plans and information provided remains on-site at all times throughout your construction phase

ESSENTIAL PRECAUTION AND APPROACH DISTANCE

NOTE: If the following clearances cannot be maintained, please contact the Nextgen Network Help Desk (see below for details) for advice on how best to resolve this situation

1. On receipt of plans and sketches and before commencing excavation work or similar activities near Nextgen Networks plant, carefully locate this plant first to avoid damage. Undertake prior exposure (vacuum excavation) such as potholing when intending to excavate or work closer to Nextgen Networks plant than the following approach distances:

- Where Nextgen Networks plant is in an area where road and footpaths are well defined by kerbs or other features a minimum clear distance of 600mm must be maintained from where it could be reasonably presumed that plant would reside
- In non established or unformed reserves and terrain, this approach distance must be at least 1.5 metres
- In country/rural areas which may have wider variations in reasonably presumed plant presence, the following minimum approach distances apply:
  d) Parallel to major plant: 10 metres (for optic fibre cable)
  e) Parallel to other plant: 5 metres

  Note: Even pot-holing needs to be undertaken with extreme care, common sense and employing techniques least likely to damage cables. For example - vacuum excavation.

- If construction work is parallel to Nextgen Networks plant, then careful pot-holing at least every 5m is required to establish the location of all plant, hence continuing nominal locations before work can commence

2. Maintain the following minimum clearance between construction activity and actual location of Nextgen Networks Plant.

Jackhammers/Pneumatic Breakers	*Not within 1.0m of actual locations*
Vibrating Plate or Wackers Packer Compactors	*Not within 0.5m of Nextgen Networks ducts 300mm compact clearance cover before compactor can be used across Nextgen Networks ducts, and 600mm clearance across Nextgen Networks cables in the solid*
Boring Equipment (in-line, horizontal and vertical)	*Not within 2.0m of actual location Constructor to check depth via vacuum excavation (pot-hole)*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Nextgen Networks ducts with less than 600mm cover. Not to be driven across Nextgen Networks fibre with less than 1.2m cover Constructor to vacuum excavate(pot-hole) and expose plant*
Mechanical Excavators, Boring and Tree Removal	*Not within 1.0m of actual location Constructor to vacuum excavate (pot-hole) and expose plant*

- All Nextgen Networks pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work
- All Nextgen Networks conduit should have the following minimum depth of cover after the completion of your work:

  Footway 450mm
  Roadway 450mm at drain invert and 600mm below the pavement subgrade level invert

- All Nextgen Networks fibre in the solid should have the following minimum depth of cover after the completion of your work:

  Footway 600mm
  Roadway 1200mm at drain invert and 1200mm below the pavement subgrade level invert

- For clearance distances relating to Nextgen Networks above ground infrastructure please contact the Network Help Desk (see below for details)

FURTHER ASSISTANCE

Over-the-phone assistance can be obtained by calling the Network Help Desk below.
Nextgen require 5 clear business days notice to conduct an on-site location. The initial on site location visit will not normally incur a charge, but at the discretion of Nextgen subsequent site visits may incur a charge to be applied at an hourly rate.
Where an on-site location is provided, the owner is responsible for all vacuum excavation work (pot-holing) to visually locate and expose Nextgen Networks plant.
If plant location plans or visual location of Nextgen Networks plant by vacuum excavation reveals that the location of Nextgen Networks plan is situated wholly or partly where the owner plans to work, then **Nextgen Networks** must be contacted through the **Network Help Desk** to discuss possible engineering solutions.
The contact number for the **Network Help Desk** is 1800 032 532.

NOTE:
If Nextgen Networks relocation or protection works are part of the agreed solution, then payment to Nextgen Networks for the cost of this work shall be the responsibility of the principal developer. The principal developer will be required to provide Nextgen Networks with the details of their proposed work showing how Nextgen Networks plant is to be accommodated and these details must be approved by the Nextgen National Operations Manager prior to the commencement of site works.

RURAL LANDOWNER - IMPORTANT INFORMATION

Where Nextgen Networks owned cable crosses agricultural land Nextgen Networks will provide a one off free-on-site electronic cable location. Please note that the exact location of cables can only be verified by visual proving by pot holing, which is not covered by this service. The Network Integrity HelpDesk Officer will provide assistance in determining whether a free-on-site location is required. Please ring the Nextgen Network Help Desk as listed above.

PRIVACY NOTE

Your information has been provided to Nextgen Networks by DBYD to enable Nextgen Networks to respond to your DBYD request. Nextgen Networks keeps your information in accordance with its privacy statement entitled 'Protecting Your Privacy' which can be obtained from Nextgen Networks either by calling 1800 032 532 or visiting our website www.nextgengroup.com.au

Warning: Nextgen Networks plans show only the presence of cables and plant. They only show their position relative to road boundaries, property fences etc, at the time of installation and Nextgen Networks does not warrant or hold out that such plans are accurate thereafter due to changes that may occur over time.
DO NOT ASSUME DEPTH OR ALIGNMENT of cables or plant as these vary significantly.
The customer has A DUTY OF CARE when excavating near Nextgen Networks cables and plant. Before using machine excavators NEXTGEN PLANT MUST FIRST BE PHYSICALLY EXPOSED BY VACUUM EXCAVATION (potholing) to identify its location.
Nextgen Networks will seek compensation for damages caused to its property and losses caused to Nextgen Networks and its customers.

EXPERIENCED PLANT LOCATORS (for your area)

On-site assistance should be sought from an Experienced Plant Locater if the telecommunications plant cannot be located within 2.5 metres of the locations indicated on the drawings provided. On-site advice should be obtained from a suitably qualified contractor highly skilled in locating Nextgen Networks plant. If there is any doubt whatsoever about the actual location of the telecommunications plant, the best method for locating the telecommunications plant or the correct interpretation of the drawings provided. In the case where Nextgen Networks plant is outside a recognised road reserve Nextgen Networks recommends that the **Network Help Desk** is contacted for assistance prior to engaging an Experienced Plant Locater.

For the assistance of customers Nextgen Networks has established strict criteria to assess the skill of contractors that may be engaged by owners requiring Nextgen Networks plant locating services to perform any of the following activities if requested to do so by the owner:

- Review Nextgen Networks plans to assess the approximate location of Nextgen Networks plant
- Advise owners of the approximate location of Nextgen Networks plant according to the plans
- Advise the owners of the best method for locating Nextgen Networks plant
- Advise owners of the hazard of unqualified persons attempting to find the exact location of Nextgen Networks plant and working in the vicinity of Nextgen Networks plant without first locating its exact position
- Perform trial hole explorations by vacuum excavation (pot-holing) to expose Nextgen Networks plant with a high degree of skill, competence and efficiency and utilising all necessary safety equipment

Nextgen Networks does not accept any liability or responsibility for the performance of or advice given by any Plant Locater engaged by you but we will, if requested, recommend suitably qualified plant locators.

GENERAL DISCLAIMER

While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither Nexgen or PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

North Sydney Council

Referral
269943780

Member Phone
(02) 9936 8100

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	85
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Attention: **Marko Djukanovic**

Thank you for your Before You Dig (BYDA) enquiry.

Job Number: **52659214**

Sequence Number: **269943780**

Dig Site Location: **601 Pacific Hwy St Leonards NSW 2065**

Thank you for contacting Before You Dig Australia (BYDA) prior to engaging in work or activities which may affect North Sydney Council Infrastructure/ Assets.

Attached is our response to your BYDA enquiry.

Also, attached are the files containing information relating to your Before You Dig request. You must read and understand all attached files in this email before proceeding with any works.

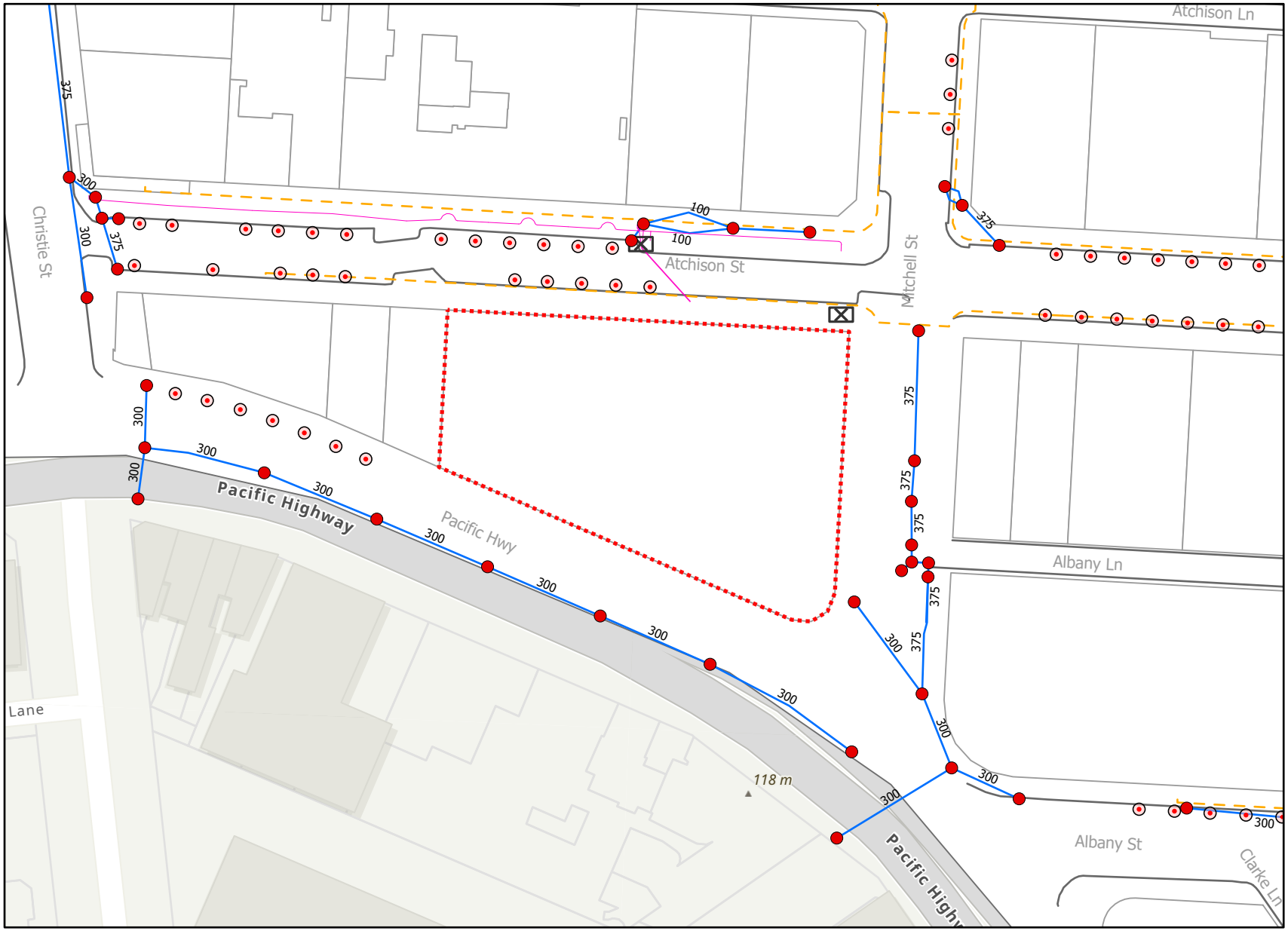
For further enquiries or assistance with interpretation of plans and search content please contact our DBYD support officer via email dbyd@northsydney.nsw.gov.au or phone 02 9936 8382.

Regards,

North Sydney Council

Job # 52659214
Seq # 269943780

Provided by North Sydney Council



Legend

- BYDA Enquiry
- Drainage Pit
- Parking Meter Sensor
- Drainage Pipe
- Redundant Parking Meter Cable
- Conduit / Cable
- Distribution Boards
- Kerbs

Esri Community Maps Contributors, DCCEEW, Spatial Services, © OpenStreetMap, Microsoft, Esri, TomTom, Garmin, METI/ NASA, USGS

Disclaimer: The Plan is provided in response to a Before You Dig request. While all reasonable care has been taken to ensure the accuracy of the information on this plan, its purpose is to provide a general indication of the location of North Sydney Council infrastructure. The information provided may contain errors or omissions and the accuracy may not suit all users. A site inspection and investigation is recommended before commencement of any project based on this data.

In an emergency contact North Sydney Council on 02 9936 8100

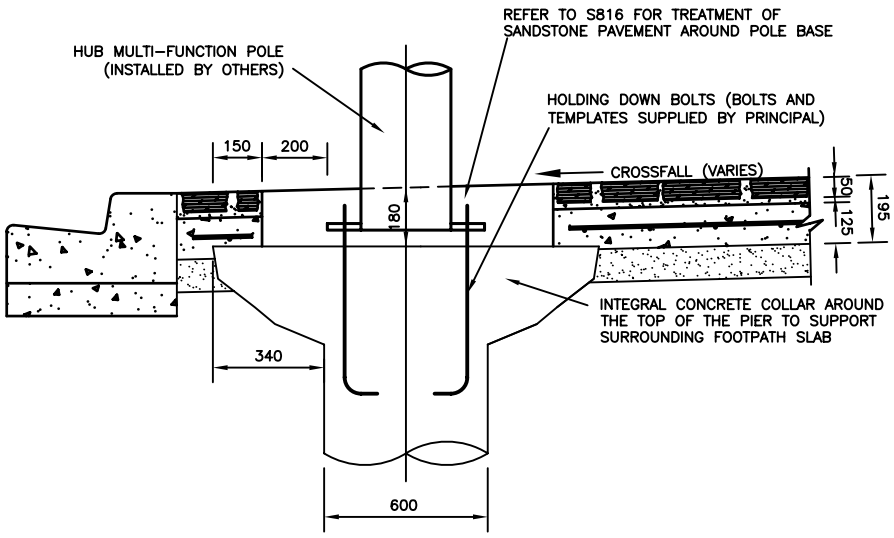
18/03/26 (valid for 30 days)

Plans generated by SmarterWX™ Automate

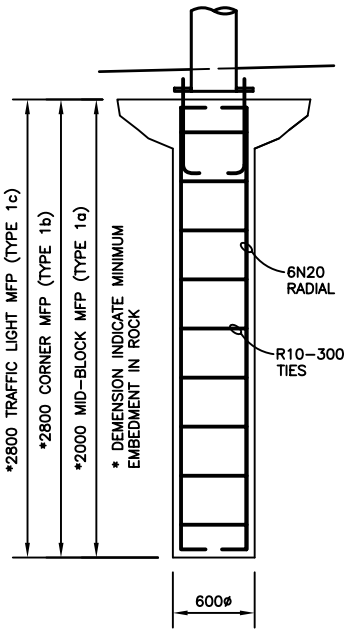
0 10 20 40 m

Scale 1:1,000

NOTE: ELECTRICAL AND/OR COMMUNICATIONS CONDUITS ARE NOT SHOWN FOR CLARITY



DETAIL

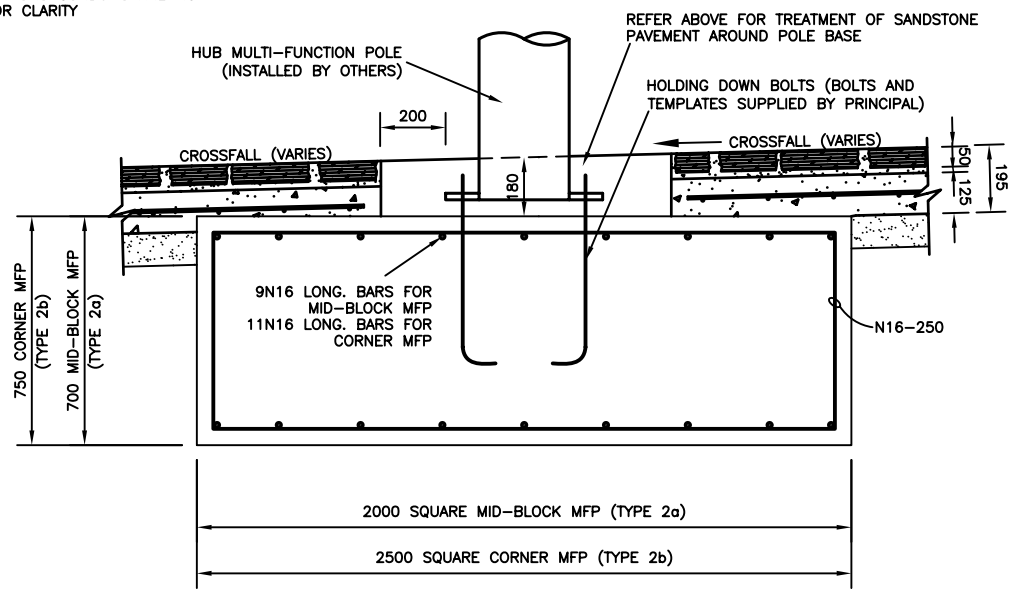


ELEVATION

STANDARD PIER FOOTING – TYPE 1

TYPE 1a: MID-BLOCK MULTI-FUNCTION POLE
TYPE 1b: CORNER MULTI-FUNCTION POLE
TYPE 1c: TRAFFIC LIGHT MULTI-FUNCTION POLE

NOTE: ELECTRICAL AND/OR COMMUNICATIONS CONDUITS ARE NOT SHOWN FOR CLARITY



SECTION

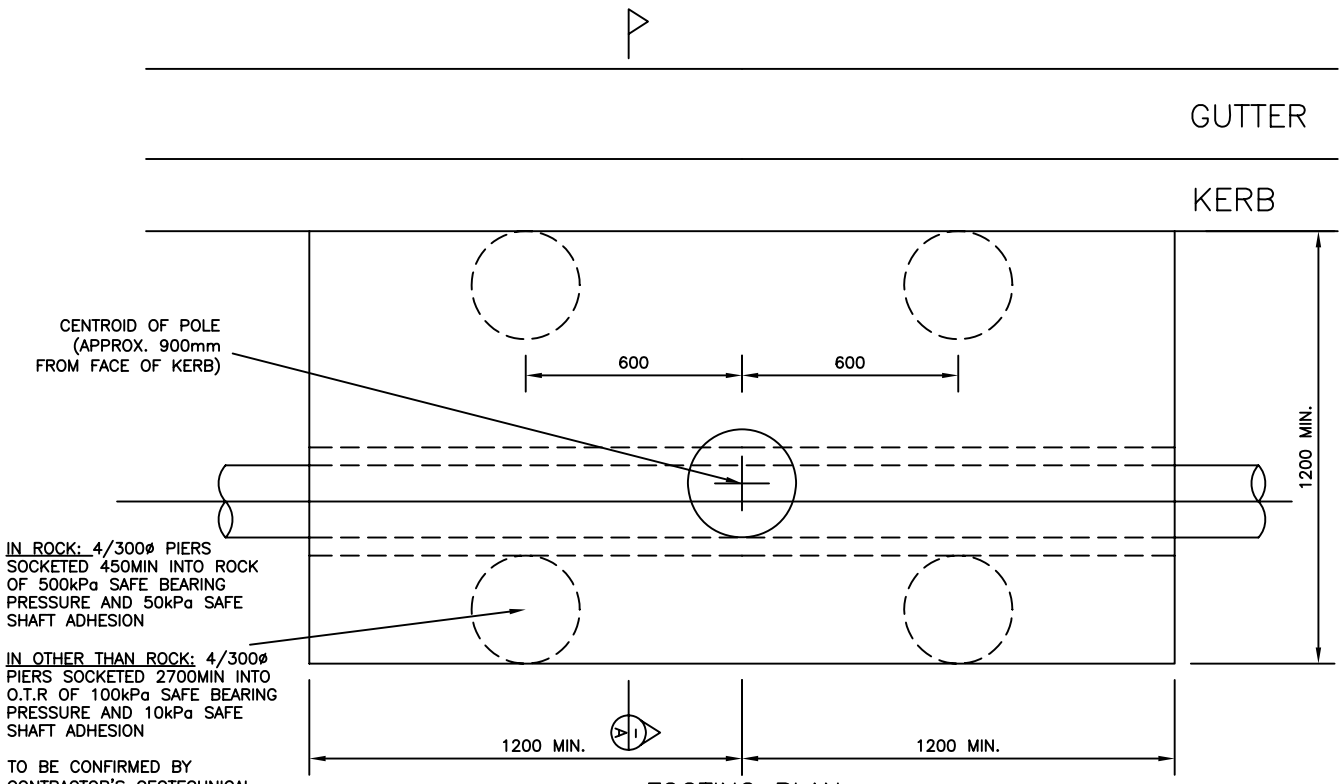
STANDARD PAD FOOTING – TYPE 2

TYPE 2a: MID-BLOCK MULTI-FUNCTION POLE
TYPE 2b: CORNER MULTI-FUNCTION POLE

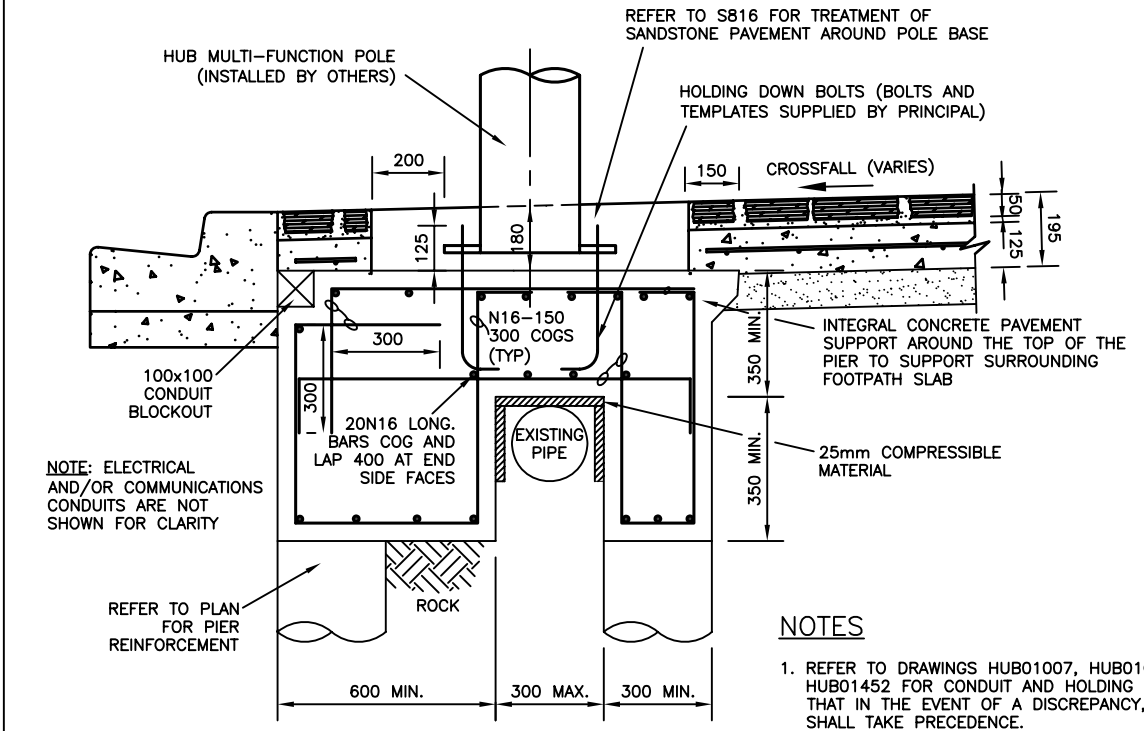
NOTES

1. REFER TO DRAWINGS HUB01007, HUB01047, HUB01435 AND HUB01452 FOR CONDUIT AND HOLDING DOWN BOLT DETAILS. NOTE THAT IN THE EVENT OF A DISCREPANCY, THE HUB DRAWINGS SHALL TAKE PRECEDENCE.
2. MINIMUM CONCRETE COVER TO REINFORCEMENT IS 40mm.
3. CONCRETE STRENGTH f'c = 32MPa.
4. PREFERRED MINIMUM CLEARANCE FROM FACE OF KERB TO FACE OF POLE IS 750mm, ABSOLUTE MINIMUM CLEARANCE IS 600mm.

APPROVED: COUNCIL ENGINEER DATE: 01/11/09	NORTH SYDNEY COUNCIL	NORTH SYDNEY COUNCIL CBD MULTI-FUNCTION POLE FOOTING TYPE 1 & 2	SCALE N.T.S. DRAWING NO. S822



FOOTING PLAN



SECTION A–A

NOTES

1. REFER TO DRAWINGS HUB01007, HUB01047, HUB01435 AND HUB01452 FOR CONDUIT AND HOLDING DOWN BOLT DETAILS. NOTE THAT IN THE EVENT OF A DISCREPANCY, THE HUB DRAWINGS SHALL TAKE PRECEDENCE.
2. MINIMUM CONCRETE COVER TO REINFORCEMENT IS 40mm.
3. CONCRETE STRENGTH f'c = 32MPa.
4. PREFERRED MINIMUM CLEARANCE FROM FACE OF KERB TO FACE OF POLE IS 750mm, ABSOLUTE MINIMUM CLEARANCE IS 600mm.

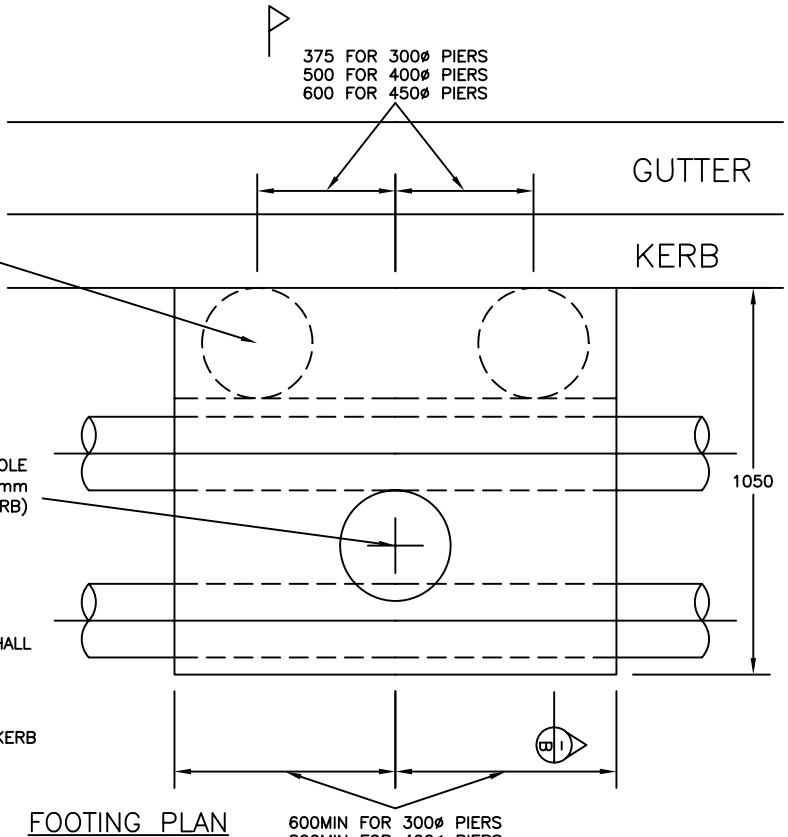
PIER AND BEAM FOOTING – TYPE 3

APPROVED: COUNCIL ENGINEER DATE: 01/04/08		NORTH SYDNEY COUNCIL CBD MULTI–FUNCTION POLE FOOTING TYPE 3	SCALE N.T.S. DRAWING NO. S823

IN ROCK
TYPE 4a: 2/300ø PIERS 3000 EMBEDMENT
TYPE 4b: 2/400ø PIERS 2000 EMBEDMENT
TYPE 4c: 2/450ø PIERS 1500 EMBEDMENT
INTO ROCK OF 500kPa SAFE BEARING PRESSURE AND 50kPa SAFE SHAFT ADHESION

IN OTHER THAN ROCK
TYPE 4c: 2/450ø PIERS 4500 EMBEDMENT
INTO O.T.R OF 100kPa SAFE BEARING PRESSURE AND 10kPa SAFE SHAFT ADHESION

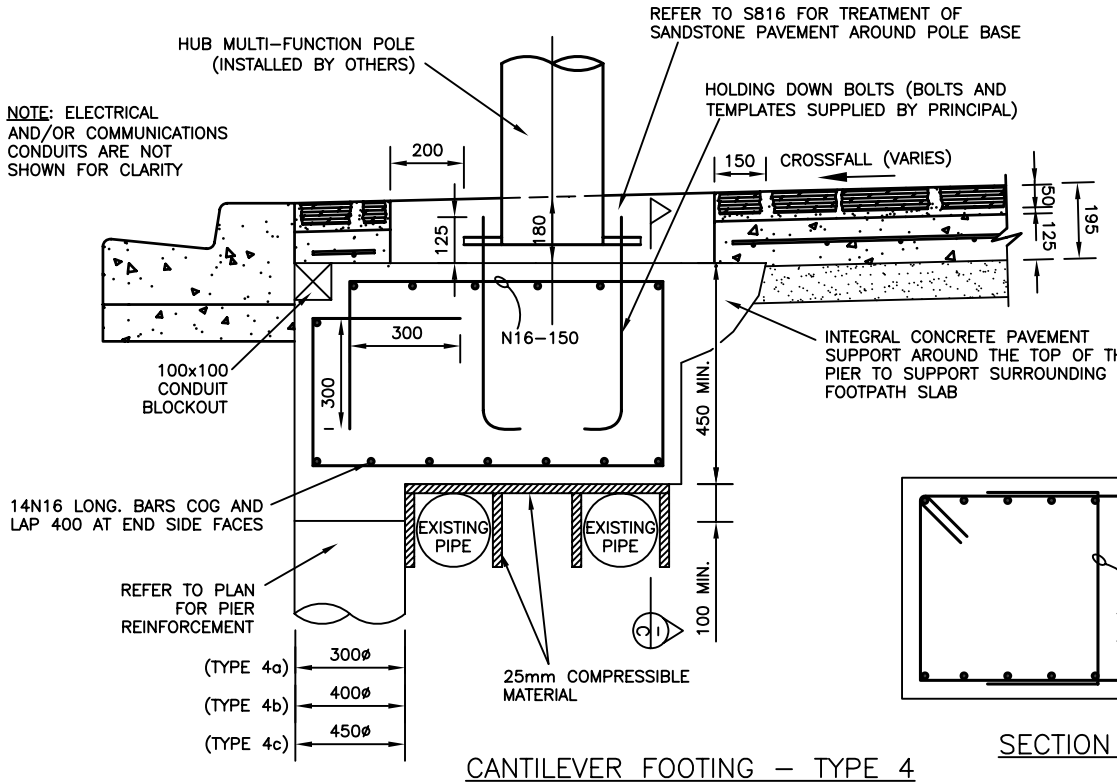
TO BE CONFIRMED BY CONTRACTOR'S GEOTECHNICAL ENGINEER. 6N20 + N12–150 PITCH. EXTEND VERTICAL BARS 500 INTO PADS AND COG 300 HORIZONTALLY.



FOOTING PLAN

NOTES

1. REFER TO DRAWINGS HUB01007, HUB01047, HUB01435 AND HUB01452 FOR CONDUIT AND HOLDING DOWN BOLT DETAILS. NOTE THAT IN THE EVENT OF A DISCREPANCY, THE HUB DRAWINGS SHALL TAKE PRECEDENCE.
2. MINIMUM CONCRETE COVER TO REINFORCEMENT IS 40mm.
3. CONCRETE STRENGTH f'c = 32MPa.
4. PREFERRED MINIMUM CLEARANCE FROM FACE OF KERB TO FACE OF POLE IS 750mm, ABSOLUTE MINIMUM CLEARANCE IS 600mm.



SECTION B–B

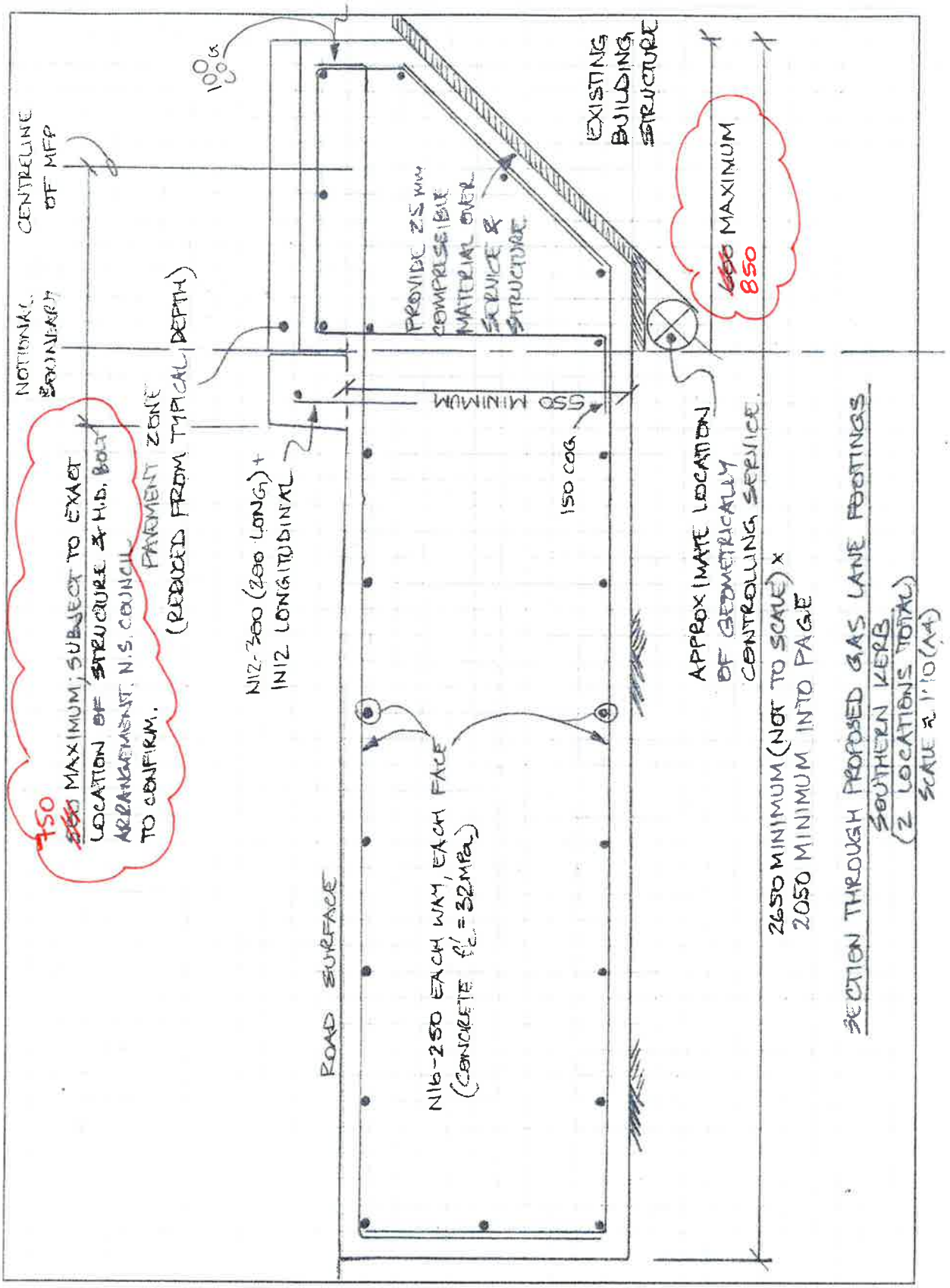
SECTION C–C

CANTILEVER FOOTING – TYPE 4

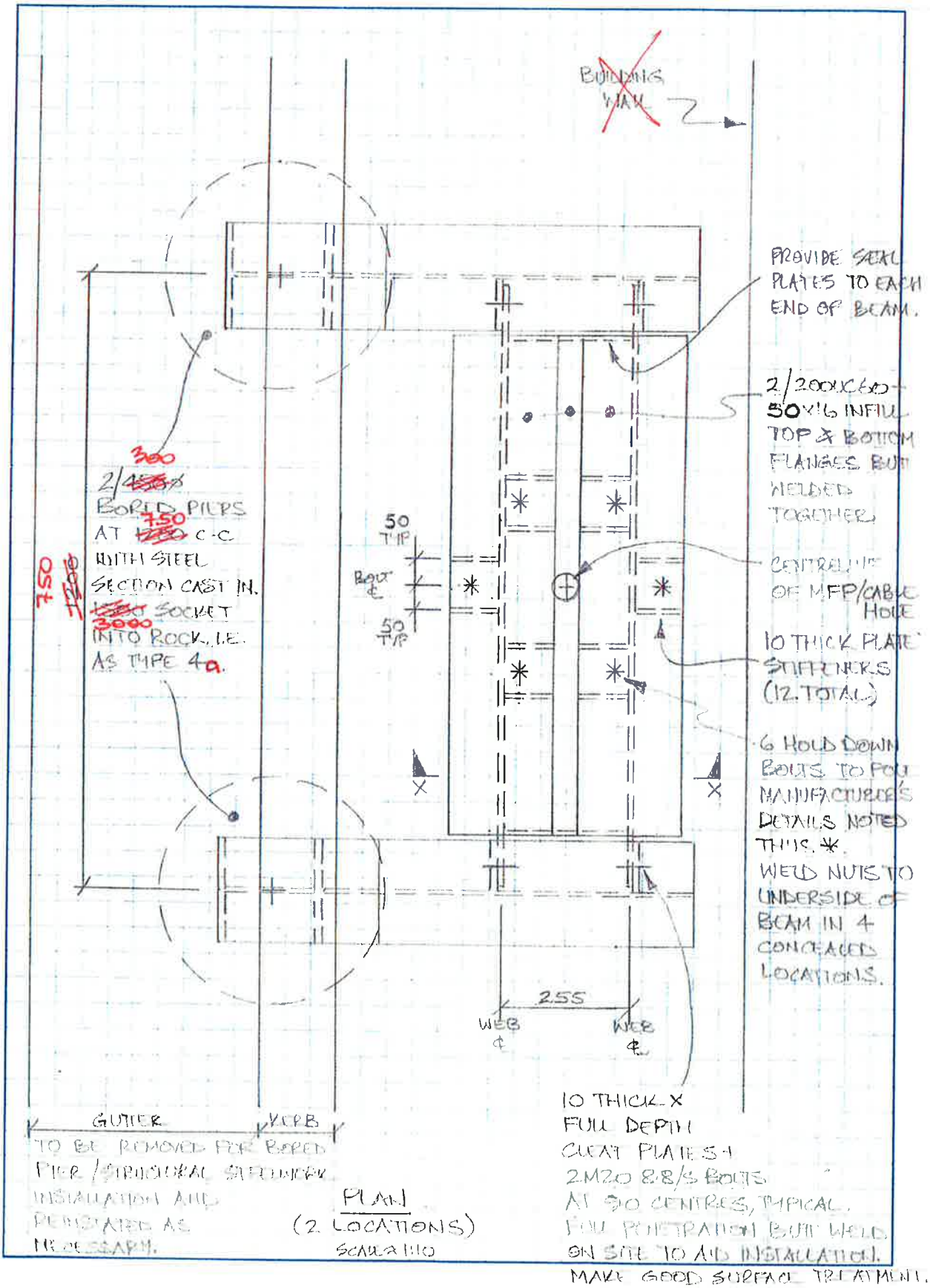
TYPE 4a: 2/300ø PIERS 3000 EMBEDMENT IN ROCK
TYPE 4b: 2/400ø PIERS 2000 EMBEDMENT IN ROCK
TYPE 4c: 2/450ø PIERS 1500 EMBEDMENT IN ROCK

APPROVED: COUNCIL ENGINEER DATE: 01/07/09		NORTH SYDNEY COUNCIL CBD MULTI–FUNCTION POLE FOOTING TYPE 4	SCALE N.T.S. DRAWING NO. S824

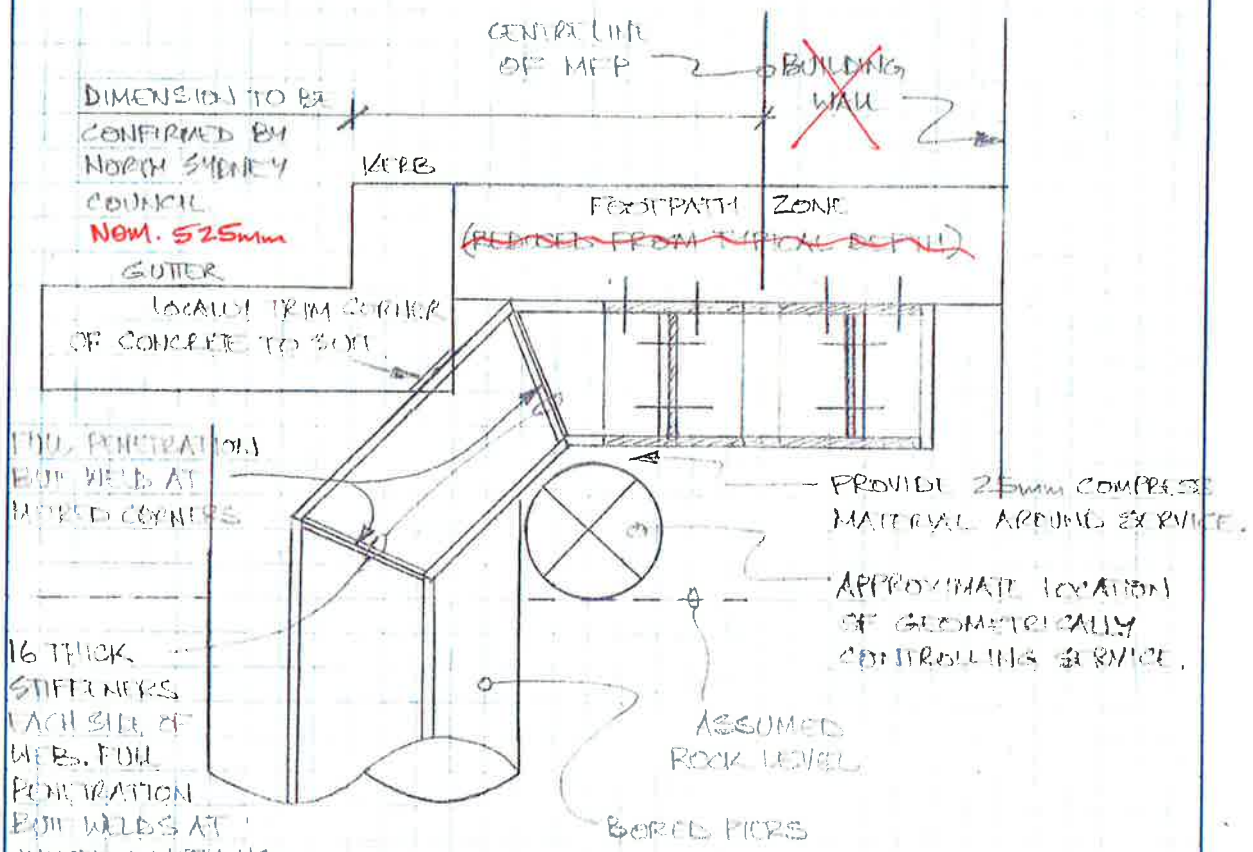
APPROVED:		NORTH SYDNEY COUNCIL	SCALE
COUNCIL ENGINEER		CBD MULTI-FUNCTION POLE FOOTING TYPE 2s	N.T.S.
DATE: 13/01/16			DRAWING NO.



APPROVED:		NORTH SYDNEY COUNCIL	SCALE N.T.S.
COUNCIL ENGINEER		CBD MULTI-FUNCTION POLE FOOTING TYPE S	DRAWING NO.
DATE: 13/01/16			



APPROVED:		NORTH SYDNEY COUNCIL	SCALE N.T.S.
COUNCIL ENGINEER		CBD MULTI-FUNCTION POLE FOOTING TYPE S	DRAWING NO.
DATE: 13/01/16			



SECTION X-X
SCALE ≈ 1:10

NOTES:
- ALL DESIGN, MATERIALS AND WORKMANSHIP SHALL CONFORM TO AS4100 & AS1554.
- UNLESS NOTED OTHERWISE, ALL WELDS SHALL BE 6mm CONTINUOUS FILLET TYPE GP USING E41/XX ELECTRODES, BUTT WELDS SHALL BE COMPLETE PENETRATION TO AS1554. INSPECTION CRITERIA FOR ALL WELDS SHALL BE PROVIDED TO AS1554 WITH ALL WELDS BEING 100% VISUALLY SCANNED.
- ALL STEELWORK SHALL BE BLAST CLEAN CLASS 3 TO AS1627 AND HOT DIPPED GALVANISED TO AS/NZS 4680 TO 600g/m² MINIMUM (650g/m² MINIMUM). WHERE GALVANISED COATING ON-SITE MAKE GOOD WITH 2 COATS OF ETHOXY ZINC RICH PRIMER EQUIVALENT TO DRY ZINC LOAD 900 / 1100 GRAMS TO DFT 100µm. BACKFILLING AROUND STEEL PILES WITH CONCRETE FOR ADDITIONAL DURABILITY IS RECOMMENDED.

APPROVED:		NORTH SYDNEY COUNCIL	SCALE N.T.S.
COUNCIL ENGINEER		CBD MULTI-FUNCTION POLE FOOTING TYPE Sx	DRAWING NO.
DATE: 13/01/16			

6 HOLD DOWN BOLTS TO FOLL MANUFACTURER'S DETAILS NOTED THUS *. WELD NUTS TO UNDERSIDE OF BEAM IN 4 CONCEALED LOCATIONS.

PROVIDE FULL SIZE PACKER EACH END.

2/200UC60 + 50x16 INFILL TOP & BOTTOM FLANGES BUTT WELDED TOGETHER.

2/400ø BORED PIERS AT 1000 C-C WITH STEEL SECTION CAST IN. 2000 SOCKET INTO ROCK I.E. AS TYPE 4b.

10 THICK PLATE STIFFENERS (12 TOTAL)

50 TYP.

BOLT ℄

50 TYP.

1000

CENTRELINE OF 1AFP/CABLE HOLE

200UC60

200UC60

255

WEB ℄

WEB ℄

PROVIDE SEAL PLATES TO EACH END OF BEAM.

10 THICK x FULL DEPTH CLEAT PLATES + 2M20 8.8/S BOLTS AT 90 CENTRES, TYPICAL. FULL PENETRATION BUTT WELD ON SITE TO AID INSTALLATION. MAKE GOOD SURFACE TREATMENT.

Y

Y

GUTTER

KERB

PLAN

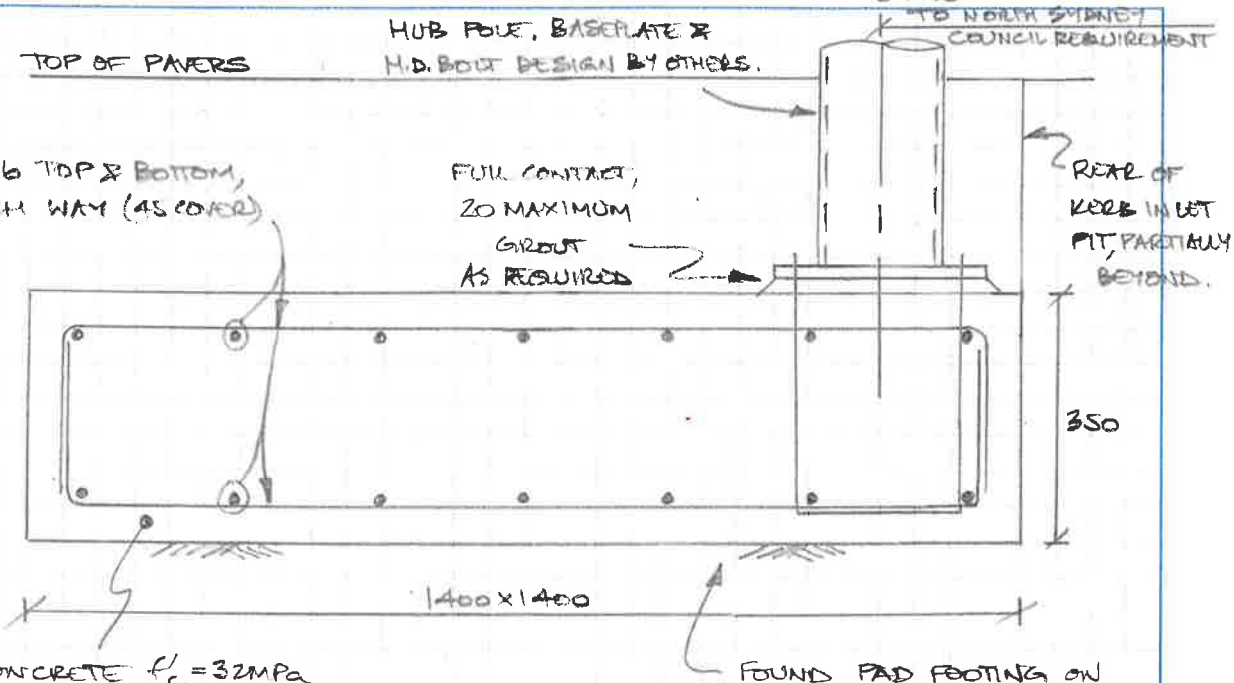
LOCATION 2.

SCALE 1:10 (A4)

LOCATION 19 SIMILAR.

CONSULTANTS
Suite 8, 82 - 86 Pacific Highway
St Leonards, NSW 2065 Australia
P: +61 2 9957 2294
E: office@gcaconsultants.com.au
W: www.gcaconsultants.com.au
ACN: 001 897 678
ABN: 56 020 305 377

PROJECT SHORE STREET LIGHTING
JOB No. 19092
DATE 6-4-20
BY MM
PAGE SK2



CONCRETE f'_c = 32MPa AT 28 DAYS.

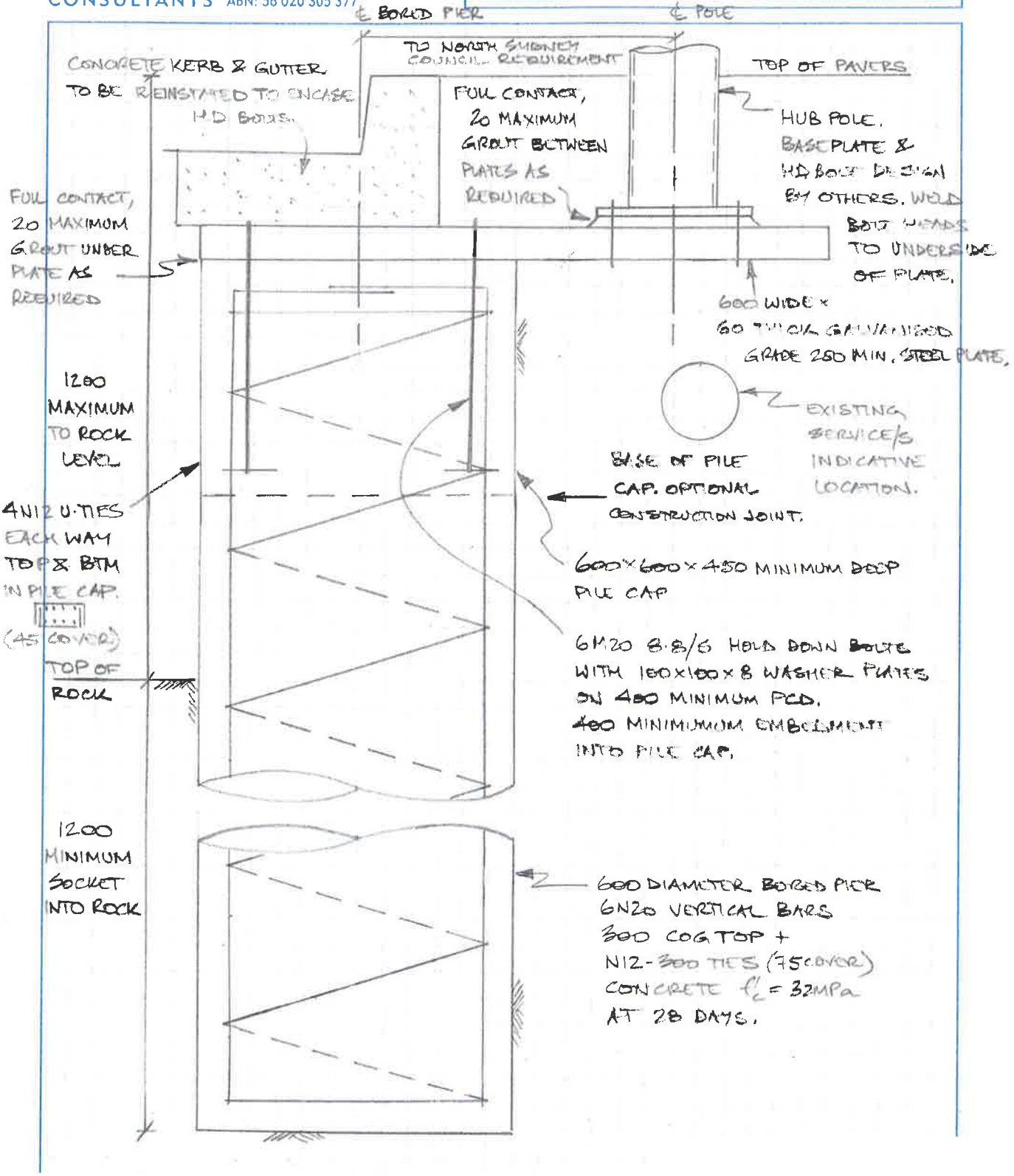
PAD FOOTING DETAILS SL06
SCALE 1:10 (A4)

FOUND PAD FOOTING ON WELL GRADED GRANULAR MATERIAL, FREE OF ORGANIC MATTER, COMPACTED TO 95% OF SMDD WITH HAND OPERATED EQUIPMENT.

APPROVED: COUNCIL ENGINEER DATE: 01/08/21	NORTH SYDNEY COUNCIL	NORTH SYDNEY COUNCIL CBD MULTI-FUNCTION POLE FOOTING TYPE 2a	SCALE N.T.S. DRAWING NO.

APPROVED:		NORTH SYDNEY COUNCIL	SCALE
COUNCIL ENGINEER		CBD MULTI-FUNCTION POLE FOOTING TYPE 4a	N.T.S.
DATE: 01/08/21			DRAWING NO.

CONSULTANTS ABN: 56 020 305 377 BY MM PAGE



BORED PIER & STEEL PLATE FOOTING DETAILS SL01, SL02, SL03 AND SL05 SCALE = 1:10 (A4)

The Roads Act enables North Sydney Council to specify the manner and standards to which any person who is entitled to place utility services in, on or over a road can undertake work.

The work referred to in this document involves all clearing, excavation, backfilling and restoration activities associated with the installation/programmed maintenance *or* emergency maintenance, of public utility services within public road reserves or other reserves under the control of North Sydney Council.

This document shall be read in conjunction with the current versions of the NSW Streets Opening Conference Guide to Codes & Practices for Street Opening and AUSPEC Specifications for Road Openings and Restorations.Where this and the above mentioned documents cover the same areas this document shall take precedence.

This document shall apply to works carried out by the Public Utility Authority itself or work under contract where the Principal to the Contract is the Public Utility Authority.

NOTIFICATION OF WORK

1. Notification of proposed work shall include the following details:

   - The Job/Project number.
   - Contact details for the Superintendent or Superintendent's Representative of the Public Utility/Authority.
   - Contact details for the Contractor including the site supervisor and after-hours emergency numbers.
   - Proposed hours of work.
   - Copies of notification letters to affected properties.

2. The notification process and customer service liaison during any work must be of the highest order.

3. Every attempt must be made by the Public Utility/Suthority; their contractors and sub-contractors to minimise the impact works will have on the surrounding area.

4. All affected properties are to be kept fully informed of upcoming works and the progress of works once started.

5. The contractor for the Public Utility/Authority shall take out a Street Opening Permit, prior to the commencement of any programmed work. **No application fee shall apply for this permit; however, should the contractor be responsible for permanent restoration; restoration fees shall be paid based on the estimated extent of work and as detailed below.**

6. Details supplied with the permit must include, though not be restricted to:

   - Contact details for the contractor including the site supervisor and after-hours emergency numbers.
   - The name of the Public Utility/Authority for whom the work is being undertaken including the Job/Project number and contact details for the Public Utility/Service Authority's representative.
   - Approval from Police Local Area Traffic Branch.
   - The submitted and approved Traffic Guidance Scheme for the proposed works in accordance with requirements of AUSPEC Road Openings and Restorations.
   - TMC Road Occupancy Licence where applicable.
   - Proposed hours of work.
   - Extent of restoration work required based on the guidelines in this document.
   - Copies of all notification letters.

EMERGENCY MAINTENANCE WORK

1. Emergency maintenance work must be undertaken in accordance with the requirements of this document, with the following exceptions:

   - Notification is not required.
   - No restriction to the hours of work.
   - Saw cutting the edges of the opening is not required.

2. Where traffic flows are affected due to the required work, the Transport Management Centre and Harbourside Police Traffic Branch shall be notified as soon as possible.

HOURS OF WORK

1. The standard hours of work in the Council area are 7:00am to 5:00pm Monday to Friday and 8:00am to 1:00pm Saturday.

2. Proposed hours of work outside those stated above must be noted on the notification. Refer to Practice Note vii of the RMS (RTA) Environmental Noise Management Manual for guidance in the programming of work outside standard hours of work.

3. Where a Road Occupancy Licence (ROL) is necessary, hours of work will be restricted to those stated on the approved licence.

TRAFFIC MANAGEMENT

1. The Australian Road Rules as applied in New South Wales apply to all work areas. This includes:
   - Enforcement of NO STOPPING ZONES; CLEARWAYS; TRANSIT LANES; etc. during signposted times
   - Not standing any plant or skips within 10 metres of the nearest point of an intersecting road.

2. It is an offence under Section 667 of the Local Government Act for any person to wilfully remove, destroy, damage or otherwise interfere with notices or signs erected by Council. Penalty exceeds $1,000.00.

3. All traffic control shall be in accordance with the current version of AS 1742

4. Where the works to be undertaken are likely to affect vehicular traffic on State or Regional roads; within 100m of any set of traffic lights; or on the following RMS maintained roads, a Road Development *or* Road Occupancy Licence must be obtained:

Falcon Street	–	Pacific Highway to Military Road.
Military Road	–	Falcon Street to Macpherson Street.
Pacific Highway	–	Harbour Bridge to Christie Street.
Berry Street	–	Pacific Highway to Arthur Street.
Arthur Street	–	Berry Street to Mount Street.
Miller Street	–	Falcon Street to Cammeray Suspension Bridge.

5. Vehicular and pedestrian access to properties shall be maintained wherever possible. 48 hours written notice shall be provided to property owners whose access will be affected.

6. **Emergency vehicle access must be available at all times.**

7. **All traffic control/management documents and plans shall be available on-site at all times.**

WASTE SKIPS

1. A Building Waste Skip Permit shall be taken out for each skip on-site. The placement of skips away from the work site for future use is not permitted. The contractor will be directed to remove any offending skip/s. Failure to do so may result in the impounding of the skip/s and Council seeking reimbursement for the cost of the removal. **All fees for up to three (3) skips shall be waived. For four (4) or more skips all fees shall be paid by the applicant.**

LOCATION AND MAINTENANCE OF SERVICES

7. Prior to commencement, Council's Design Section shall be contacted to obtain location details for stormwater and subsoil drainage lines; recycled water reticulation network and street lighting cabling that may be in the affected area.

8. The location of existing stormwater and subsoil drainage lines; recycled water reticulation network and street lighting cabling, shall be established by exploratory excavation prior to the principal excavation.

9. Property stormwater lines discharging into kerb and guttering or other Council drainage structures, eg. Pits or pipes, shall be maintained at all times.

10. Any damage caused to any of the above services by activities associated with the maintenance/installation work shall be repaired or replaced to the satisfaction of Council.

SURFACE PAVEMENT REMOVAL

1. The edges of all proposed trenches in concrete or asphalt footpaths or carriageway pavements shall be saw-cut for the full depth of the bound pavement layers except where located along expansion joints. Any concrete base found under segmental pavers, shall also be saw-cut for its full depth.

2. All concrete and asphalt footpath and carriageway pavement material shall be removed and legally disposed of off-site.

3. **All full segmental paving units shall be taken up by hand, neatly stacked on pallets, sealed with plastic wrap and delivered to Council's Works Depot. Pallets returned to Council's Works Depot shall be clearly marked to identify the origin of the pavers.**

4. Council approval is required to store pavers on-site. Pavers stored on-site must be at a location that will minimise interference with both vehicular and pedestrian traffic access to the area and surrounding properties.

5. **All cut and damaged segmental paving units and concrete edging associated with sections of lifted segmental pavers shall be removed and legally disposed of off-site.**

6. **Turf, small plants, shrubs and trees may be taken up and stored for possible re-use. The decision as to whether or not the turf and plants are suitable for re-use will be made by Council's Open Space & Environmental Services Division. Contact on - Ph (02) 9936 8228.**

7. All turf, small plants, shrubs and trees deemed unsuitable for re-use shall be removed and legally disposed of off-site.

EXCAVATION

1. **No excavated material shall be re-used for backfilling.**

2. All excavated material shall be legally disposed of off-site immediately.

3. Where excavating across a roadway, not more than one-half the width of the road pavement shall be opened at any one time.

4. Excavated material shall not, at any time, be stockpiled against tree trunks, buildings, fences or obstruct the free flow of water along gutters.

BACKFILLING

1. **No excavated material shall be used for backfilling.**

2. All backfilling, between the Overlay Zone for the particular service being installed and the base-course for the surface treatment, shall be undertaken in accordance with AUS-SPEC 1152 4.2 Trench Backfill.

3. The base-course backfill shall consist of DGB20 material in accordance with Council's Standards and Specifications.

4. Backfill for trenches less than 300mm in width shall be placed by hand with shovels. **In such trenches backfill shall not be pushed in from the sides with mechanical plant.**

COMPACTION

1. Backfilling shall be compacted to the requirements of Table 4.1 in AUS-SPEC 1152 4.3 Compaction of Trench Backfill.

2. All material shall be compacted in layers not exceeding 150mm compacted thickness. Each layer shall be compacted to the minimum compaction specified before the next layer is commenced.

PROTECTION OF TREES

1. All existing trees shall be protected from any damage during the works.

2. The storage, stockpiling, dumping or otherwise placing under or near trees, bulk materials and harmful materials, including oil, waste concrete, clearings, boulders and the like is prohibited.

3. The Public Utility Authority or its Contractor shall not attach stays, guys and the like to trees and shall prevent damage to tree bark.

4. **The Public Utility Authority or its contractor shall not cut tree roots without the approval of Council's Division of Open Space and Environmental Services - Ph (02) 9936 8228.**

5. All soil replacement, for a minimum 300mm thickness around tree roots, shall consist of a soil mixture approved by Council's Division of Open Space and Environmental Services, placed and compacted in layers of no more 150mm to a dry density equal to that of the surrounding soil.

6. No material shall be placed above the original ground surface around tree trunks or over the root zone unless approved by Council's Division of Open Space and Environmental Services.

RESTORATION - GENERAL

1. Carriageway pavements and pathways shall be restored in a continuous manner to a condition at least equivalent to that existing prior to the commencement of the works.

2. **Service access pits, access chamber frames and lids, etc. shall be set by the Public Utility Authority or its contractor such that carriageway pavements and pathways can be restored to original levels. All new pit installations or reconstructions must use aesthetic/pave-through pit lids where they are in existing paved areas. The Public Utility Authority or its contractor shall liaise with other utility authorities should any other utility service access pit be required to be adjusted or replaced prior to restoration.**

3. All asphalt carriageway pavement reinstatements shall include a 100mm over-cut around the entire perimeter of the opening. The minimum width for trench restoration works on asphalt roadways or paths is 600mm.

4. All concrete carriageway pavement reinstatements shall be dowelled to the existing road pavement in accordance with Council's requirements.

5. Unless approved in advance by Council, the area of concrete carriageway pavement to be reinstated (in addition to the actual area opened and all over-break as a result of the works) shall include any concrete carriageway pavement adjoining such opening that is within 500mm of:

   (a) Any edge of the concrete slab in which the opening is made.
   (b) Any edge of a previous reinstatement.

6. Where the concrete footpath is determined to be less than three (3) years old, full width slab replacement is required.

7. Unless approved in advance by Council, the area of concrete footpath to be reinstated, in addition to the actual area opened and all over-break as a result of the works, shall include any concrete footpath adjoining such opening which is within 500mm of:

   (a) Any edge of the concrete slab in which the opening is made.
   (b) Any joint in a concrete slab.
   (c) Any edge of a previous reinstatement.

8. Unless approved in advance by Council, the area of segmented paving footpath to be reinstated, in addition to the actual area opened and all over-break as a result of the works, shall include one complete paver outside the edge of the excavated area around the entire perimeter.

9. Unless approved in advance by Council, the area of sandstone paved footpath to be reinstated, in addition to the actual area opened and all over-break as a result of the works, shall include an additional 300mm outside the edge of the excavated area around the entire perimeter to allow for appropriate blending in with the existing paved footpath.

10. Unless approved in advance by Council, the length of kerb and/or gutter to be reinstated, in addition to the actual length opened and all over-break as a result of the works, shall include any kerb and/or gutter adjoining the opening, which is within 500mm of a joint or the edge of a previous reinstatement.

11. Where property stormwater pipes discharging into carriageway gutters have been cut, they shall be

replaced to the satisfaction of Council.

12. **Where a restoration has subsided or proved unsatisfactory through the incorrect backfilling of an opening, the Public Utility Authority concerned will be liable for all costs involved in restoring the faulty restoration.**

13. **Where council stormwater pipes or culverts have been damaged during the course of the work, Council's Engineering and Property Services Division shall be contacted on 9936 8100 as soon as possible. Damaged pipes or culverts shall be repaired or replaced to the satisfaction of Council. The Public Utility Authority concerned will be liable for all costs involved in restoring the damage including CCTV inspections required to confirm the extent of damage and suitability of the repair.**

RESTORATION - TEMPORARY PAVEMENT RESTORATION

1. Immediately after backfilling, the carriageway pavement, footpath or driveway shall be temporarily restored and re-opened to traffic.

2. Temporary restoration shall consist of either:

   - Hot mix compacted in accordance with industry best practice to a thickness of a minimum of 25mm and maximum of 50mm. Where required the base course material shall be built up to achieve the 50mm maximum thickness allowed.
   - Permanent patch cold mix, eg. EZ Street; Sami Pavefix or similar, compacted as per manufacturer's requirements and to a maximum thickness of 50mm. Where required the base course material shall be built up to achieve the 50mm maximum thickness allowed.
   - Steel plating, non-slip coated, overlapping the opening by 400mm on each side, of sufficient thickness to support traffic loadings, suitably secured with pins and ramped with bituminous cold mix in accordance with RMS specification M209.

3. Steel plating shall only be utilised where access is required to the trench/opening again and complete backfilling is not possible.

4. Where steel plating is used, advance warning signs shall be provided in accordance with either AS 1742.3 and its associated handbooks or the RMS document – Traffic Control at Work Sites.

RESTORATION - PERMANENT BY COUNCIL

1. Restoration orders shall be sent to Council through either:

Facsimile	-	(02) 9938 8177
Email	-	council@northsydney.nsw.gov.au
Post	-	North Sydney Council PO Box 12 North Sydney NSW 2059

2. All openings in verges or public reserves shall be restored in accordance with the requirements of Council's Division of Open Space & the Environmental Services – Ph (02) 9936 8228.

3. Minimum charge for a restoration is 1.0 square metre of area *or* 1.0 metre length. Areas/lengths over the minimum shall be measured to the nearest 0.1 square metre/metre.

4. **Where the restoration is the contractual responsibility of the contractor undertaking the work, all costs associated with the restoration shall be paid to Council, based on the estimated extent of restoration required when the Street Opening Permit is taken out prior to the commencement of any work by the contractor. Adjustments will be negotiated with the contractor once the public**

utility infrastructure works are completed and the area is ready for permanent restoration.

RESTORATION - PERMANENT BY PUBLIC UTILITY AUTHORITY

1. **Permanent restoration of the area affected by the works undertaken by the Public Utility Authority or its contractor may only be carried out with the prior agreement and approval of North Sydney Council.**
   A 12 month defects liability period applies for all work undertaken by or on behalf of the public utility.

2. The extent of work shall be agreed to by North Sydney Council and the Public Utility Authority prior to the commencement of any permanent restoration work.

3. All work shall be undertaken in accordance with North Sydney Council's current Infrastructure Specification for Roadworks, Drainage and Miscellaneous Works.

4. Where a permanent restoration carried out by the Public Utility Authority or its contractor is shown to be unsatisfactory through incorrect preparation and finishing, the Public Utility Authority concerned will be liable for all costs involved in restoring the faulty restoration to Council standards.

5. All temporary pavement material shall be removed and legally disposed of off-site by the Public Utility Authority or its contractor.

6. All concrete works shall be restored using ready mixed concrete of a minimum strength of 25Mpa.

7. Around electricity supply poles, the concrete paving shall be terminated 200mm from the pole and the resulting space filled with bituminous cold mix material.

8. Paving units shall be re-laid to match the pattern and surface levels of the existing adjacent paving. Cut or damaged paving units unsuitable for re-laying shall be replaced with new units of the same material, type, size and colour as the existing units.

9. **All openings in verges or public reserves shall be restored in accordance with the requirements of Council's Division of Open Space & the Environmental Services.**

10. A maintenance period of 4 weeks applies to all turfing and landscape restorations. Maintenance includes the following activities; watering, weeding, pest and disease control, pruning, mulching or any other horticultural activity to ensure the health and survival of the turf and/or plants.

11. **At the end of the maintenance period, any turf and/or plants that have died off shall be replaced at the public utility's own expense.**

CLEANUP

1. Upon completion of all works associated with the project, the areas affected by the works and associated construction activities; including services mark-ups shall be cleaned up and restored to a condition at least equivalent to that existing at the commencement of the works.

2. All rubbish and residual construction materials shall be legally disposed of off-site by the Public Utility Authority or its contractor.

3. Failure to comply shall result in Council undertaking the necessary remediation work with all costs including overheads being charged to the Public Utility Authority.

REFERENCE DOCUMENTS

NORTH SYDNEY COUNCIL INFRASTRUCTURE SPECIFICATION FOR ROADWORKS, DRAINAGE AND MISCELLANEOUS WORKS

NSW STREETS OPENING CONFERENCE GUIDE TO CODES AND PRACTICES FOR STREETS OPENING

RMS Manual – Traffic Control at Work Sites

Australian Standard 1742 Pt 3.

AUS-SPEC – Specification 1151 – Road Openings and Restorations

AUS-SPEC – Specification 1152 – Road Openings and Restorations (Utilities)

AUS-SPEC – Specification 1391 – Service Conduits

AUS-SPEC – Specification 1392 – Trenchless Conduit Installations

RMS Specification M209 – Road Openings and Restoration

NOTE:

WHEN UNDERTAKING WORK IN THE NORTH SYDNEY COUNCIL AREA REFERENCE DOCUMENTS SHOULD BE UTILISED IN THE FOLLOWING ORDER:

1. **NORTH SYDNEY COUNCIL – PUBLIC UTILITY AUTHORITY WORKS**
2. **NSW STREETS OPENING CONFERENCE GUIDE TO CODES AND PRACTICES FOR STREETS OPENING**
3. **AUS-SPEC Specifications**

DEFINITIONS

The definition of terms used to define components of the road reserve shall be in accordance with AS 1348.1 unless otherwise stated. The terms are:

Carriageway - That portion of the road reserve devoted for the use of vehicles, including parking lanes.

Clearing - The removal of vegetation or other obstacles at or above ground level on commencing work.

Footpath - The section the pathway paved to facilitate passage of pedestrians.

Pathway - That portion of the road reserve devoted for the movement of pedestrians.

Pavement - That portion of a carriageway placed above the sub grade for the support of, and to form a running surface for, vehicular traffic. Kerbing and guttering is deemed to be part of the pavement.

Roads Authority - North Sydney Council is the Roads Authority for the local government area under its control with the exception of those roads in its local government area classified as State Roads, the carriageway portion of these roads being under the control of Roads and Maritime Services (RMS).

Service - Physical conduits or conductors within the road reserve for the distribution of electricity; gas; telecommunications; and water. They may consist of pipes, ducts, cables, etc. with associated access points, protection devices and location indication devices. Services comprise public utility and commercially provided services and property services linking from the principal carriers to properties.

Street Opening Work - Work within the road reserve, requiring a permit from the relevant Roads Authority. This includes excavation and/or trenchless techniques; restoration; cable hauls, etc.

Trenchless Technique - Includes, but is not limited to: micro tunnelling; horizontal directional drilling; auger boring; guided boring; impact moling; rotary moling; rod pushing; pipe ramming; thrust boring; jacking and bursting.

Public Utility Authority - The service provider: electricity; gas; telecommunications; or water for whom the service installation/maintenance and restoration work is being conducted.

Verge - That portion of the road formation not covered by the pavement or footpath.

REDUNDANT PARKING METER CABLES INFORMATION

Within North Sydney Council Local Government Area, near or adjacent the current parking meters, there are some old and **redundant parking meter cables** **remaining in the ground. They were originally installed in the 90's and are mostly located in footpath areas i.e. in between grass verge/pavers/concrete footpath and the back of the concrete/sandstone kerb.**

The 12V cables were disconnected from the main power source in 2006. To identify these cables, they are approximately 15mm diameter and black. In some locations for extra protection, the cables were enclosed in approx. 25mm diameter white or orange conduits. Exposed and/or buried cables are slowly being removed by Council or by Contractors during major footpath reconstruction and/or during public domain works.

Council has included their original and approximate locations on DBYD. If you are uncertain and require further clarification or information, please contact the Parking Meter team at Council on **(02) 9936 8100** prior to commencement of works.



Figure 1: *example cables and housings*



Figure 2: *black cable and internal wires*

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Figure 3: *black cable without housing*



Figure 4: *black cable housed in white conduit*



Figure 5: *cable housed in white conduit*



Figure 6: *black cable housed in orange conduit*

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UNDERGROUND ASSETS LOCATION INFORMATION

ATTENTION

The accompanying plan(s) in relation to North Sydney Council's Underground assets are forwarded in response to your recent 'Dial Before You Dig' inquiry. Please note the following important information and basis upon which the plan(s) are issued:

1. Plans indicate the general position of North Sydney Council's lighting, underground electricity, parking sensors and stormwater drainage assets **at the time of their construction**. North Sydney Council does NOT guarantee that all its existing Assets are shown on the plans. Plans have NOT necessarily been adjusted to reflect any subsequent changes to surface levels, road alignments, fences, buildings and the like. Asset locations are approximate and, accordingly, the plans are NOT suitable for scaling purposes.

2. Plans and information provided is **Valid for 30 days** from the date of issue.

3. Plans do NOT show locations of Private internal drainage systems belonging to and/or serving individual customers, or drainage systems which may be connected to North Sydney Council's Drainage network.

4. The plans have been prepared and are only intended for North Sydney Council's own use. North Sydney Council does not supply the plans on a commercial basis because it cannot and will not warrant their accuracy or completeness. It supplies them free of charge only with a view to reducing the very real risk of inadvertent damage being caused to its underground assets. Accordingly, North Sydney Council accepts no liability for any inaccuracies in the information or lack of information on the plans.

5. North Sydney Council plans or other details are provided only for the use of the applicant, its servants, or agents. **The applicant may not give the plans or details to other parties, and may not generate profit from commercialising the plans or details.**

6. To determine their precise location, North Sydney Council's underground assets MUST first be exposed by pot-holing using hand-held tools or vacuum non-destructive techniques i.e. **before** any mechanical means of excavation are employed.

7. Please contact North Sydney Council Engineering Department (02 9936 8100) immediately should you locate North Sydney Council drainage or electricity conduits not indicated on these plans.

8. Asbestos cement pipelines may form part of North Sydney Council's storm water systems and, if damaged, can pose a risk to health.

9. Persons excavating in the vicinity of North Sydney Council's underground assets **MUST** exercise care and suitably protect North Sydney Council's Assets. Protection may include timbering, shoring, sheet piling, support and/or bracing to prevent movement.

10. "DUTY OF CARE"
    When working in the vicinity of North Sydney Council Assets you have a legal "Duty of Care" that must be observed. The subsequent points must be considered:
    - It is the responsibility of the owner and any consultant engaged by the owner, including (but not limited to) an architect, consulting engineer, developer, and head contractor to design for minimal impact and protection of North Sydney Council Assets. North Sydney Council will provide free plans and sketches showing the presence of its network to assist at this design stage.
    - It is the owner's (or constructor's) responsibility to:
        - Request plans of North Sydney Council Assets for a particular location at a reasonable time before construction begins.
        - Contact North Sydney Council if Assets are wholly or partly located near planned construction activities.
11. "DAMAGE"
    ANY DAMAGE TO NORTH SYDNEY COUNCIL ASSETS MUST BE REPORTED TO (02) 9936 8100 IMMEDIATELY

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- The owner (or constructor) is responsible for all damage done to North Sydney Council Assets as a result of works prior to and after obtaining North Sydney Council Assets plans, or failure to follow agreed instructions.
- North Sydney Council reserves all rights to recover compensation for loss or damage to its assets including consequential losses.

12. A road opening permit is required for all works undertaken within the North Sydney Council area. An application for a road opening permit can be found online at; http://www.northsydney.nsw.gov.au/Building_Development/Building_DA_Forms/Road_Closures_Openings

13. Constructors are legally responsible for any damage and financial loss resulting from their interfering with North Sydney Council's underground assets**. In an emergency, call 9936 8100**

14. Minimum clearances MUST be maintained between North Sydney Council's underground assets and underground services belonging to other parties.

15. Plans MUST be approved by North Sydney Council prior to landscaping and/or building over or adjacent to any North Sydney Council asset.

16. Backfilling of excavation work in the immediate vicinity of North Sydney Council's Assets MUST comply with Infrastructure Specification Manual for Road works, Drainage and Miscellaneous Works. Further information and guidance is available on North Sydney Council's website at; http://www.northsydney.nsw.gov.au/Projects_Infrastructure/Specifications_Styles/Infrastructure_Specifications_and_Styles

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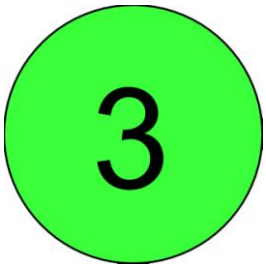
WORKING NEAR MULTI-PURPOSE POLES & UNDERGOUND POWER INFORMATION

ATTENTION

North Sydney Council has Multi-purpose poles installed throughout the North Sydney Council Local Government Area. These have been indicated on the attached plan by the following symbol;



The annotation within the symbol indicates what type of footing each pole is founded on. The footing types and details have been attached below.

Below are photos of what you may encounter;





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Underground power supply conduits are;

- Road crossings
    - Three (3) 100mm diameter PVC pipes, two (2) orange and one (1) white.
- Under footpaths
    - Three (3) 50mm diameter PVC pipes, two (2) orange and one (1) white.

If you plan to excavate within the vicinity of North Sydney Council's underground power conduits or Multi-Purpose Poles or require their removal for your works to be completed please contact the Engineering department on **(02) 9936 8100** prior to any commencement of works in order to confirm the handling procedure for the removal of these poles.

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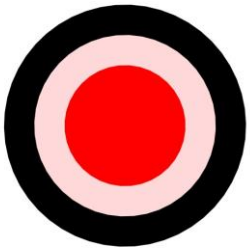
WORKING NEAR PARKING METER SENSORS INFORMATION

ATTENTION

North Sydney Council has **active parking meter sensors** installed throughout the North Sydney Council Local Government Area. See working conditions in detail below if you plan to excavate or move/drag equipment or move/drag unregistered heavy vehicles on/over/within 1 metre of an active parking sensor.

Contact the Parking Meter team on (02) 9936 8100 prior to any commencement of works. These have been indicated on the attached plan by the following symbol;



WARNING

The active parking sensors contain long life batteries and have the potential to explode if they are pierced or compressed with force. *Any battery may explode if drilled or hammered regardless of the battery type.*

CONDITIONS

The following work conditions must be taken into consideration when planning major works within the vicinity of North Sydney Council's parking infrastructure:

Council's PARKING METER ZONES contain ACTIVE PARKING SENSORS. They are located in the centre of each metered parking space within the roadway. The sensors are visible from the surface and the locations are listed on Dial Before You Dig.

The minimum safe distance from an active sensor during major works is 1 metre. If the proposed work is less than 1 metre of the active sensor they must be removed by a Council contractor.

For compliance and to reduce the risk of damaging/compressing an active parking sensor, the following procedures are required:

1. **AVOID placing heavy machinery/equipment directly on an active sensor.**
2. **AVOID movement of unregistered heavy machinery/vehicles with tracks/spikes over an active sensor.**

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3. **AVOID dragging heavy equipment over an active sensor;**

4. **AVOID drilling, sawing or digging within 1 metre of an active sensor.**

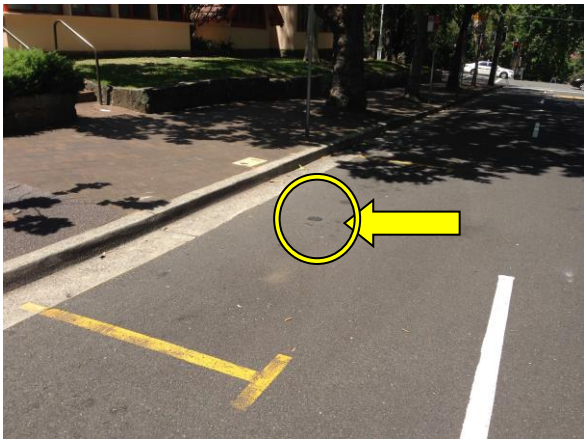
5. **If the above four (4) items cannot be avoided, the sensor/s must be removed in advance by Council.**
   Council requires a minimum of 7 business days to arrange sensor removal. Fees are required for removal and additional urgency fee if the removal is required less than 7 business days. See, Council's Street Opening Permit for Fees & Charges or the general Fees & Charges.

6. **Alternatively, only with authorisation from Council, one of the two types of parking sensors currently being used can be covered to spread the load across an area:**
   - **Sensor type 1 can be covered to protect an active parking sensor from damage and unnecessary compression from an unregistered machine/vehicle. Sensor type 1 can have a 'minimum road coverage of 2.0m x 2.0m square steel plate' or 'minimum road coverage of 2.0m x 2.0m square 20mm thick MDF board minimum'.**
   - **Sensor type 2 cannot be covered with plates.**
   - **It is recommended that the Parking Meter team is contacted on (02) 9936 8100 prior to any commencement of works.**

7. **Otherwise, if a parking sensor is found to be damaged by your works, a fee will be applied for urgent removal and the replacement of the sensor.**

Below are photos of two types of active parking sensors within North Sydney Council parking meter zones;

Approximate location of a sensor (centre of space)



Type 1 – textured top and large diameter



Type 2 – smooth top and small diameter



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Optus and or Uecomm Nsw

Referral
269943782

Member Phone
1800 505 777

Responses from this member

Response received Wed 18 Mar 2026 3.20pm

File name	Page
Response Body	114
269943782 - Optus Plan.pdf	115
269943782 - Optus Response Letter.pdf	116

Response received Wed 18 Mar 2026 3.20pm

File name	Page
Response Body	127
2010-1.zip	Excluded
2093-1.zip	Excluded
2681-1.zip	Excluded
2685-1.zip	Excluded
269943782 - Optus Response Letter (Uecomm).pdf	128
269943782 - Uecomm Plan.pdf	130

Optus - Before You Dig Australia - REFERRAL NOTIFICATION

This referral has been successfully processed by Optus and the results are contained in the attached files.

Notice: Please DO NOT REPLY TO THIS EMAIL as it has been automatically generated and replies are not monitored.

If you have any queries or attachments missing please contact:
Network Operations Centre
1 Lyonpark Road,
Macquarie Park, NSW 2113
Ph: 1800 505 777
Fax: 1300 307 035

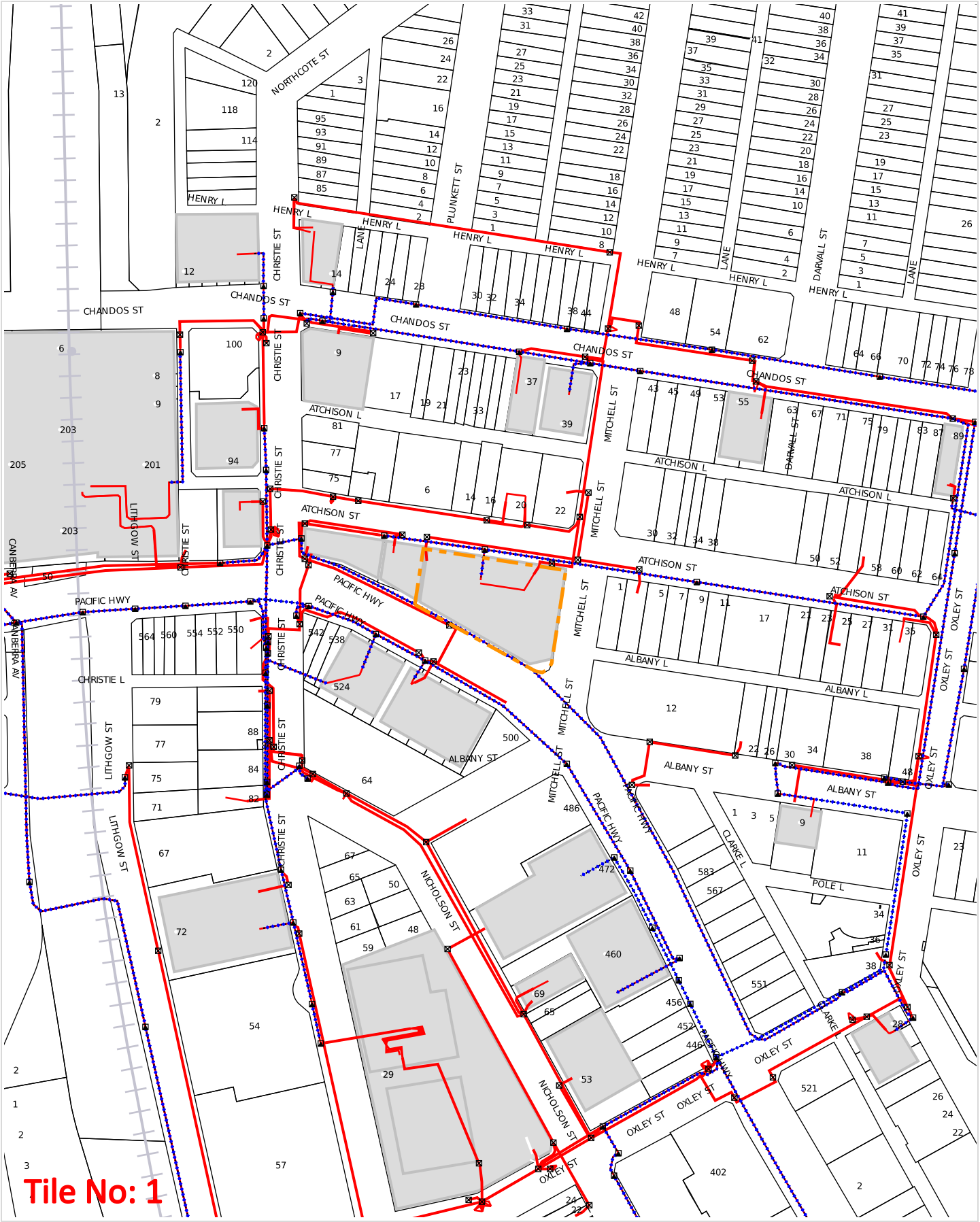
You will require Adobe Reader to view attachments.
http://www.adobe.com/downloads/

We thank you for your enquiry and appreciate your continued use of the “Before You Dig Australia Service” Asset Analysis Service. If you require further information in relation to Optus and/or Uemcomm cables please contact Optus on above.

This reply relates only to the location indicated above and is valid for 30 days from the sent date. Where additional works are planned that have not been specified within this reply, Optus require that an additional enquiry be submitted to Before You Dig Australia enquiry Service: http://www.byda.com.au

In the case of no additional location request being submitted, Optus will hold the relevant party responsible for any damage to Optus and/or Uecomm plant and all expenses incurred by Optus as a result of asset damage.

This e-mail may contain confidential information. If you are not the intended recipient, please notify Network Operations Centre immediately and delete this e-mail from your system. You must not disclose this e-mail to anyone without express permission from the sender. The contents of all e-mails sent to and received from Optus may be scanned, stored, or disclosed to others at Optus’ discretion.



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Sequence Number: 269943782

Date Generated: 18 Mar 2026

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208

OPTUS

BEFORE YOU DIG www.byda.com.au

Optus Contract Management Team
Unit 9, 677 Springvale Road
Mulgrave, Victoria, 3178

Date: 18 Mar 2026
To: Marko Djukanovic
Company: Stockland
Address: Level 25,133-145 Castlereagh Street
Sydney, NSW 2000

ENQUIRY DETAILS
Location: 601 Pacific Hwy, St Leonards, NSW 2065
Sequence No.: 269943782
BYDA Reference: 52659214

In relation to your enquiry concerning the above location, Optus advises as follows:

Optus records indicate that there ARE underground Optus FIBRE OPTIC TELECOMMUNICATIONS ASSETS in the vicinity of the above location as per the attached drawing(s).

PLEASE NOTE that any interference with these assets may be considered an offence under the Criminal Code Act 1995 (Cth). Optus reserves the right to seek compensation for loss or damage to its assets including consequential loss.

This reply is valid for a period of 30 days from the date above.

IMPORTANT INFORMATION
Asset location drawings provided by Optus are reference diagrams and are provided as a guide only. The completeness of the information in these drawings cannot be guaranteed. Exact ground cover and alignments cannot be provided with any certainty as these may have altered over time. Depths of telecommunications assets vary considerably as do alignments. It is essential to identify the location of any Optus assets in the vicinity prior to engaging in any works.

All Optus assets in the vicinity of any planned works will need to be electronically located to ascertain their general location. Depending on the scope of planned works in the vicinity, the assets may also need to be physically located.

YOU MUST ENGAGE THE SERVICES OF ONE OF THE OPTUS ASSET ACCREDITED LOCATORS TO CARRY OUT ASSET LOCATION (REFER LIST OF ACCREDITED LOCATORS AT THE END OF THIS OPTUS RESPONSE).

Unless otherwise agreed with Optus, where an on-site asset location is required, the requestor is responsible for all costs associated with the locating service including (where required) physically exposing the Optus asset.

DUTY OF CARE
When working in the vicinity of telecommunications assets you have a legal "Duty of Care" and non-interference that must be observed.

It is your responsibility as the requesting party (as a landowner or any other party involved in the planned works) to design for minimal impact to any existing Optus asset. Optus can assist at the design stage through consultation.

It is also your, as the requesting party (or your representative's), responsibility to:

a) Obtain location drawings (through the Before You Dig Australia process) of any existing Optus assets at a reasonable time before any planned works begin;

b) Have an Optus Accredited Asset Locator identify the general location of the Optus asset and physically locate the asset where planned works may encroach on its alignment; and

c) Contact Optus for further advice where requested to do so by this letter.

DAMAGE TO ANY OPTUS ASSET MUST BE REPORTED TO 1800 505 777 IMMEDIATELY

You, your head contractor, and any relevant subcontractor are all responsible for any Optus asset damage as a result of planned activities in the vicinity of Optus assets.

This applies where works commence prior to obtaining Optus drawings, where there is failure to follow instructions or during any construction activities.

Optus reserves the right to recover compensation for loss or damage to its assets including consequential loss. Also, you, your head contractor and any relevant subcontractor may also be liable for prosecution under the Criminal Code Act 1995 (Cth).

ASSET RELOCATIONS

You are not permitted by law to relocate, alter or interfere with any Optus asset under any circumstance. Any unauthorised interference with an Optus asset may lead to prosecution under the Criminal Code Act 1995 (Cth). Enquiries relating to the relocation of Optus assets must be referred to the relevant Optus Damages and Relocations Team (refer to "FURTHER ASSISTANCE").

APPROACH DISTANCES

On receipt of Optus asset location drawings and prior to commencing any planned works near an Optus asset, engage an Optus Accredited Locator to undertake a general location of the Optus asset.

Physical location of the Optus asset by an Optus Accredited Locator will also be required where planned works are within the following approach distances of the general location of the Optus asset:

a) In built up metropolitan areas where road and footpaths are well defined by kerbs or other features a minimum clear distance of 1 meter must be maintained from the general location of the Optus asset.

b) In non-established or unformed metropolitan areas, a minimum clear distance of 3 meters must be maintained from the general location of the Optus asset.

c) In country or rural areas where wider variations may exist between the general and actual location of an Optus asset may exist, then a minimum clear distance of 5 meters must be maintained from the general location of the Optus asset.

If planned works are parallel to the Optus asset, then the Optus asset must be physically located by an Optus Accredited Locator at a minimum of 5 meter intervals along the length of the parallel works prior to work commencing.

Under no circumstances is crossing of any Optus asset permitted without physical location of the asset being carried out by an Optus Accredited Locator. Depending on the asset involved an Optus representative may be required onsite.

The minimum clearances to the physical location of Optus assets for the following specific types of works must be maintained at all times.

Note: Where the clearances in the following table cannot be maintained or where the type of work differs from those listed then advice must be sought from the relevant Optus Damages and Relocations Team (refer to "FURTHER ASSISTANCE").

Type of Works	**Clearance to Physical Location of Optus Asset**
Jackhammers / Pneumatic Breakers	Not within 1 meter.
Light duty Vibrating Plate or Wacker Packer type compactors (not heavy road construction vibrating rollers etc.)	500mm compact clearance cover before a light duty compactor can be used over any Optus conduit. No compaction permitted over Optus direct buried cable without prior approval from Optus.
Boring Equipment (in-line, horizontal and vertical)	Not within 5 meters parallel of the Optus asset location without an Accredited Optus Asset Locator physically exposing the Optus asset and with an Optus representative onsite. Not to cross the Optus asset without an Accredited Optus Asset Locator physically exposing the Optus asset and with an Optus representative onsite.

Type of Works	Clearance to Physical Location of Optus Asset
Heavy vehicle Traffic (over 3 tonnes)	Not to be driven across Optus conduits with less than 600mm of cover. Not to be driven across Optus direct buried cable with less than 1.2 meters of cover. Once off crossings permitted, multiple crossing (e.g. road construction or logging) will require Optus approval. Accredited Optus Asset Locator to physically expose the Optus asset to verify actual depth.
Mechanical Excavators, Farm Ploughing, Vertical Hole installation for water bore or fencing etc.	Not within 1 meter. Accredited Optus Asset Locator to physically expose the Optus asset to verify actual location.

ASSET CLEARANCES AFTER COMPLETION OF WORKS

All Optus pits and manholes must be a minimum of 1 meter from the back of any kerb, 3.5 meters of the road surface without a kerb or not within 15 meters of street intersection.

In urban areas Optus conduit must have the following minimum depth of cover:

- Footway 600mm;
- Roadway 1 meter at drain invert and at road centre crown.

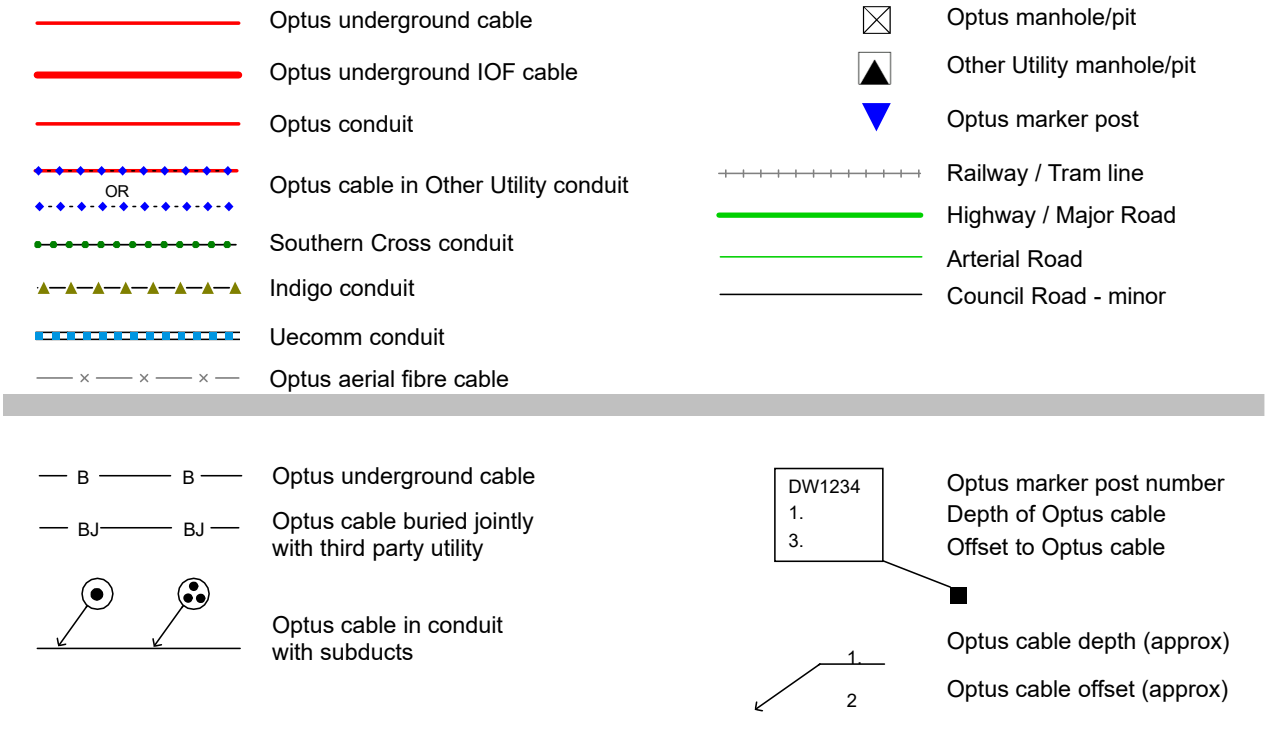
In rural areas Optus conduit must have a minimum depth of cover of 1 meter and direct buried cable 1.2 meters.

In cases where it is considered that the above clearances cannot be maintained at the completion of works, advice must be sought from the relevant Optus Damages and Relocations Team (refer "Further Assistance").

FURTHER ASSISTANCE

Further assistance on asset clearances, protection works, or relocation requirements can be obtained by contacting the relevant Optus Damages and Relocations Team on the following email address:
NFODamages&RelocationsDropbox@optus.com.au
Further assistance relating to asset location drawings etc. can be obtained by contacting the Optus Network Operations Asset Analysis Team on 1800 505 777.

OPTUS ENGINEERING DRAWING SYMBOLS



OPTUS

Optus Accredited Asset Locators

Name	Company Name	Phone	Email	State	Region/Service Area
Drew Misko	Australian Subsurface Pty Ltd	0427 879 600	admin@australiansubsurface.com	ALL	ALL
Andrew Watson	Subsurface Mapping Solutions Pty Ltd	0408 839 723	admin@subsurfacems.com.au	ALL (Not TAS)	South East QLD + Aus wide
Chris Gordon	Heavy Construction Solutions	1300 859 027	chris.gordon@heavycs.com.au	VIC, NSW, QLD, SA, TAS	All
Anthony Emmerson	Taylors Development Strategists	03 9501 2800	a.emmerson@taylorsds.com.au	All	Nation Wide
Nathan Kelleher	Seeker Utility Engineering Pty Ltd	1300 733 583	info@seekerutility.com.au	VIC, NSW, ACT, QLD, TAS	Melbourne, regional Victoria, Sydney & regional NSW, all ACT, Brisbane QLD, Hobart & regional TAS
Sean Henry	Asset Survey Solutions	1300 035 796	info@assetsurvey.com.au	VIC, QLD, NSW, SA	VIC, QLD, NSW, SA
Suhairee Suhaimi	BCE Spatial	08 9791 7411	harry@bcespatial.com.au	WA/SA/VIC/NSW	All Regions
Alan Cordner	Alcom Fibre Services Pty Ltd	0400 300 337	alcomfibre@bigpond.com	NSW	Sydney, NSW
Daniel Rogers	D&D Rogers Pty Ltd T/as Bradmac Locating Services	0407662605	info@bradmaclocating.com.au	NSW	Sydney and surrounds
Shane Buckley	Cable & Pipe Locations Pty Ltd	0408730430	shane@cableandpipelocations.com.au	NSW	North Coast, Mid-North Coast, Northern Rivers, Central West, New England
Annabelle Pegler	Down Under Detection Services (DUDS)	0418 267 964	apegler@duds.net.au	NSW	All
Michael Grant	M&K Grant Bega Bobcats Pty Ltd	0427 260 423	zzbobcat@bigpond.net.au	NSW	Bega, Far South Coast
Antony Critcher	Geotrace Australia	1300 562 284	antony@geotrace.com.au	NSW	Entire Region
Stephen Sanders	Hydro Digga	0427 076 091	admin@hydrodigga.com	NSW	Mid North Coast
Nathan Ellis	Utility Locating Services	0404 087 555	mail@uls.com.au	NSW	Sydney only

Scott O'Malley	Coastal Cable Locators Pty Ltd	0427 975 777	scott@coastalcablelocators.com.au	NSW	South Coast
Liam Bolger	Brandon Construction Services	0438 044 008	liam.bolger@hotmail.com	NSW	Sydney
Karen Durkin	Durkin Construction Pty Ltd	02 9712 0308	karen@durkin.au	NSW/ACT	Entire NSW and ATC
Theresa Donnelly	Locate and Map	(02) 8753 0049	admin@locateandmap.com.au	NSW	Greater Sydney Region
Ken Browne	Riteway Traffic Control Pty Ltd	0419 212 969	kbrowne@ritewaytc.com.au	NSW	Central Coast, Newcastle
Jean-Max Monty	Civilscan	1300 575 488	info@civilscan.com.au	NSW	Sydney, Central Coast, Hunter, Blue Mountains, Southern Highlands, Illawarra
Scott Hunter	Hunter Ground Search	0409327345	admin@hunter-groundsearch.net.au	NSW	Hunter, Upper Hunter, Central Coast, Newcastle
Damien Black	Mid North Coast Hydro Digging & Service Locating P/L	0418 409 465	djblack1@bigpond.com	NSW	Mid North Coast
Joseph Restuccia	ProLocate	0415 633 393	joe.restuccia@prolocate.com.au	NSW	NSW Wide
Barry Maloney	Online Pipe & Cable Locating	1300 665 384	Office@onlinepipe.com.au	NSW	Sydney, Central Coast, Canberra, Wollongong, Newcastle
Sam Romano	Locating Services	0403 065 510	sam.romano@locatingservices.com.au	NSW	NSW All
Scott Allison	CRUX Surveying Australia Pty Ltd	0285822300	scottallison@cruxsurveying.com.au	NSW	Sydney Metro
Donna Wullaert	Commence Communications Pty Ltd	02 6226 3869	admin@commencecomms.com.au	NSW	Canberra/ Yass / Bungendore/ Goulburn and surrounding regional areas
Grant Pearson	Warrabinya Services	0423 651 615	grant@warrabinya.com.au	NSW	Greater Sydney region
Stephen Fraser	Advanced Ground Locations	(02) 4930 3195	steve_agl@hotmail.com	NSW	Newcastle, Hunter Valley, Central Coast, Taree & Surrounding Areas
Mark Smith	Armidale Electrical	02 6772 3702	office@armidale-electrical.com.au	NSW	Northern Tablelands/Northern NSW
Samantha Guptill	Australian Locating Services	1300 761 545	admin@locating.com.au	NSW	All NSW
Clay Laneyrie	Laneyrie Electrical	0411142627	bindy@laneyrieelectrical.com.au	NSW	Illawarra, South Coast, Shoalhaven, Southern Highlands

Reece Gainsford	East Coast Locating Services	0431 193 111	admin@eastcoastlocatingservices.com.au	NSW	Newcastle/Maitland/ Hunter / Sydney / Central Coast / upper hunter / Port Stephens
Jason Vane	Smartscan Locators Pty Ltd	1300 778 923	bookings@sslocators.com.au	NSW	Sydney, Wollongong, Central Coast
Alex Farcash	Newcastle Locating Services	0410698599	admin@newcastlelocatingservices.com.au	NSW	NSW
Amer El Chami	Site Scan Pty Ltd	0449 992 520	office@sitescan.net.au	NSW	All NSW
Ali El Najjar	Sydney Service Locators	0449 205 705	Info@sydneyservicelocators.com.au	NSW	Sydney only
Paul Wallis	Beveridge Williams	0431 458 878	wallisp@bevwill.com.au	NSW	NSW Wide
Cameron Handley	Wombat Underground Services	0407477038	accounts@wombatundergroundservices.com.au	NSW	ALL
Simon Williams	Geoscope Utility Detection Services Pty Ltd	1300 750 350	info@geoscopelocating.com.au	NSW	Sydney only
Laurence Mead	Astrea Pty Ltd	1300 009 346	admin@astrea.com.au	NSW	Sydney only
Braydon Greenwood	City Coast Services	0422432813	braydon.greenwood@live.com.au	NSW	NSW
Jim Morrison	Absolute Utilities Pty Ltd	0429 496 375	jim@absoluteutilities.com.au	NSW	Mid North Coast
Declan Dowd	Dowds Pipe And Cable Locating	0434 635 134	accounts@pipeandcable.com.au	NSW	Sydney/Wollongong
Nicholas Schneider	Subsurface Utility Solutions	0421157372	nick@subsurf.com.au	NSW	Sydney only
Ricky Evans	Riverina Cable Locating	0411444980	ricky@riverinacablelocating.com.au	NSW	Riverina, Murray
Adrian Ruane	Road and Rail Excavations Pty Ltd	0414 594 063	cody@roadandrailexcavations.com.au	NSW	Sydney only
Billy Cameron	Locate Down Under Pty Ltd	0431275034	info@locatedownunder.com.au	NSW	Sydney only
Daniel Hudson	Geosurv Locating Pty Ltd	1300 554 675	dan@geosurv.com.au	NSW	Sydney only
Roneel Chand	JDG Civil	0416506891	sadhunaam@gmail.com	NSW	Sydney only
Tim Briggs	Deetect Locating Services	0414630852	deetect.locating@outlook.com	NSW	ACT / NSW
Sean Ferriter	Utech Solutions Pty Ltd	1300 427 614	seanf@vaughancivil.com.au	NSW	Sydney only
Mark Restuccia	Direct Connect Locating PTY LTD	0400507690	info@dclocating.com.au	NSW	NSW only
Ali Chahine	Underground Industries	0406906787	info@undergroundindustries.com.au	NSW	Sydney only

Scott Copetti	Metiri	0435 710 399	scott@metiri.com.au	NSW	Newcastle & Hunter Region
Alex Trevisan	VFT	61 458 488 173	admin@vftes.com	NSW/SA	Sydney/Adelaide
Roneel Chand	Tonagh Civil Pty Ltd,	0416506891	roneel@tonaghcivil.com.au	NSW	All Regions
Brett Pickup	BAP Services Pty Ltd	0434006009	Brett@bapservices.com.au	NSW	All Areas, Sydney, Illawarra, Newcastle, ACT
Patrick Billingham	OzDetect Pty Ltd	0497700667	patrick@ozdetect.com.au	NSW	NSW
Cameron Brown	Sub Scan Australia	0421751343	admin@subscan.com.au	NSW	Norther Rivers
Jesse Gavin	LCG GLOBAL PTY LTD	1300032740	info@lcgsolutions.com.au	NSW	All NSW
Christopher Aitken	HL Mullane & Son Pty Ltd	1300 608 999	maintenance@mullane.com.au	NSW	Newcastle
Rob Moate	Dig Safe NSW Pty Ltd	0477 900 200	rob@digsafensw.com.au	NSW	All Regions
Michael Nicholls	LocateX	0487 043 596	info@locatex.com.au	NSW	Sydney, Central Coast, New-castle
Brad Mccorkindale	b4 u dig locators	0447818260	jon@b4udiglocators.com	NSW	central west NSW
Wayne Cini	Aquabend	0409 925 472	aquabend@hotmail.com	NSW	midnorth coast
Euan Gow	Jurovich Surveying	1300 750 000	egow@jurovichsurveying.com.au	WA/NSW/SA	All state
Paul Linton	Utility Mapping	1300 627 746	plinton@isgroup.io	NSW/VIC/QLD/WA/NT	Sydney/ Melbourne/ Brisbane/ Perth/ Darwin
Karen Durkin	Durkin Construction Pty Ltd	02 9712 0308	karen@durkin.au	NSW/ACT	Entire NSW and ACT
Andrew Findlay/ Anthony Hart	LiveLocates	1300 517 062	info@livelocates.com.au	NSW/ACT	South Coast NSW, ACT, Snowy Mountains, Snowy Valley
Ian Brown	A1 Locate Services Pty Ltd	0400 484 828	Ian.brown@a1locate.com.au	NSW/ACT	Illawarra, Shoalhaven, South Coast, Southern Highlands & all NSW & ACT
Jason Steger	Steger & Associates Reg-istered Land Surveyors	0400 008 641	jason.steger@steger.com.au	ACT/NSW	ACT & Surrounds
Samuel Hathaway	Landmark Surveys	02 6280 9608	enquiries@landmarksur-veys.com.au	NSW/ACT	Canberra, Southern & Western NSW
Kaisar Sefian	Australian Utility Search Pty Ltd	0424 841 888	kaisar@aususearch.com.au	NSW/ACT	Sydney to Canberra & all in between
Daniel Fox	Epoca Environmental Pty Ltd	1300 376 220	daniel@epocaenvironmen-tal.com.au	NSW & ACT	All NSW & ACT
Scott Tancred	SureSearch Underground Services	1300 884 520	Scott.Tan-cred@suresearch.com.au	NSW/ACT QLD	NSW, Sydney, Northern NSW, Canberra, QLD, South East QLD.

Justin Martinez	LCG GLOBAL PTY LTD	0401749007	J.martinez@lcgsolutions.com.au	NSW, ACT, QLD, VIC	All regions
Troy Redden	On Point Utility Locating	1300 66 76 46	Troy@onpointlocating.com.au	NSW/QLD	Throughout both states
Geoff Campbell	CLS Locating	0450759497	geoffrey@campbellslocating.com.au	NSW/QLD	All QLD, Northern Rivers, NSW
Patrick Popovic	Site And See Pty Ltd	0479 162 692	patrick@siteandsee.com.au	QLD/NSW	Northern NSW, South East QLD
Kelsee Stevens	Abletech Underground Group	07 5293 7746	admin@abletechunderground.com.au	QLD / NSW	QLD / NSW
George Koenig	Downunder Locations(NSW) Pty Ltd	0438243856	downunderlocations@gmail.com	NSW/QLD	Tweed Heads/Gold Coast/Northern Rivers/Brisbane
Rhys Lambert	Provac / one find cables	1300 734 772	rhys@provac.net.au	QLD	South East QLD
Paul Beaton	Cairns Asset Locations	0448 157 227	paul.beaton@clarketrenching.com.au	QLD	FNQ to NT Border
Chris Hall	D C Locators Pty Ltd	0419 679 741	dcloc@powerup.com.au	QLD	Brisbane, Ipswich
Benji Lee	LADS	0478 915 237	benji@ladsqld.com.au	QLD	South East QLD
Ian Lambert	Lambert Locations Pty Ltd	07 5562 8400	admin@lambertlocations.com.au	QLD	South East QLD & Northern NSW
Ross Clarke	FNQ Cable Locators Pty Ltd	0428 775 655	onlineco@bigpond.net.au	QLD	QLD REGION
Col Greville	Bsure Locators	0488 520 688	admin@bsurelocators.com.au	QLD	Wide Bay & Burnett, Central and Western Queensland, Western Downs
Matthew Carr	Pensar	0405609739	matty.carr@pensar.com.au	QLD	Brisbane
Lacey Wallace	GeoRadar Asutralia Pty Ltd	(07) 4331 5588	accounts@georadar.net.au	QLD	Widebay, Central QLD, Emerald & Surroundings
Craig Waite	C Locate	0437 808 444	clocate@bigpond.com	QLD	South East
Jeffrey Lenehan	Syndicate	0404141270	jlenehan@syndicate.com.au	QLD	Brisbane
Toni O'Dell	Utility Location Services	1300 001 857	qldops@utilitylocationservices.com.au	QLD	South East QLD
Jenny Dziduch	1300 Locate Pty Ltd	1300 562 283	admin@1300locate.com.au	QLD	All Queensland, Northern NSW
Brendon Smith	Advanced Locating PTY LTD	0424678823	admin@advancedlocating.com.au	QLD	Gold Coast
Bruce Normyle	Dynamic Locator Services	0434 731 933	Bruce@dynamicexcavations.com.au	QLD	SEQ
Robert Rutledge	Safe Dig Services	+61 7 3376 0856	rrutledge@safedig.com.au	QLD	Brisbane

Michael Falla	ICUC Locating Services Pty Ltd	0410085365	michael.falla@icuclocatings-ervices.com.au	QLD	South East QLD
Ben Stephens	DTS Group TA Electros-can	0434 140 556	ben.s@electroscanqld.com.au	QLD	Queensland
Adam Lloyd	Aussie HydroVac Ser-vices	07 3287 7818	adam.lloyd@aussiehy-drovac.com.au	QLD	All
Michael Prentice	Onsite Utility Locations	0437 172 601	admin@onsiteutilityloca-tions.com.au	QLD	SEQ
Roland Mollison	LandPartners Pty Ltd	0439 488 545	roland.mollison@landpart-ners.com.au	QLD	South East Queensland
Duncan McGrath	Abletech Underground Group	0418 511 767	duncan@abletechunder-ground.com.au	QLD	QLD Wide
Daniel Poppi	Ace Cable Locations	0431517837	acecablelocations@bigpond.com	QLD	Wide Bay Burnett
Jason Bastow	Utility Underground	0414454015	jason@utilityunder-ground.com.au	QLD	QLD / NSW
Aidan Waszaj	South-East Scanning Pty Ltd	0421 193 439	aidan@southeastscan-ning.com.au	QLD	Southeast Queensland
Josh Brinn	i-LOCATE	0418 105 902	josh@i-lec.com.au	QLD	QLD only
Carl Molloy	Provac Melbourne	0451 104 611	melbourne@provac.net.au	VIC	Melbourne Region
Olivier Davies	Central Locating Pty Ltd	0439995894	ollie@centrallocating.com.au	VIC	Geelong and surrounding area
Tina Brereton	D-Tech Ground & Over-head	03 9544 8933	tina@d-tech.net.au	VIC	ALL
Josh Taylor	Advanced Locations Vic-toria Pty Ltd	0427846716	josh@advancedloca-tionsvic.com.au	VIC	All Victoria
Ben Minutoli	Geelong Cable Locations	1800 449 543	ben@geelongcableloca-tions.com.au	VIC	Melbourne, Geelong, Country Victoria
Mick McGoldrick	Locate Cables	0404 241 679	mick@locatecables.com	VIC	Western Victoria
Phi Nguyen	Asset Detection Services Pty Ltd	1300 300 100	Phi.nguyen@assetdetec-tion.com.au	VIC	Melbourne/VIC
Maurice Tobin	Drain Solutions	0412 111600	info@drainsolutions.com.au	VIC	Melbourne Metro
Leigh French	Veris Australia VIC	(03) 7019 8400	melbourne@veris.com.au	VIC	Melbourne
Ben Wooldridge	Controltech Solutions	0447 760 759	ben.wooldridge@controltechsolu-tions.com.au	VIC	Melbourne
Chris Sandlant	Access Utility Engineer-ing P/L	03 9799 8788	Chris.sandlant@accessue.com.au	VIC	Victoria & Regional
Shaun Stephen	STS Locating Services	0405 181 734	stslocatingservices@gmail.com	VIC	All VIC

Glen Foreman	Underground Services Detection Pty Ltd	0402 748 889	undergroundservices@big-pond.com	VIC	Victoria
Clinton Carver	Insight Underground Pty Ltd	0468 900 273	clinton@insightunder-ground.com.au	VIC	Victoria
Lindsay Botha	L B Underground Service Locations & Engineering	0499 658 677	lb.locations.engineer-ing@gmail.com	VIC	Metro and Regional Victoria
Damien Nielsen	ELS Environmental Loca-tion Systems Pty Ltd	0499 499 137	bookings@elsvic.com.au	VIC	Victoria only
Tyler Blake	CHS Group	0409 437 750	tyler.blake@chsgroup.com.au	VIC	Horsham VIC
Craig Jackson	Survey Management So-lutions	0400647299	craigj@surveyms.com.au	VIC	All Regions
Chloe Milligan	Tequa Plumbing and Civil	0351432666	civil@tequa.au	VIC	Gippsland only
David Hunter	Ballarat Locating Ser-vices	0488 501 261	dave@ballaratlocating.com.au	VIC	Western Victoria, Melbourne
Alex Jones	HR Utilities	1300 533 612	info@hrutilities.com.au	VIC	All of VIC
Ashley Stevens	ABS HYDRO Pty Ltd	0422 798 476	ashley.stevens@abshydro.com.au	NSW/VIC	All of VIC, Regional NSW
Robert Wootton	Trenchless Pipelaying Contractors (TPC)	08 8376 5911	tpc@trenchlesspipelaying.com.au	SA	All
Marc Rose	SADB	0488190699	marc@sadb.com.au	SA	Adelaide only
Deninis Stray	Pinpoint Services Map-ping	(08) 8130 1600	hello@pinpointsm.com.au	SA	Adelaide
Michael Grear	Michael Grear	08 82788732	admin@mgsurveys.com.au	SA	South Australia
Mattew Cooper	Fulton Hogan	0447 320 581	Matthew.Cooper@fulton-hogan.com.au	SA	Adelaide
Liam Catchpole	Apex Service Locating Pty Ltd	0458 924 471	liam@apexvacsolutions.com.au	SA	Adelaide and Surroundings
Bradley Gosling	Engineering Surveys	0433506880	bgosling@engsurveys.com.au	SA	Adelaide
Jason Shelvock	SA Underground Pty Ltd	0430 067 476	jason@saunderground.com.au	SA	All SA
Stephanie Leong	Platinum Locating Ser-vices	08 94080625	enquiries@platinumlocat-ing.com.au	WA	WA
Henry Westbrook	Cable Locates & Consult-ing	08 9524 6600	admin@cablelocates.com.au	WA	All WA
Cameron Swift	Mikcomm Communica-tion	08 9337 1125	cswift@mikcomm.com.au	WA	All
Tobi Lawrence-Ward	Abaxa	08 9256 0100	enquiries@abaxa.com.au	WA	Perth, Southwest, Western Australia

Ben Upton	TerraVac Vacuum Excavation	0433 374 802	locations@terravac.com.au	WA	Perth
Dale Shearsmith	Subtera	1300 046 636	dale@subtera.com.au	WA	WA
Liam Davies	Bunbury Telecom Service	897260088	admin@btswa.com.au	WA	WA
Edel O'Connor	Kier Contracting	0456 190 910	edel@kier.com.au	WA	Perth Metro & greater region; Regional WA
Nigel Nunn	CCS Group / Utility Locating Solutions	08 9385 5000	enquiry@ccswa.com.au	WA	Perth
Jeremy Brown	Spotters Asset Locations Pty Ltd	0459 130 677	jeremy@spottersassetlocations.com.au	WA	All
Reece Topham	Prime Locate	0400 888 406	reece@primelocate.com.au	WA	All
Rhyce Murphy	RM Surveys	08 9457 7900	rhyce.murphy@rmsurveys.com.au	WA	All
James Horton	Westscan Pty Ltd	1300 858 404	westscan1@gmail.com	WA	All
Ashleigh Austin	Veris WA	0419 024 696	perth@veris.com.au	WA	Perth Metro & Regional
Tim Daws	Award Contracting Pty Ltd	0411 878 895	info@awardcontracting.com.au	WA	Metro & Country Regions
Stephen Steart	Cabling WA Pty Ltd	0422 845 586	ssteart@cablingwa.com.au	WA	Perth Metro
Devvyn Barto	Pulse Locating	0431402738	devvyn.barto@pulselocating.com.au	WA	Western Australia
Shane McQuoid	Find Wise Location Services	0407992758	shane@findwise.com.au	WA	Perth
Alex King	KR SURVEYS	0400077933	alex@krsurveys.com.au	WA	Statewide
Cody Foster	Precision Locating Pty Ltd	0473029391	cody@precisionlocating.net	WA	Statewide
Scott Harrison	Triodia Scanning services PTY LTD	0438 664 196	booking@triodiascanning.com.au	WA	Perth/ Regional
Stuart Speckman	FYFE	08 8944 7888	Stuart.Speckman@fyfe.com.au	NT/SA/NSW	NT/SA/NSW
Wayne Parslow	Danisam	0417 089 865	danisam@westnet.com.au	NT	Darwin NT and Surrounds
Heather Easther	Archers Underground Serveice Pty Ltd	0418 737 299	admin@auslocations.com.au	TAS	Statewide
Scott Crerar	Paneltec Group	0400 895 637	scott@paneltec.com.au	TAS	All
Hayden Stone	Utility Detection & Mapping	03 61712555	admin@udmgroup.com.au	TAS	Statewide

Optus - Before You Dig Australia - REFERRAL NOTIFICATION

This referral has been successfully processed by Optus and the results are contained in the attached files.

Notice: Please DO NOT REPLY TO THIS EMAIL as it has been automatically generated and replies are not monitored.

If you have any queries or attachments missing please contact:
Network Operations Centre
1 Lyonpark Road,
Macquarie Park, NSW 2113
Ph: 1800 505 777
Fax: 1300 307 035

You will require Adobe Reader to view attachments.
http://www.adobe.com/downloads/

We thank you for your enquiry and appreciate your continued use of the “Before You Dig Australia Service” Asset Analysis Service. If you require further information in relation to Optus and/or Uemcomm cables please contact Optus on above.

This reply relates only to the location indicated above and is valid for 30 days from the sent date. Where additional works are planned that have not been specified within this reply, Optus require that an additional enquiry be submitted to Before You Dig Australia enquiry Service: http://www.byda.com.au

In the case of no additional location request being submitted, Optus will hold the relevant party responsible for any damage to Optus and/or Uecomm plant and all expenses incurred by Optus as a result of asset damage.

This e-mail may contain confidential information. If you are not the intended recipient, please notify Network Operations Centre immediately and delete this e-mail from your system. You must not disclose this e-mail to anyone without express permission from the sender. The contents of all e-mails sent to and received from Optus may be scanned, stored, or disclosed to others at Optus’ discretion.

Marko Djukanovic
To: Stockland
Level 25,133-145 Castlereagh Street
Sydney, NSW 2000

Uecomm Pty Limited
ABN 56 079 083 195

Building 8, 658 Church St,
Richmond, VIC 3121
Ph: (03) 9221 4100
Fax: (03) 9221 4193
Ah: 1800 707 447

LOCATION OF UNDERGROUND FIBRE OPTIC CABLE INFORMATION SHEET

IMPORTANT: PLEASE READ ALL INFORMATION AND CONDITIONS BELOW AND THE NOTICE ON THE REVERSE SIDE OF THE PLAN/S.

"Before You Dig Australia" Sequence No 269943782	**Issue Date:** 18 Mar 2026
Customer ID Optus	**Issue By:** Optus and or Uecomm Nsw

Location: 601 Pacific Hwy, St Leonards, NSW 2065
Uecomm Asset Location No. 2010-1,2093-1,2685-1,2681-1
Before You Dig Australia Job No. 52659214

In relation to your enquiry at the above address, Uecomm advises as follows:

The records of Uecomm Limited disclose that there ARE underground FIBRE OPTIC / TELECOMMUNICATIONS cables in the vicinity of the above enquiry as per attached plan/s.

- The underground cables referred to in this advice are defined as the underground communications cables owned or controlled by Uecomm Pty Limited.
- The person/company responsible for submitting the inquiry should take care to ensure all plans listed above have been received. For any plan listed above but not received please contact **1800 707 447**.
- Any information provided is valid only for **30 days** from the date of issue set out above.
- If the work operations extend beyond this period, or if the designs are altered in any way, you are requested to resubmit your proposal for reassessment.
- Further assistance may be obtained if necessary, by telephoning **1800 707 447**.

PLEASE READ ALL INFORMATION AND DISCLAIMERS BELOW:

1. Due to the nature of underground cables and the age of some cables and records, it is impossible to conclusively ascertain the location of all cables. The accuracy and/or completeness of the information cannot be guaranteed and, accordingly, they are intended to be indicative only and, as a result, Uecomm does not accept any responsibility for any inaccuracies of its plans. They should not be solely relied upon when undertaking underground works. It is also inaccurate to assume that fibre optic cables follow straight lines and careful on-site investigations are essential to locate its exact position.
2. The following minimum clearances must be maintained:
    - 300mm when laying asset's inline, horizontal or vertical.
    - 500mm when operating vibrating equipment, e.g., jackhammers or vibrating plates.
    - 1000mm when operating mechanical excavators.
3. Due to the inherent dangers associated with excavation in the vicinity of underground cables, precautions should be taken in the undertaking of any underground works, including (but not limited to) the following:
    - All excavation sites should be examined for underground cables by careful hand excavation. Cable cover slabs if present must not be disturbed. Hand excavation needs to be undertaken with extreme care to minimise the likely hood of damage to the cable, e.g., blades of hand equipment should be orientated parallel to the line of the cable rather than digging across the cable.
    - If any undisclosed underground cables are located, Uecomm Limited should be notified immediately.
    - All personnel must be properly briefed, particularly those associated with the use of earthmoving equipment, trenching, boring and pneumatic equipment.
    - All excavations must be undertaken in accordance with the relevant legislation and regulations.

4. **DAMAGE. ANY DAMAGE TO UECOMM'S NETWORK MUST BE REPORTED IMMEDIATELY TO 1800 707 447.**
5. Uecomm recommends using Uecomm approved location contractors to provide on-site location services for Uecomm plant. You can arrange Uecomm on-site visits by calling Uecomm on 1800 707 447 and Uecomm or its approved representative will attend your site to provide guidance to the location of the Uecomm assets (the "Uecomm Asset Alignment"). **Uecomm requires 3 clear business days' notice to conduct an on-site location**. The initial on-site visit by Uecomm will not normally incur a charge, but at the discretion of Uecomm, subsequent site visits may incur a charge to be applied at an hourly rate.
6. Uecomm will hold the relevant party responsible for any damage to Uecomm plant and all expenses incurred by Uecomm as a result of asset damage.
7. Except to the extent that liability may not be capable of lawful exclusion, Uecomm Pty Limited and its servants and agents and the related bodies corporate of Uecomm Pty Limited and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any Plans attached hereto. Except as expressly provided to the contrary in this information sheet or the attached Plans, all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

We thank you for your enquiry and appreciate your continued use of the Before You Dig Australia and/or Uecomm Asset Analysis Service. If you require further information, please contact Uecomm on **1800 707 447**.

IMPORTANT *This document may be confidential and privileged. Unauthorised use is prohibited. If you have it in error, please notify us and shred this document. Thank you.*



Uecomm Underground Cable

Scale: 1:2500

Printed on: 18 Mar 2026

Sequence Number: 269943782

Location: 601 Pacific Hwy, St Leonards, NSW 2065

Job Location
- Line
- Point
- Area

Undergound Asset
- Uecomm

This document is confidential and may also be privileged, and neither confidentiality nor privilege is waived lost or destroyed by virtue of it being transmitted to an incorrect addressee. Unauthorised use of the contents is therefore strictly prohibited. Any information contained in this document that has been extracted from our records is believed to be accurate, but no responsibility is assumed for any error or omission.

Superloop (Australia) Pty Ltd

Referral
269943779

Member Phone
(07) 3905 2400

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	132
269943779.pdf	133

To: Marko Djukanovic RE: Before You Dig Australia (BYDA) REFERRAL NOTIFICATION FROM SUPERLOOP LTD. Sequence No: 269943779 Enquiry Date: 18/03/2026 Commencement Date: 24/03/2026 Completion Date: 01/06/2032 Thank you for the above enquiry. Please find attached the "269943779.pdf" which overviews your proposed work area in association with Superloop's underground assets. Please note that this communication, including any attachments, is confidential. If you are not the intended recipient, you should not read it please contact us immediately, destroy it, and do not copy or use any part of this communication.

Before You Dig Australia (BYDA)
Location Information

Level 1, 545 Queen Street
Brisbane, QLD, 4000
Ph: (07) 3905 2400
www.superloop.com

To:
Stockland - Marko Djukanovic
Level 25 133-145 Castlereagh Street
Sydney NSW 2000

Enquiry Details

Utility ID	90428
Sequence Number	269943779
Enquiry Date	18/03/2026 13:05
Response	**AFFECTED**
Address	601 Pacific Hwy St Leonards
Location in Road	Road,Nature Strip,Footpath
Activity	Planning and Design

Enquirer Details

Customer ID	3831362
Contact	Marko Djukanovic
Company	Stockland
Email	marko.djukanovic@stockland.com.au
Phone	+61475520426

Disclaimer

Plans issued by Superloop are valid for 28 days unless otherwise stated. If this timeframe has elapsed, you will be required to reapply via Before You Dig.Australia Superloop plans are provided for the use of the applicant only and must not be distributed to any third parties. Superloop shall not be liable for any loss or damage caused by the use of its plans and/or information supplied to the applicant. Please ensure Superloop plans and information provided remain on-site at all times during construction.

Powered by x-info assurancesuite Protect your assets

Your Enquiry has fallen within the risk area for Superloop's asset.

IMPORTANT:

- The proposed work has the potential to impact Superloop underground assets (Optical Fibre) in the area. Diagrams indicating the position of Superloop's underground assets are attached.
- There may be additional Superloop assets in this area contained within Telstra duct which are not shown on these diagrams. No work is to take place until plans have been obtained from Telstra.
- **Superloop does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Superloop assets resulting from, or in connection with the information provided.**

CONCERNING SUPERLOOP PLANS:

- Drawings and Plans provided by Superloop are reference diagrams which were correct at the time the asset was built. Exact ground cover and alignments cannot be provided with any certainty as these may alter over time. Depths of Telecommunications plant vary considerably as do alignments. It is essential to uncover the asset and positively identify the asset's exact location.
- Superloop plans are provided as a guide only and the completeness of the information cannot be guaranteed.
- The attached diagrams are valid for 28 days from the date of this reply.
- Services belonging to other third parties are not included on these plans.
- Superloop plans are provided for the use of the applicant only and must not be distributed to any third parties.
- Please ensure Superloop plans and information provided remains on-site at all times during construction.

DUTY OF CARE:

- When working in the vicinity of telecommunications plant you have a legal "Duty of Care" that must be observed.
- It is the responsibility of the owner and any consultant engaged by the owner, including an architect, consulting engineer, developer, and head contractor to design for minimal impact and protection of Superloop plant. Superloop will provide plans and sketches showing the presence of its network to assist at this design stage. It is the owner's (or constructor's) responsibility to:
    - ❖ Request plans of Superloop plant for a particular location at a reasonable time before construction begins
    - ❖ Visually locate Superloop plant by vacuum excavation (pot holing) where construction activities may damage or interfere with Superloop plant (see "Essential Precautions and Approach Distances" section for more information)
    - ❖ Contact Superloop, if Superloop plant is wholly or partly located near planned construction activities.

DAMAGE:

IN CASE OF EMERGENCY OR TO REPORT DAMAGE

PHONE 1300 558 406

IMMEDIATELY

- All damage, regardless of severity, must be reported to Superloop immediately.
- The contractor, or other agency, is liable for all damage to Superloop assets when works commence prior to obtaining plans, or failure to follow agreed instructions.
- Superloop reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.
- **Superloop does not accept any liability for loss or damage occurring due to inaccuracy or lack of information on the plans provided.**

Powered by x-info assurancesuite Protect your assets

ESSENTIAL PRECAUTIONS AND APPROACH DISTANCES:

Note: If the following clearances cannot be maintained, please contact Superloop (see above for details) for advice on how best to resolve this situation.

1. On receipt of plans and before commencing excavation work or similar activities near Superloop plant, carefully locate this plant first to avoid damage. Undertake prior manual exposure such as potholing when intending to excavate or work closer to Superloop plant than the following approach distances:
   - Where Superloop plant is in an area where road and footpaths are well defined by kerbs or other features a minimum clear distance of 600mm must be maintained from where it could be reasonably presumed that plant would reside.
     In non-established or unformed reserves and terrain, this approach distance must be at least 1.5 metres.
   - NOTE: Even manual pot-holing needs to be undertaken with extreme care, common sense and employing techniques least likely to damage cables.
   - If construction work is parallel to Superloop plant, then careful hand digging or using non-destructive water jet method (pot-holing) at least every 5m is required to establish the location of all plant, hence confirming nominal locations before work can commence.

2. Maintain the following minimum clearance between construction activity and **actual location** of Superloop Plant.

Jackhammers/Pneumatic Breakers	*Not within 1.0m of **actual location.***
Vibrating Plate or Wacker Packer Compactor	*Not within 0.5m of Superloop ducts.* *300mm compact clearance cover before compactor can be used across Superloop ducts.*
Boring Equipment (in-line, horizontal and vertical)	*Not within 2.0m of **actual location**.* *Constructor to check depth via vacuum excavation (pot-hole).*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Superloop ducts (or plant) with less than 600mm cover.*
Mechanical Excavators, Farm ploughing and Tree Removal	*Not within 1.0m of **actual location.*** *Constructor to check depth via vacuum excavation (pot-hole).*

- All Superloop pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work.
- All Superloop conduit should have the following minimum depth of cover after the completion of your work:
  - **Footway 450mm**
  - **Roadway 450mm at drain invert and 600mm at road centre crown**

Powered by x-info assurancesuite Protect your assets

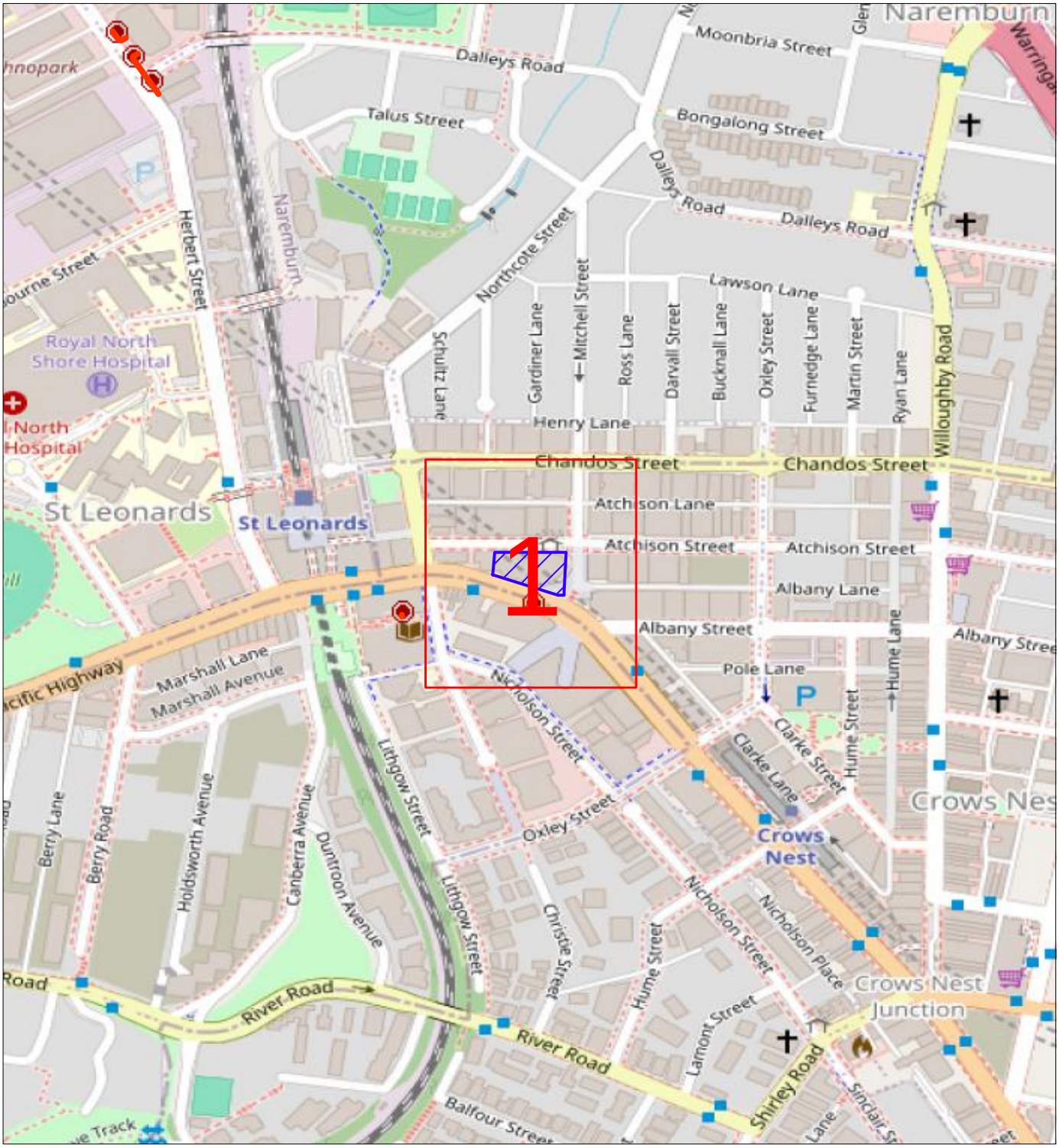
Date: 18/03/2026

superloop

Overview Map

Sequence No: 269943779

601 Pacific Hwy St Leonards



N

0 0.06km

LEGEND:

Superloop Asset

Property Boundary

Affected BYDA Work Area

1 Detail Map

Superloop does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Superloop assets resulting from, or in connection with the information provided.

Background layer sourced from Open Street Maps

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Date: 18/03/2026

Map 1

Sequence No: 269943779

601 Pacific Hwy St Leonards



LEGEND:

- Superloop Asset
- Property Boundary
- Affected BYDA Work Area

Superloop does not accept any liability for inaccuracies or any lack of information on the plans, or any damage to Superloop assets resulting from, or in connection with the information provided.

Background layer sourced from Open Street Maps

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Referral
269943775

Member Phone
(02) 8265 9400

Responses from this member

Response received Wed 18 Mar 2026 2.08pm

File name	Page
Response Body	139
DP1231638.pdf	141
Sydney Metro DBYD - Tunnel Assets - CSW.pdf	156

Sydney Metro
L43, 680 George St
Sydney NSW 2000

Date: 18 Mar 2026

To: Marko Djukanovic

Please DO NOT SEND A REPLY to this email as it has been automatically generated and replies are not monitored.

Thank you for your BYDA enquiry (referenced below)â€"according to our records your enquiry impacts our infrastructure.

Please ensure that you read the attached documentation, as it contains important information including essential steps that must be undertaken prior to commencing your intended activities.

SEQUENCE NO.:	269943775
JOB NO.:	52659214
LOCATION:	601 Pacific Hwy St Leonards NSW 2065

WARNING: When working in the vicinity of Sydney Metro's assets you have a legal *Duty of Care* that must be observed.

If you require further information, please contact Sydney Metro using the email address in the attached letter(s).

To best manage the risk of damage and liabilitiy, we recommend that you engage the services of a Certified Locator

Important Notice

This enquiry response, including any associated documentation, has been assessed and compiled from the information detailed within the BYDA enquiry outlined above. **Please ensure that the BYDA enquiry details and this response accurately reflect your proposed works.**

This response is intended for use only by the addressee. If you have received the enquiry response in error, please let us know by telephone and delete all copies; you are advised that copying, distributing, disclosing or otherwise acting in reliance on the response is expressly prohibited.

Disclaimer: While reasonable measures have been taken to ensure the accuracy of the information contained in this plan response, neither Sydney Metro nor PelicanCorp shall have any liability whatsoever in relation to any loss, damage, cost or expense arising from the use of this plan response or the information contained in it or the completeness or accuracy of such information. Use of such information is subject to and constitutes acceptance of these terms.

If you are unable to launch any of the files for viewing and printing, you may need to download and install free viewing and printing software such as Adobe Acrobat Reader (for PDF files)

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 29314	332235.444	6256965.459	C	3	65.079	LC	L3	SCIMS	SCIMS
PM 29315	332087.492	6256953.49	B	2	69.848	LC	L3	SCIMS	SCIMS
PM 29316	331889.736	6257268.063	B	2	79.02	LC	L3	SCIMS	SCIMS
SS 34517	331879.12	6256987.353	B	U	70.653	LC	L3	SCIMS	SCIMS
SS 34518	331810.836	6256944.397	B	U	76.631	LC	L3	SCIMS	SCIMS
SS 38990	332732.228	6256502.573	B	2	76.645	LB	L2	SCIMS	SCIMS
SS 39005	332852.847	6255930.306	B	2	78.415	LB	L2	SCIMS	SCIMS
SS 49348	333140.311	6256107.585	B	2	85.555	LB	L2	SCIMS	SCIMS
SS 51275	332301.910	6256897.360	D	4		U	U	SCIMS	SCIMS
SS 58858	332963.021	6256223.248	B	2	73.101	LB	L2	SCIMS	SCIMS
SS 61584	331928.356	6256752.993	B	2	87.382	LC	L3	SCIMS	SCIMS
SS 61953	332984.934	6256113.479	B	2	79.073	LB	L2	SCIMS	SCIMS
SS 85254	333329.233	6255918.044	B	2	82.854	LB	L2	SCIMS	SCIMS
SS 85255	333325.418	6255839.692	B	2	83.599	LB	L2	SCIMS	SCIMS
SS 86488	333100.307	6255963.258	B	2	89.058	LB	L2	SCIMS	SCIMS
SS 86490	333216.173	6255913.59	B	2	90.236	LB	L2	SCIMS	SCIMS
SS 86491	333249.914	6255780.141	B	2	87.604	LB	L2	SCIMS	SCIMS
SS 149671	332156	6256850	U	U	75.724	LC	L3	SCIMS	SCIMS

COMBINED SCALE FACTOR = 0.999930 ZONE 56

SOURCE: M.G.A. CO-ORDINATES AND SCALE FACTOR ADOPTED FROM SCIMS ON THE 17th MARCH 2017

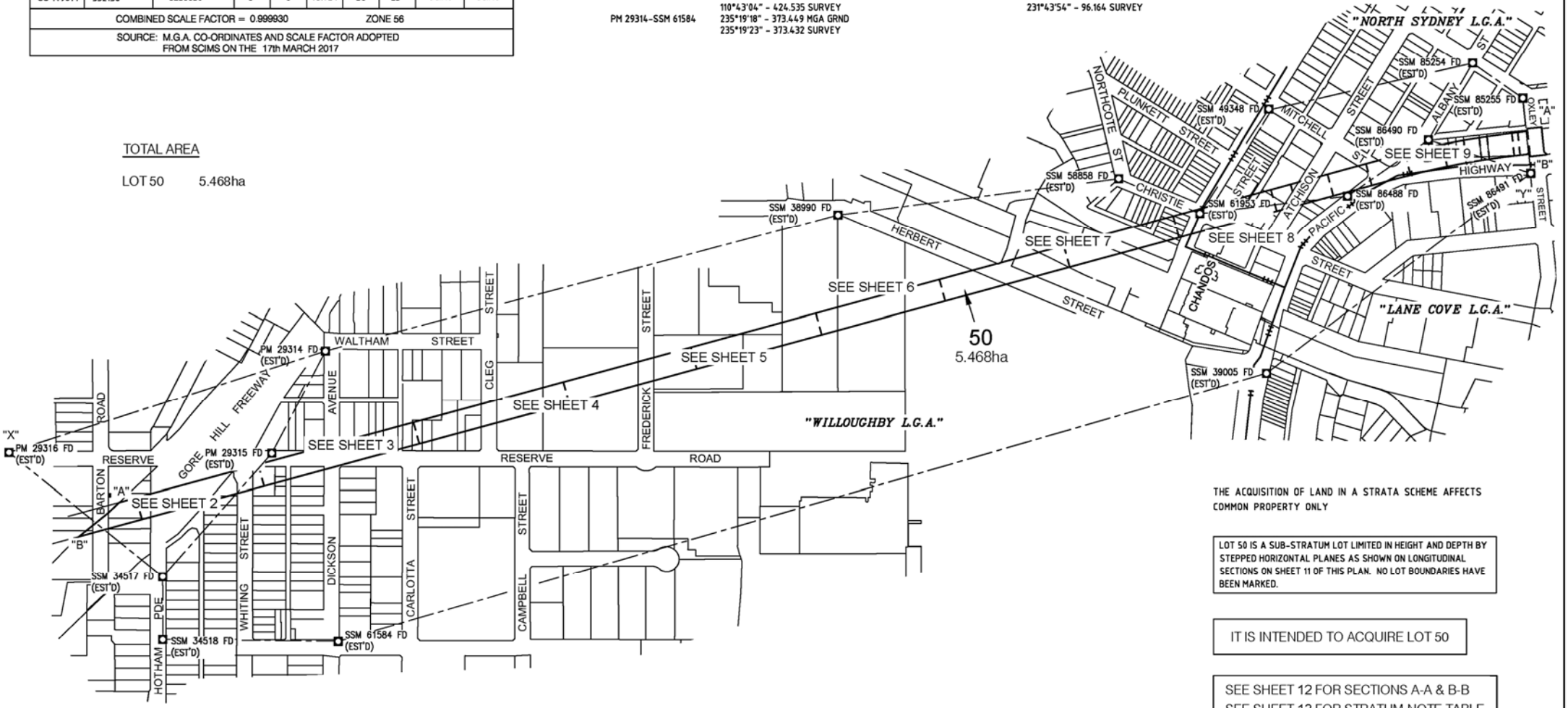
SURVEY CONNECTIONS

PM 29316–SSM86491	137°34'05" – 2016.077 MGA GRND "X"–"Y" 137°34'05" – 2016.062 SURVEY	SSM 38990 – SSM 58858	140°26'05" – 362.362 MGA GRND 140°26'09" – 362.363 SURVEY
PM 29316–SSM 34517	182°09'57" – 280.931 MGA GRND 182°09'57" – 280.923 SURVEY	SSM 58858–SSM 61953	168°42'38" – 111.943 MGA GRND 168°42'15" – 111.947 SURVEY
PM 29316–PM 29314	131°11'46" – 459.470 MGA GRND 131°11'50" – 459.464 SURVEY	SSM 61953–SSM 49348	92°10'21" – 155.500 MGA GRND 92°10'11" – 155.498 SURVEY
SSM 34517–SSM 34518	237°49'37 – 80.678 MGA GRND 237°49'35" – 80.683 SURVEY	SSM 61953–SSM 86488	142°28'30" – 189.426 MGA GRND 142°28'28" – 189.418 SURVEY
SSM 34517–PM29315	99°13'50" – 211.121 MGA GRND 99°13'50" – 211.109 SURVEY	SSM 49348–SSM 85254	135°05'37" – 267.633 MGA GRND 135°05'46" – 267.627 SURVEY
PM 29315–PM29314	85°22'30" – 148.445 MGA GRND 85°22'45" – 148.444 SURVEY	SSM 86488–SSM 86490	113°12'12" – 126.072 MGA GRND 113°12'14" – 126.067 SURVEY
SSM 34518–SSM 61584	148°27'02" – 224.619 MGA GRND 148°26'55" – 224.611 SURVEY	SSM 86490–SSM 85254	87°44'38" – 113.156 MGA GRND 87°44'46" – 113.152 SURVEY
PM 29314–SSM 38990	132°58'37" – 679.060 MGA GRND 132°58'34" – 679.047 SURVEY	SSM 85254–SSM 85255	182°47'15" – 78.450 MGA GRND 182°47'20"– 78.447 SURVEY
SSM 61584–SSM 39005	131°39'55" – 1237.624 MGA GRND 131°39'54" – 1237.622 SURVEY	SSM 86490–SSM 86491	165°48'39" – 137.658 MGA GRND 165° 48'35" – 137.663 SURVEY
SSM 39005–SSM 86491	110°42'57" – 424.547 MGA GRND 110°43'04" – 424.535 SURVEY	SSM 85255–SSM 86491	231°44'12" – 96.169 MGA GRND 231°43'54" – 96.164 SURVEY
PM 29314–SSM 61584	235°19'18" – 373.449 MGA GRND 235°19'23" – 373.432 SURVEY		

M.G.A.

TOTAL AREA

LOT 50 5.468ha



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

LOT 50 IS A SUB-STRATUM LOT 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.

IT IS INTENDED TO ACQUIRE LOT 50

SEE SHEET 12 FOR SECTIONS A-A & B-B
SEE SHEET 13 FOR STRATUM NOTE TABLE

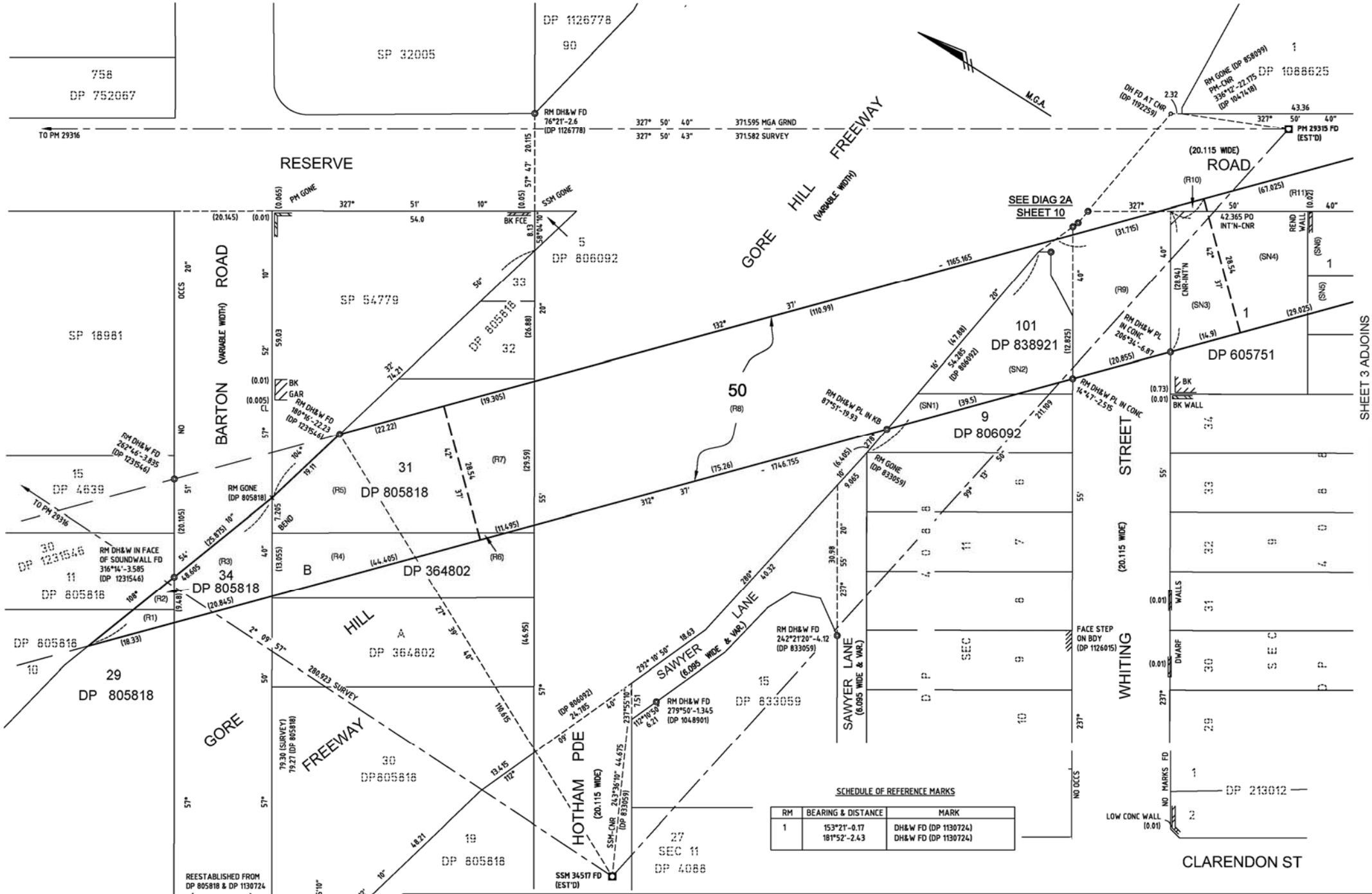
Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 3500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:1 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:2 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W



SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
1	153°21'-0.17 181°52'-2.43	DH&W FD (DP 1130724) DH&W FD (DP 1130724)

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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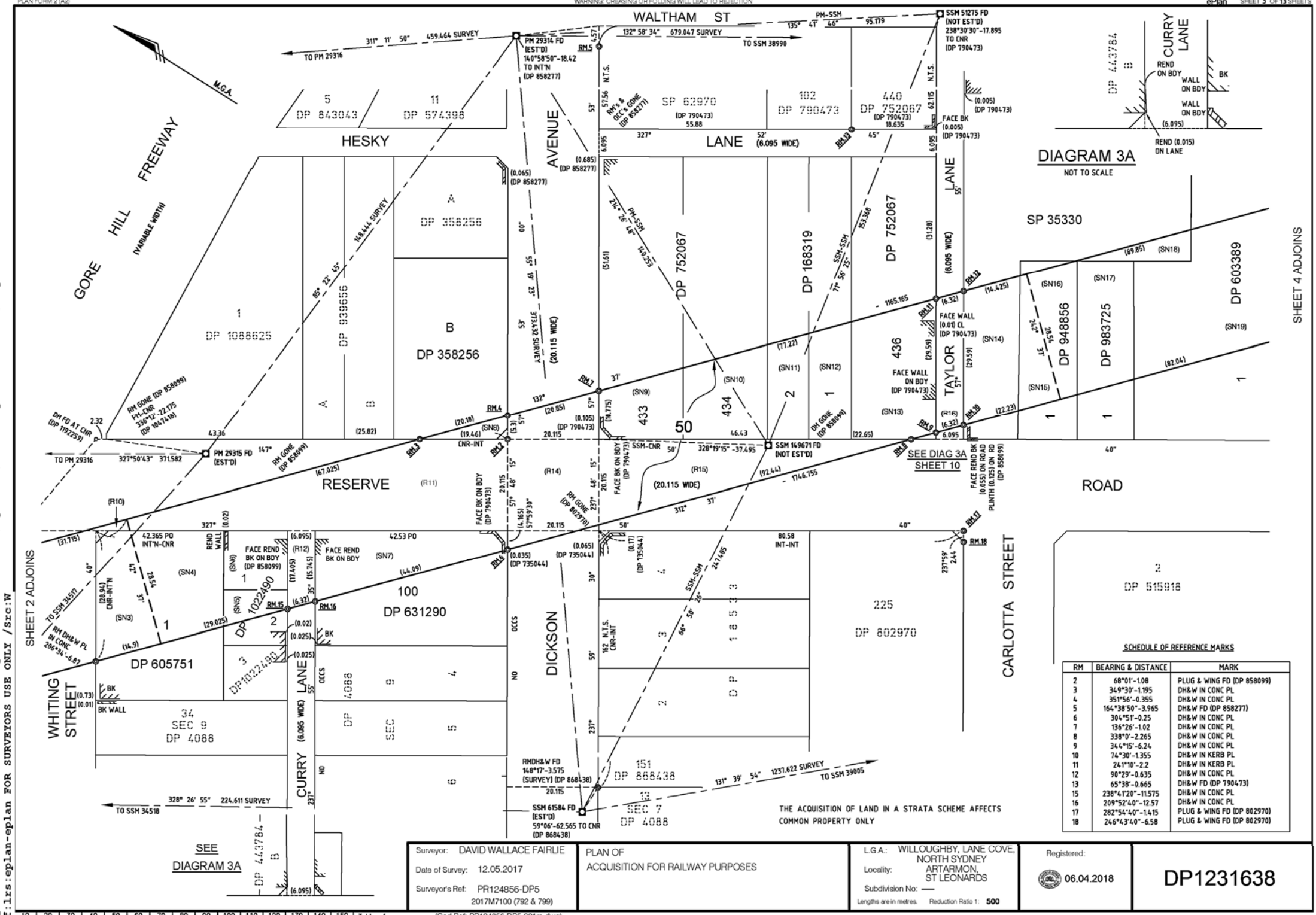


SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
2	68°01'-1.08	PLUG & WING FD (DP 858099)
3	349°30'-1.195	DH&W IN CONC PL
4	351°56'-0.355	DH&W IN CONC PL
5	164°38'50"-3.965	DH&W FD (DP 858277)
6	304°51'-0.25	DH&W IN CONC PL
7	136°26'-1.02	DH&W IN CONC PL
8	338°0'-2.265	DH&W IN CONC PL
9	344°15'-6.24	DH&W IN CONC PL
10	74°30'-1.355	DH&W IN KERB PL
11	241°10'-2.2	DH&W IN KERB PL
12	90°29'-0.635	DH&W IN CONC PL
13	65°38'-0.665	DH&W FD (DP 790473)
15	238°41'20"-11.575	DH&W IN CONC PL
16	209°52'40"-12.57	DH&W IN CONC PL
17	282°54'40"-1.415	PLUG & WING FD (DP 802970)
18	246°43'40"-6.58	PLUG & WING FD (DP 802970)

Surveyor: DAVID WALLACE FAIRLIE
Date of Survey: 12.05.2017
Surveyor's Ref: PR124856-DP5
2017M7100 (792 & 799)

PLAN OF
ACQUISITION FOR RAILWAY PURPOSES

L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY
Locality: ARTARMON, ST LEONARDS
Subdivision No: —
Lengths are in metres. Reduction Ratio 1: 500

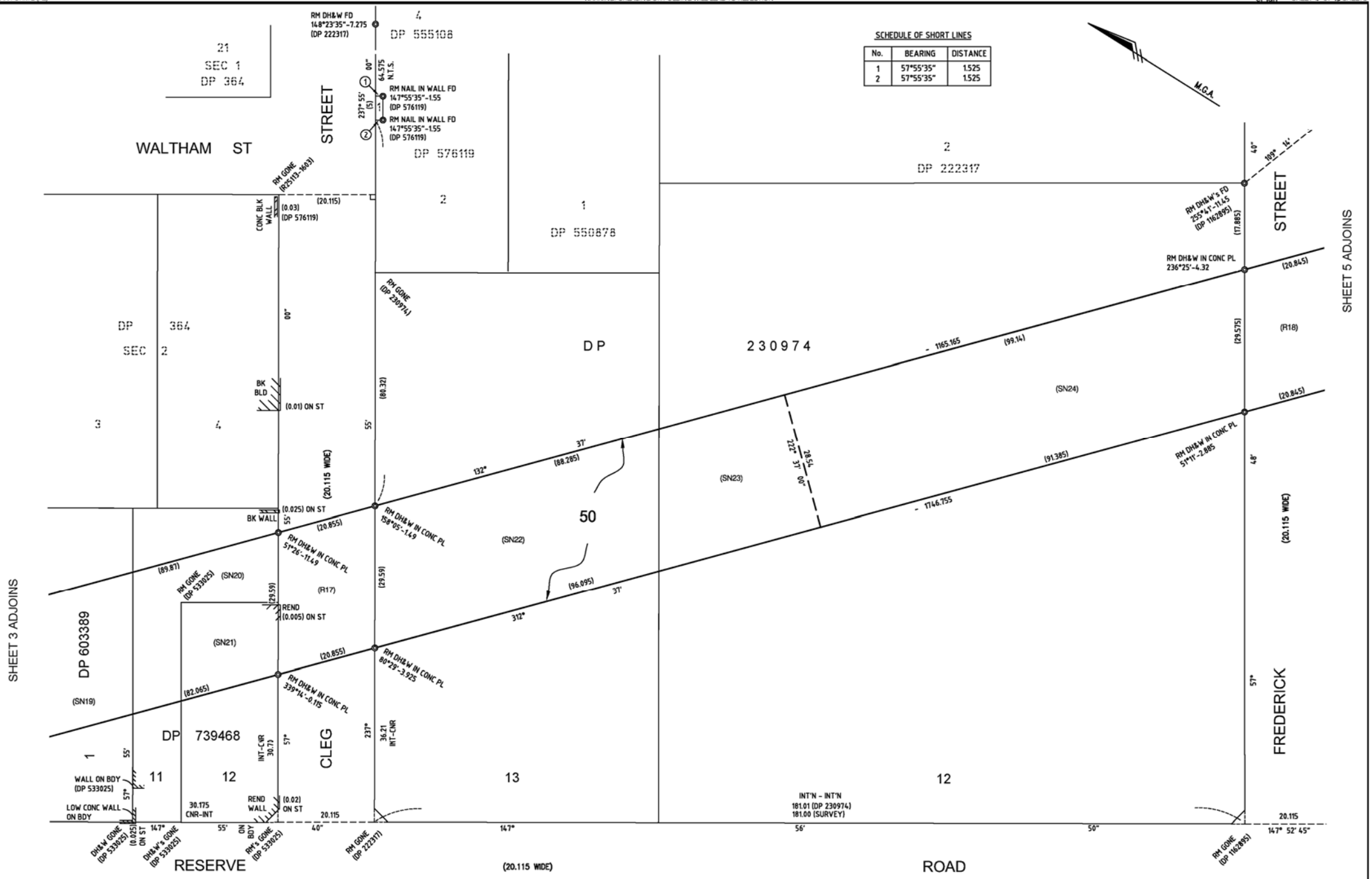
Registered: 06.04.2018

DP1231638

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 Table of mm (Cad Ref: PR124856-DP5-001m.dwg)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:3 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:4 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W



Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

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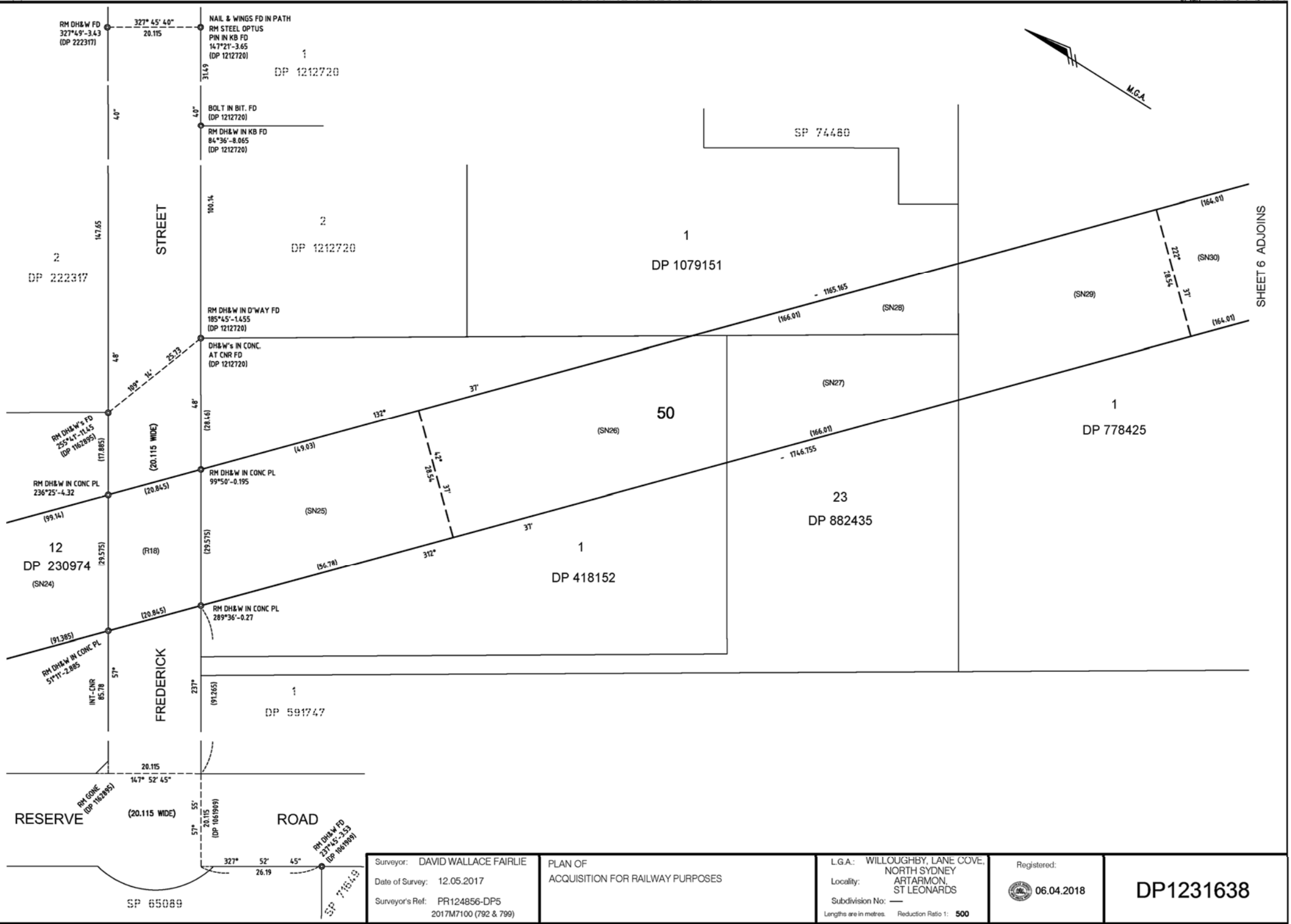
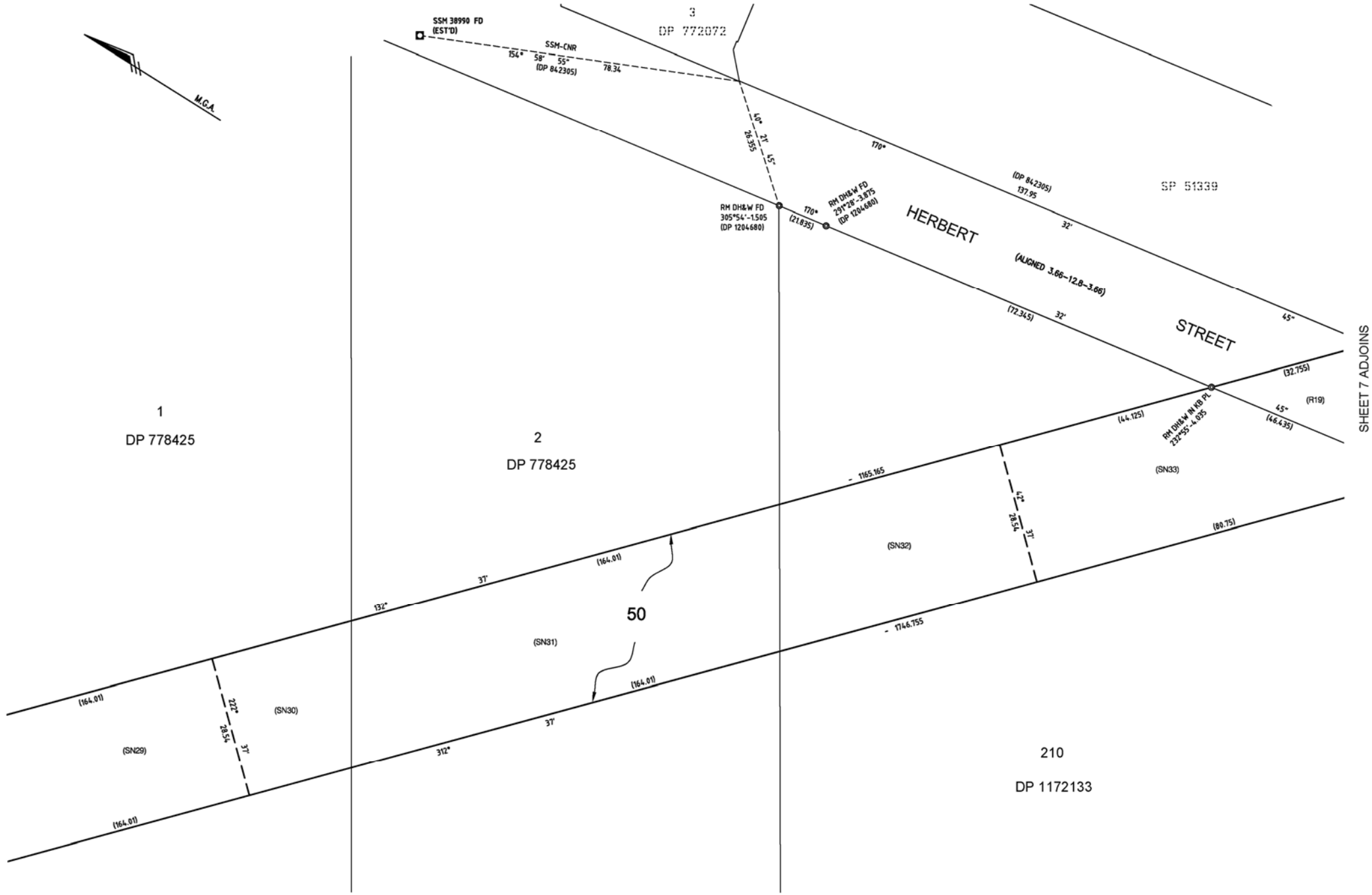
Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:5 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W



Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)



Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

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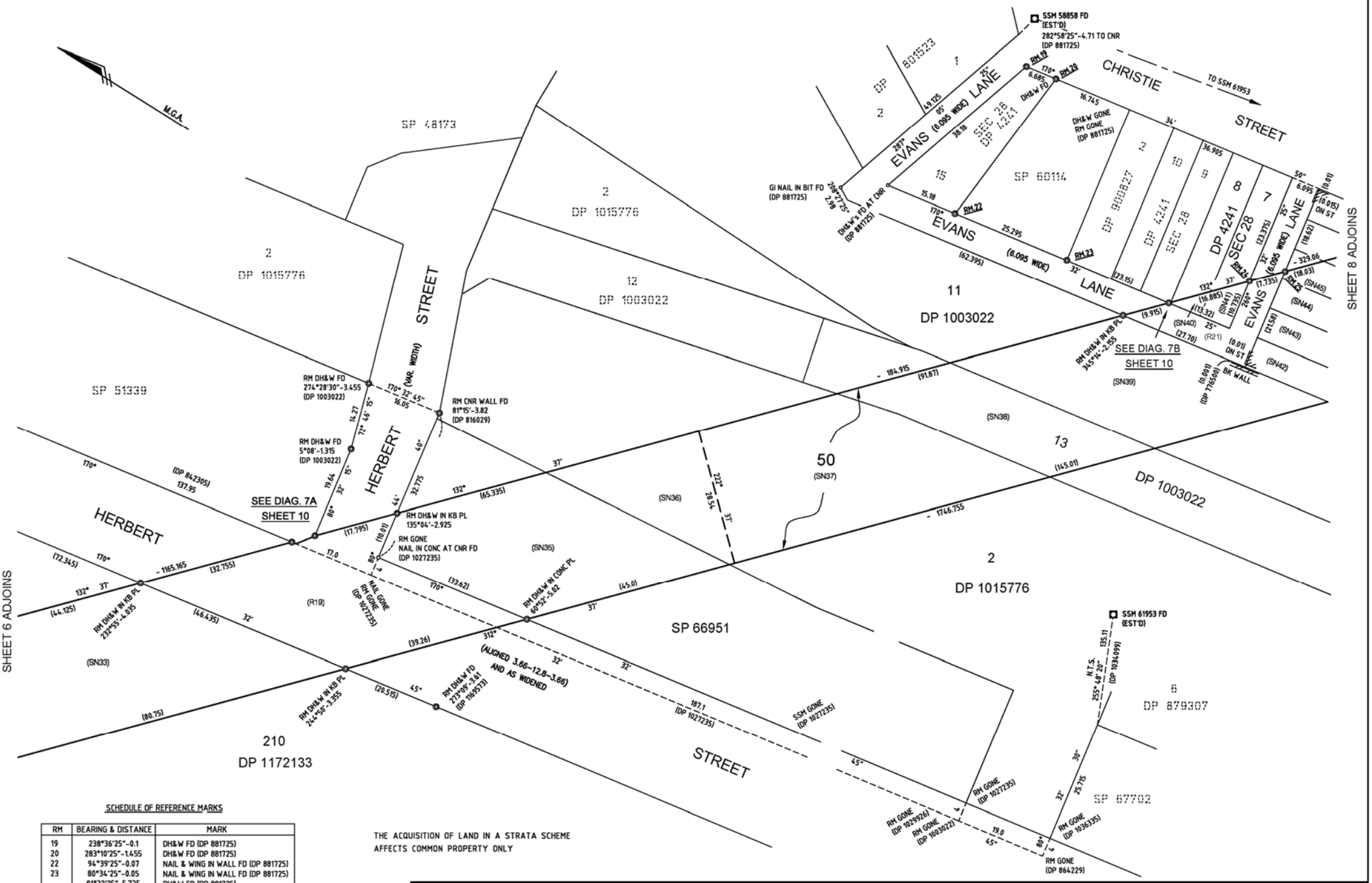
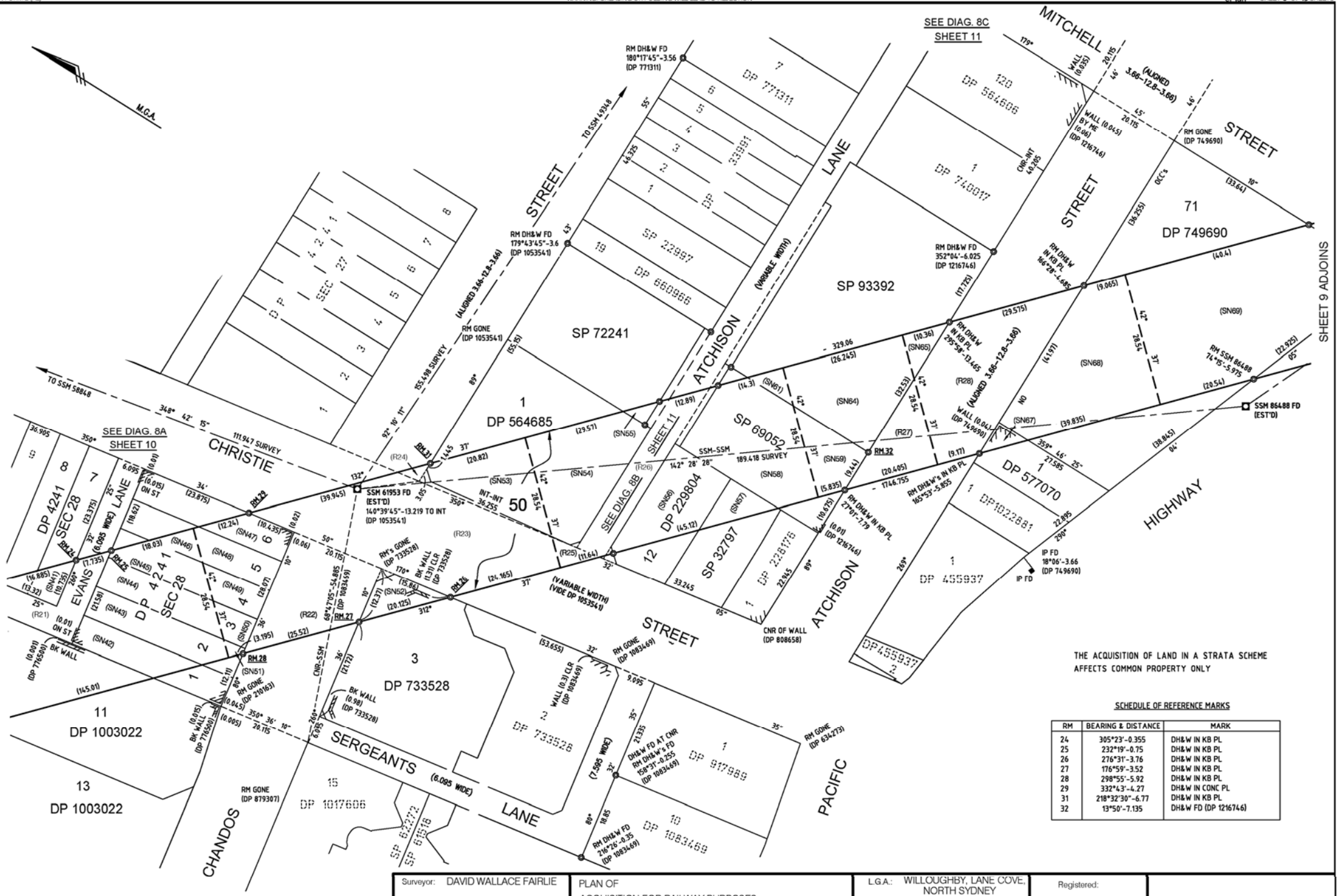
Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:6 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W


M.G.A.
SP 48173
2
DP 1015776
SP 51339
HERBERT
STREET
RM DH&W FD
274°28'30"-3.455
(DP 1003022)
RM DH&W FD
5°08'-1.315
(DP 1003022)
RM CNR WALL FD
81°15'-3.82
(DP 816029)
170° 32' 45" (VAR. WIDTH)
16.05
14.27
71° 46' 15"
19.64
80° 32' 15"
32.775
44'
40°
SEE DIAG. 7A
SHEET 10
RM DH&W IN KB PL
135°04'-2.925
RM GONE
NAIL IN CONC AT CNR FD
(DP 1027235)
12
DP 1003022
11
DP 1003022
50
(SN37)
13
DP 1003022
2
DP 1015776
SP 66951
(SN35)
(SN36)
(SN38)
(SN39)
(SN40)
(SN41)
(SN42)
(SN43)
(SN44)
(SN45)
(R21)
(R19)
(SN33)
(DP 842305)
137.95
(72.345)
(44.125)
(46.435)
(80.75)
(32.755)
(17.795)
(10.01)
(33.62)
(39.26)
(20.515)
(65.335)
(91.87)
(145.01)
(45.0)
(62.395)
(23.15)
(27.70)
(13.32)
(16.885)
(10.735)
(9.915)
(7.735)
(21.58)
(18.03)
(18.62)
(23.375)
(6.095)
(0.01)
(0.015)
ON ST
(0.01)
(DP 776500)
BK WALL
- 1165.165
- 184.915
- 1746.755
- 329.06
222°
28.54
37'
37'
37'



SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
24	305°23'-0.355	DH&W IN KB PL
25	232°19'-0.75	DH&W IN KB PL
26	276°31'-3.76	DH&W IN KB PL
27	176°59'-3.52	DH&W IN KB PL
28	298°55'-5.92	DH&W IN KB PL
29	332°43'-4.27	DH&W IN CONC PL
31	218°32'30"-6.77	DH&W IN KB PL
32	13°50'-7.135	DH&W FD (DP 1216746)

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm (Cad Ref: PR124856-DP5-001m.dwg)

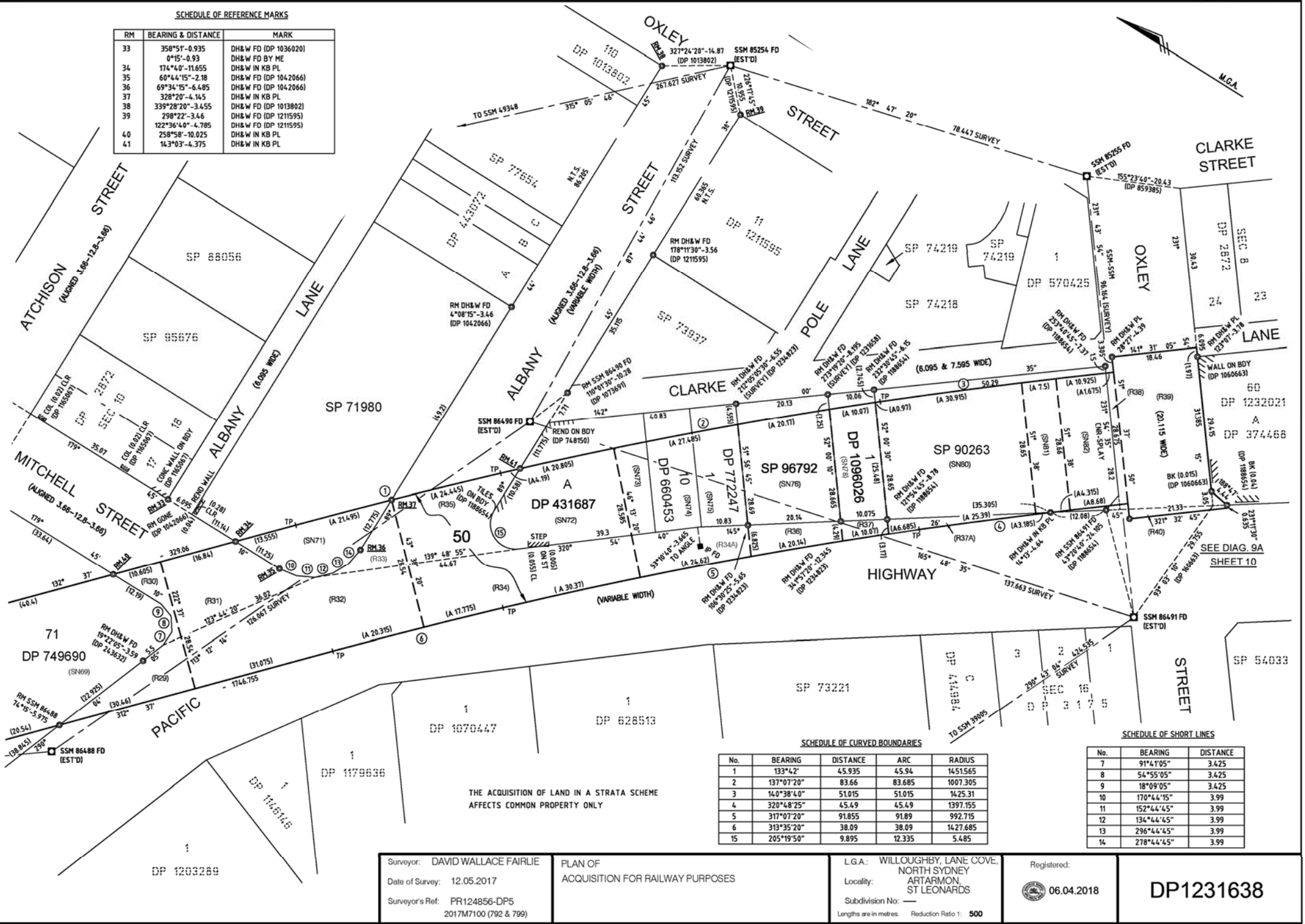
Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:8 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:9 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

SHEET 8 ADJOINS

SCHEDULE OF REFERENCE MARKS

RM	BEARING & DISTANCE	MARK
33	358°51'–0.935	DH&W FD (DP 1036020)
	0°15'–0.93	DH&W FD BY ME
34	174°40'–11.655	DH&W IN KB PL
35	60°44'15"–2.18	DH&W FD (DP 1042066)
36	69°34'15"–6.485	DH&W FD (DP 1042066)
37	328°20'–4.145	DH&W IN KB PL
38	339°28'20"–3.455	DH&W FD (DP 1013802)
39	298°22'–3.46	DH&W FD (DP 1211595)
	122°36'40"–4.785	DH&W FD (DP 1211595)
40	258°58'–10.025	DH&W IN KB PL
41	143°03'–4.375	DH&W IN KB PL



SCHEDULE OF CURVED BOUNDARIES

No.	BEARING	DISTANCE	ARC	RADIUS
1	133°42'	45.935	45.94	1451.565
2	137°07'20"	83.66	83.685	1007.305
3	140°38'40"	51.015	51.015	1425.31
4	320°48'25"	45.49	45.49	1397.155
5	317°07'20"	91.855	91.89	992.715
6	313°35'20"	38.09	38.09	1427.685
15	205°19'50"	9.895	12.335	5.485

SCHEDULE OF SHORT LINES

No.	BEARING	DISTANCE
7	91°41'05"	3.425
8	54°55'05"	3.425
9	18°09'05"	3.425
10	170°44'15"	3.99
11	152°44'45"	3.99
12	134°44'45"	3.99
13	296°44'45"	3.99
14	278°44'45"	3.99

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: 500	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:10 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

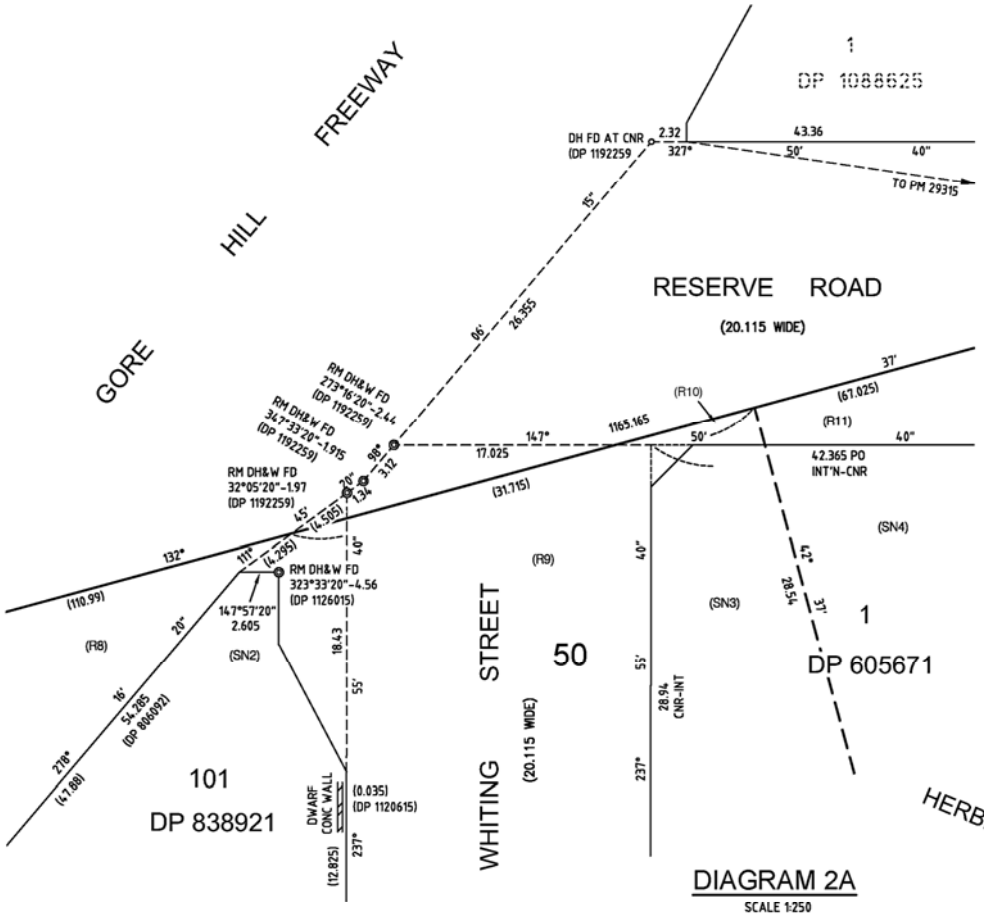


DIAGRAM 2A
SCALE 1:250

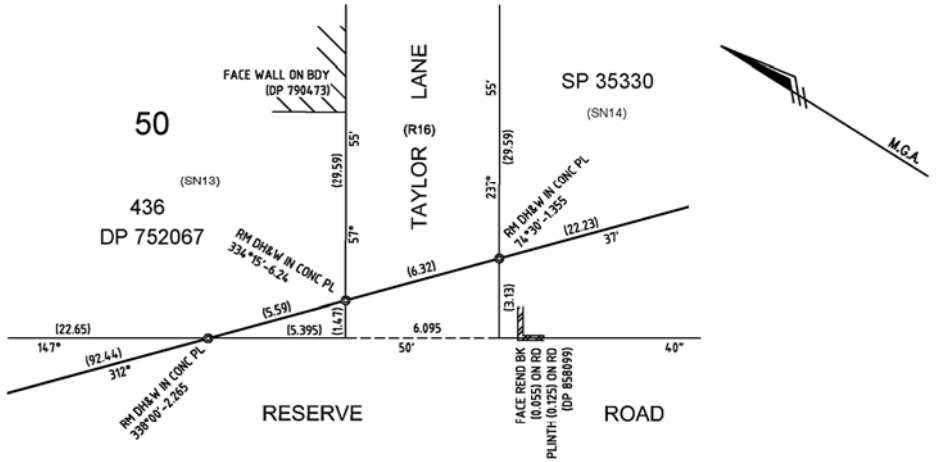
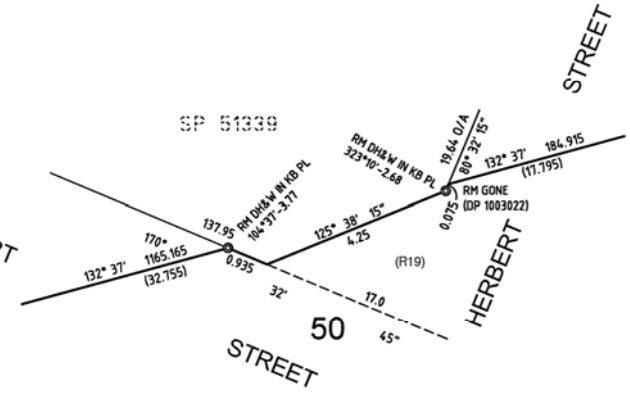


DIAGRAM 3A
SCALE 1:150



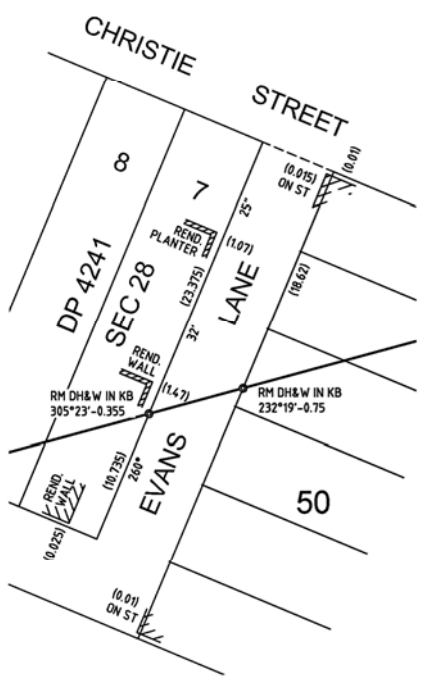




DIAGRAM 9A
SCALE 1:250

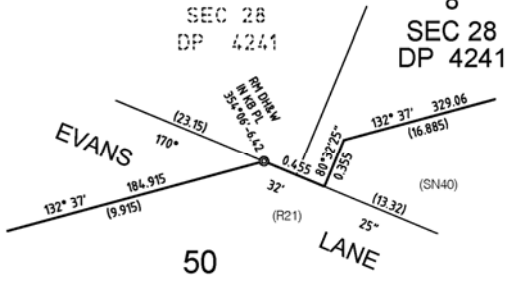


DIAGRAM 7B
NOT TO SCALE

DIAGRAM 7A
NOT TO SCALE

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

DIAGRAM 8A
SCALE 1:250

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: AS SHOWN	Registered: 06.04.2018	DP1231638

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 Table of mm (Cad Ref: PR124856-DP5-001m.dwg)

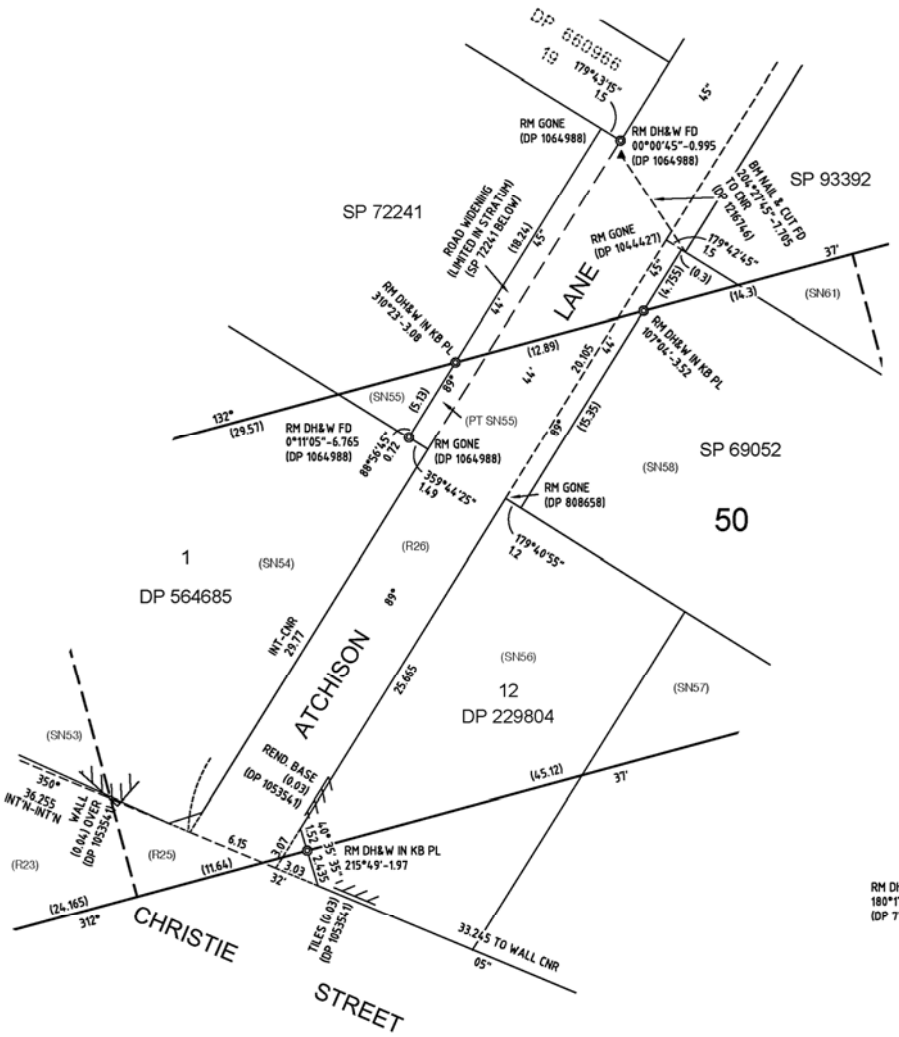


DIAGRAM 8B
SCALE 1:250

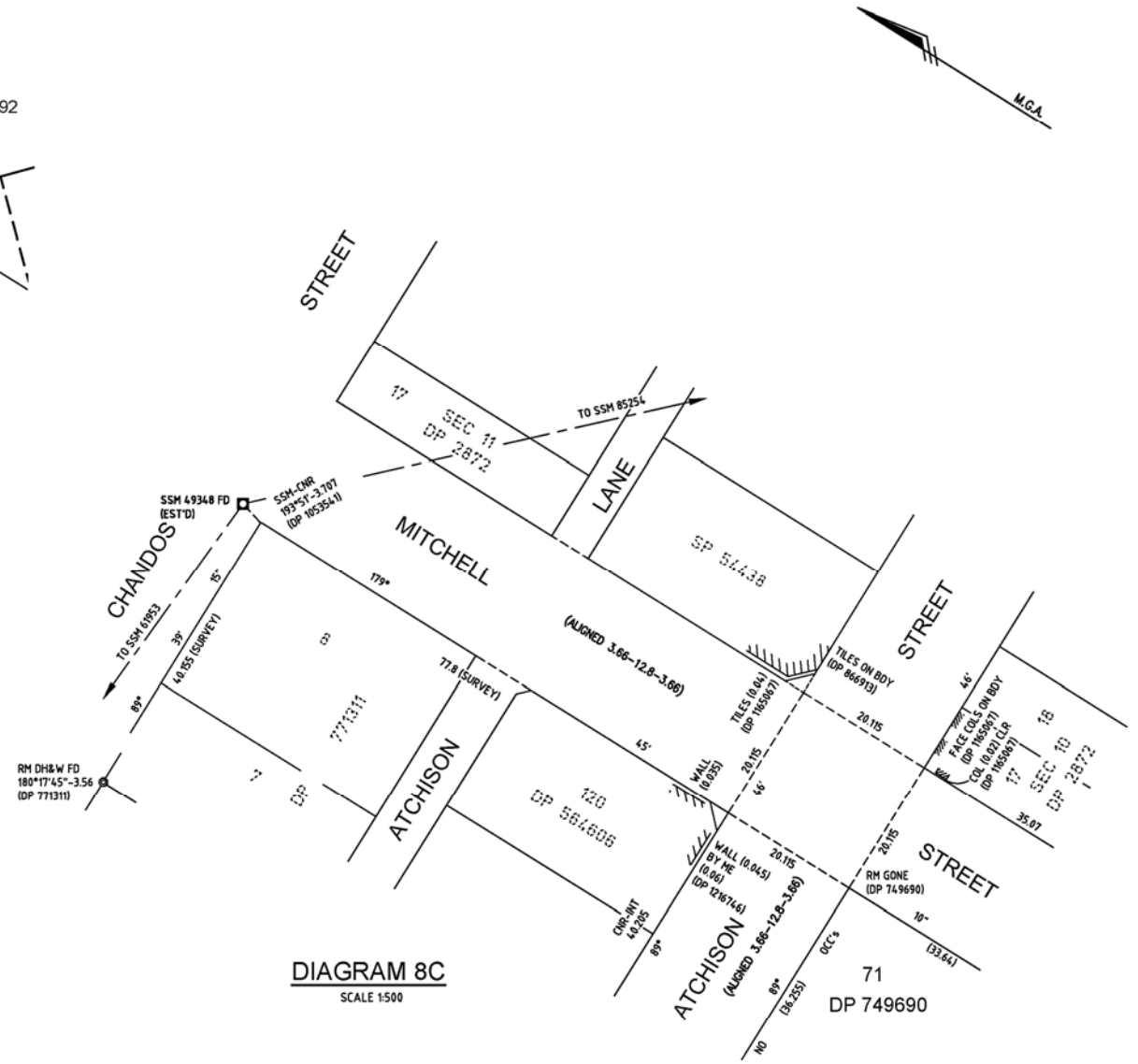


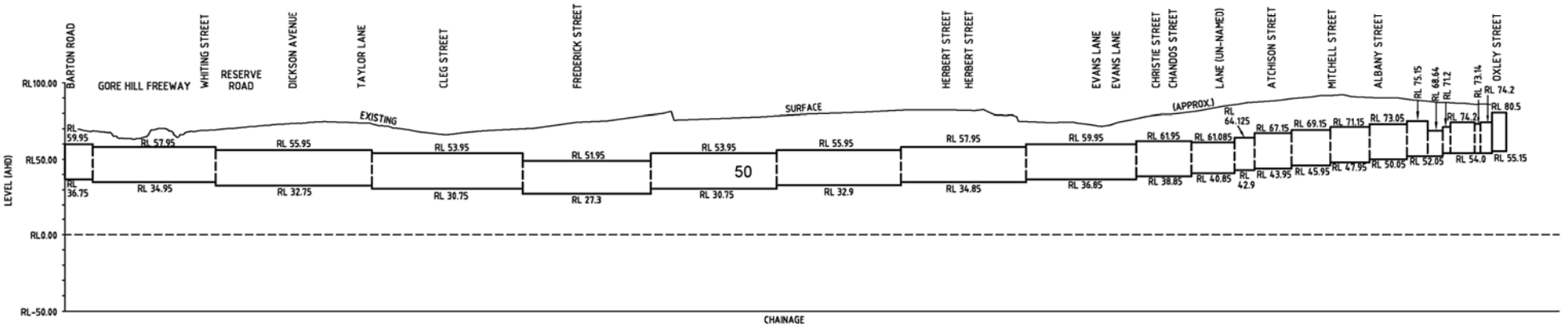
DIAGRAM 8C
SCALE 1:500

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

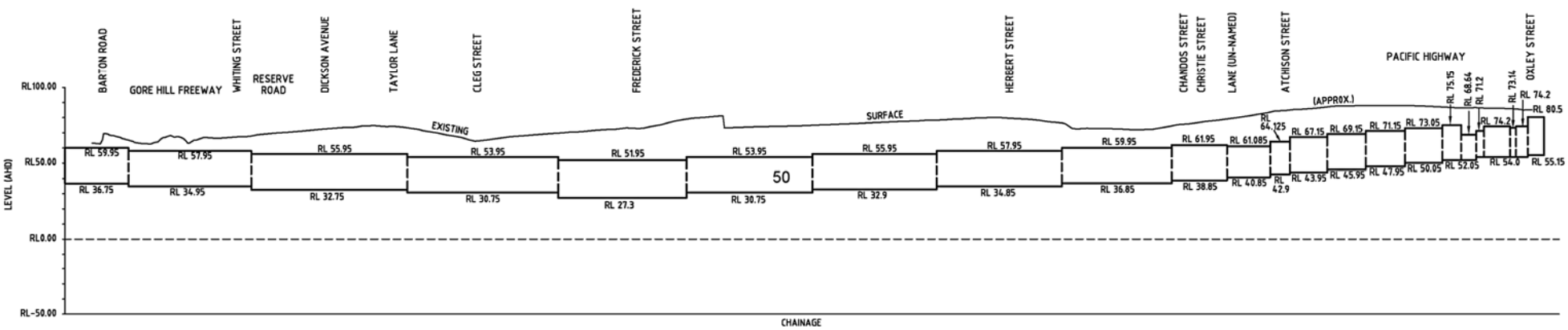
Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: AS SHOWN	Registered: 06.04.2018	DP1231638

10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 Table of mm (Cad Ref: PR124856-DP5-001m.dwg)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:11 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W



SECTION A-A



SECTION B-B

NOTE

ALL LEVELS RELATIVE TO AUSTRALIAN HEIGHT DATUM (AHD)

Surveyor: DAVID WALLACE FAIRLIE Date of Survey: 12.05.2017 Surveyor's Ref: PR124856-DP5 2017M7100 (792 & 799)	PLAN OF ACQUISITION FOR RAILWAY PURPOSES	L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY Locality: ARTARMON, ST LEONARDS Subdivision No: — Lengths are in metres. Reduction Ratio 1: N.T.S.	Registered: 06.04.2018	DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:12 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

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 50					
LOT 9 DP 806092	(SN1)	*68*	RL 57.95	RL 34.95	77	77
LOT 101 DP 838921	(SN2)	*68*	RL 57.95	RL 34.95	511	511
LOT 1 DP 605751	(SN3)	*69*	RL 57.95	RL 34.95	299	706
	(SN4)	*70*	RL 55.95	RL 32.75	407	
LOT 2 DP 1022490	(SN5)	*71*	RL 55.95	RL 32.75	87	87
LOT 1 DP 1022490	(SN6)	*71*	RL 55.95	RL 32.75	187	187
LOT 100 DP 631290	(SN7)	*72*	RL 55.95	RL 32.75	425	425
LOT B DP 358256	(SN8)	*73*	RL 55.95	RL 32.75	48	48
LOT 433 DP 752067	(SN9)	*74*	RL 55.95	RL 32.75	248	248
LOT 434 DP 752067	(SN10)	*75*	RL 55.95	RL 32.75	342	342
LOT 2 DP 168319	(SN11)	*75*	RL 55.95	RL 32.75	203	203
LOT 1 DP 168319	(SN12)	*75*	RL 55.95	RL 32.75	233	233
LOT 436 DP 752067	(SN13)	*75*	RL 55.95	RL 32.75	526	526
CP SP 35330	(SN14)	*75*	RL 55.95	RL 32.75	372	460
	(SN18)	*71*	RL 53.95	RL 30.75	88	
LOT 1 DP 948856	(SN15)	*74*	RL 55.95	RL 32.75	151	372
	(SN16)	*74*	RL 53.95	RL 30.75	221	
LOT 1 DP 983725	(SN17)	*73*	RL 53.95	RL 30.75	349	349
LOT 1 DP 603389	(SN19)	*71*	RL 53.95	RL 30.75	903	903
LOT 11 DP 739468	(SN20)	*68*	RL 53.95	RL 30.75	535	535
LOT 12 DP 739468	(SN21)	*68*	RL 53.95	RL 30.75	358	358
LOT 13 DP 230974	(SN22)	*68*	RL 53.95	RL 30.75	1748	1748
LOT 12 DP 230974	(SN23)	*71*	RL 53.95	RL 30.75	884	3603
	(SN24)	*73*	RL 51.95	RL 27.30	2719	
LOT 1 DP 418152	(SN25)	*78*	RL 51.95	RL 27.30	1509	3373
	(SN26)	*80*	RL 53.95	RL 30.75	1864	
LOT 23 DP 882435	(SN27)	*76*	RL 53.95	RL 30.75	1050	1050
LOT 1 DP 1079151	(SN28)	*77*	RL 53.95	RL 30.75	443	443
LOT 1 DP 778425	(SN29)	*77*	RL 53.95	RL 30.75	1381	2101
	(SN30)	*78*	RL 55.95	RL 32.90	720	
LOT 2 DP 778425	(SN31)	*79*	RL 55.95	RL 32.90	2546	2546
LOT 210 DP1172133	(SN32)	*80*	RL 55.95	RL 32.90	1416	3199
	(SN33)	*82*	RL 57.95	RL 34.85	1783	
CP SP 66951	(SN35)	*80*	RL 57.95	RL 34.85	1257	1257
LOT 2 DP 1015776	(SN36)	*77*	RL 57.95	RL 34.85	486	1908
	(SN37)	*74*	RL 59.95	RL 36.85	1422	
LOT 13 DP 1003022	(SN38)	*74*	RL 59.95	RL 36.85	656	656
LOT 11 DP 1003022	(SN39)	*73*	RL 59.95	RL 36.85	1064	1064
LOT 8 SEC 28 DP4241	(SN40)	*73*	RL 59.95	RL 36.85	19	19
LOT 7 SEC 28 DP4241	(SN41)	*73*	RL 59.95	RL 36.85	53	53
LOT 1 SEC 28 DP 4241	(SN42)	*75*	RL 59.95	RL 36.85	154	154
LOT 2 SEC 28 DP 4241	(SN43	*75*	RL 59.95	RL 36.85	201	211
	(SN51)	*77*	RL 61.95	RL 38.85	10	
LOT 3 SEC 28 DP 4241	(SN44)	*76*	RL 59.95	RL 36.85	179	230
	(SN50)	*77*	RL 61.95	RL 38.85	51	
LOT 4 SEC 28 DP 4241	(SN45)	*76*	RL 59.95	RL 36.85	127	213
	(SN49)	*77*	RL 61.95	RL 38.85	86	
LOT 5 SEC 28 DP 4241	(SN46)	*77*	RL 59.95	RL 36.85	36	157
	(SN48)	*77*	RL 61.95	RL 38.85	121	

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 50					
LOT 6 SEC 28 DP 4241	(SN47)	*78*	RL 61.95	RL 38.85	99	99
LOT 3 DP 733528	(SN52)	*79*	RL 61.95	RL 38.85	94	94
LOT 1 DP 564685	(SN53)	*81*	RL 61.95	RL 38.85	276	705
	(SN54)	*82*	RL 61.085	RL 40.85	429	
CP SP 72241	(SN55)	*83*	RL 61.085	RL 40.85	26	26
LOT 12 DP 229804	(SN56)	*83*	RL 61.085	RL 40.85	284	284
CP SP 32797	(SN57)	*84*	RL 61.085	RL 40.85	76	76
CP SP 69052	(SN58)	*85*	RL 61.085	RL 40.85	485	632
	(SN59)	*86*	RL 64.125	RL 42.90	147	
CP SP 93392	(SN61)	*85*	RL 61.085	RL 40.85	33	492
	(SN64)	*87*	RL 64.125	RL 42.90	409	
	(SN65)	*87*	RL 67.15	RL 43.95	50	
LOT 1 DP 577070	(SN67)	*87*	RL 67.15	RL 43.95	29	29
LOT 71 DP 749690	(SN68)	*88*	RL 67.15	RL 43.95	669	1863
	(SN69	*91*	RL 69.15	RL 45.95	1194	
CP SP 71980	(SN71)	*91*	RL 71.15	RL 47.95	272	272
LOT A DP 431687	(SN72)	*90*	RL 73.05	RL 50.05	480	603
	(SN73)	*89*	RL 75.15	RL 52.05	123	
LOT 10 DP 660453	(SN74)	*89*	RL 75.15	RL 52.05	202	202
LOT 1 DP 772247	(SN75)	*88*	RL 75.15	RL 52.05	213	213
CP SP 96792	(SN76)	*88*	RL 68.64	RL 52.05	465	465
LOT 1 DP 1096026	(SN78)	*88*	RL 71.20	RL 54.00	251	251
CP SP 90263	(SN80)	*87*	RL 74.20	RL 54.00	863	1386
	(SN81)	*87*	RL 73.14	RL 54.00	214	
	(SN82)	*87*	RL 74.20	RL 54.00	309	

ROAD OWNERSHIP TABLE

AFFECTED ROAD	FEE SIMPLE
GORE HILL FREEWAY	CT 29/805818, CT 34/805818, CT 924-233, CT B/364802, CT 31/805818, CT 11/1192259, CT 12/806092, CT 34/11/4088, A/C 3560-182, CT 12/1192259, CT 13/806092, CT 14/806092, CT 15/806092
WHITING STREET	CT 690-27, CT 13/1192259, CT 17/1192259, CT 4642-76
CURRY LANE	CT 690-27
RESERVE ROAD	CROWN LAND
DICKSON AVENUE	CROWN LAND, CT 690-27, CT 1380-65
TAYLOR LANE	CROWN LAND
CLEG STREET	CT 1414-210, CT 6975-76
FREDERICK STREET	CT 300-88
HERBERT STREET	CROWN ROAD (VESTED IN WILLOUGHBY C.C.) VIDE GOV'T GAZETTE 23/04/1895 FOL 2642 CT 9/1003022, CT 1/772072
EVANS LANE	CT 1522-116
CHANDOS STREET	CT 1035-34, CT15068-1
CHRISTIE STREET	CT 1035-34, CT 4922-218, CT 10250-41, CT 1522-116
ATCHISON LANE	CT 1035-34, CT 100/808658
ATCHISON STREET	CT 1035-34
MITCHELL STREET	CT 1035-34
PACIFIC HIGHWAY	CROWN ROAD VIDE GOV'T GAZETTE 17/2/1888 FOL 1298 CROWN ROAD VIDE GOV'T GAZETTE 24/1/1958 FOL 162 CT 1321-240, CT 1320-156, CT 5039-144, CT 4318-64, CT 1177-166, CT 1130-226, CT 1177-36, CT 2058-207, CT 1928-18, CT 1/185649, CT 2453-171, CT 2450-94, CT 1832-241, CT 1827-32, CT 1793-93, CT 2502-163, CT 2337-85, CT 1654-139
ALBANY STREET	CT 1035-34
OXLEY STREET	CT 1035-34
CLARKE LANE	CT 1035-34

AFFECTED ROAD	EXTENT OF ACQUISITION					
	PLAN NOTATION	APPROX GROUND LEVEL	UPPER STRATUM LIMIT	LOWER STRATUM LIMIT	PART AREA (approx.) (m^2)	TOTAL AREA (approx.) (m^2)
	ACQUISITION LOT 50					
GORE HILL FREEWAY	(R1)		RL 59.95	RL 36.75	56	4548
	(R2)		RL 59.95	RL 36.75	29	
	(R3)		RL 59.95	RL 36.75	300	
	(R4)		RL 59.95	RL 36.75	312	
	(R5)		RL 59.95	RL 36.75	780	
	(R6)		RL 57.95	RL 34.95	4	
	(R7)		RL 57.95	RL 34.95	435	
	(R8)		RL 57.95	RL 34.95	2632	
WHITING ROAD	(R9)		RL 57.95	RL 34.95	658	658
RESERVE ROAD	(R10)		RL 57.95	RL 34.95	12	1786
	(R11)		RL 55.95	RL 32.75	1123	
	(R15)		RL 55.95	RL 32.75	651	
CURRY LANE	(R12)		RL 55.95	RL 32.75	101	101
DICKSON AVENUE	(R14)		RL 55.95	RL 32.75	595	595
TAYLOR LANE	(R16)		RL 55.95	RL 32.75	180	180
CLEG STREET	(R17)		RL 53.95	RL 30.75	595	595
FREDERICK STREET	(R18)		RL 51.95	RL 27.30	595	595
HERBERT STREET	(R19)		RL 57.95	RL 34.85	1182	1182
EVANS LANE	(R21)		RL 59.95	RL 36.85	228	228
CHANDOS STREET	(R22)		RL 61.95	RL 38.85	411	422
	(R24)		RL 61.95	RL 38.85	11	
CHRISTIE STREET	(R23)		RL 61.95	RL 38.85	926	955
	(R25)		RL 61.085	RL 40.85	29	
ATCHISON LANE	(R26)		RL 61.085	RL 40.85	267	267
ATCHISON STREET	(R27)		RL 64.125	RL 42.90	193	844
	(R28)		RL 67.15	RL 43.95	651	
PACIFIC HIGHWAY	(R29)		RL 69.15	RL 45.95	190	1937
	(R32)		RL 71.15	RL 47.95	739	
	(R34)		RL 73.05	RL 50.05	569	
	(R34A)		RL 75.15	RL 52.05	209	
	(R36)		RL 68.64	RL 52.05	111	
	(R37)		RL 71.20	RL 54.0	37	
	(R37A)		RL 74.20	RL54.0	54	
	(R40)		RL80.50	RL 55.15	28	
MITCHELL STREET	(R30)		RL 69.15	RL 45.95	72	438
	(R31)		RL 71.15	RL 47.95	366	
ALBANY STREET	(R33)		RL 71.15	RL 47.95	98	441
	(R35)		RL 73.05	RL 50.05	343	
OXLEY STREET	(R38)		RL 74.20	RL 54.00	52	678
	(R39)		RL80.50	RL 55.15	626	

Surveyor: DAVID WALLACE FAIRLIE
Date of Survey: 12.05.2017
Surveyor's Ref: PR124856-DP5
2017M7100 (792 & 799)

PLAN OF
ACQUISITION FOR RAILWAY PURPOSES

L.G.A.: WILLOUGHBY, LANE COVE, NORTH SYDNEY
Locality: ARTARMON, ST LEONARDS
Subdivision No: —
Lengths are in metres. Reduction Ratio 1: 2000

Registered: 06.04.2018

DP1231638

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

(Cad Ref: PR124856-DP5-001m.dwg)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:13 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:14 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

PLAN FORM 6 (2013) WARNING: Creasing or folding will lead to rejection ePlan

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet 1 of 2 sheet(s)

Office Use Only

Registered: 06.04.2018

Title System: TORRENS

Purpose: ACQUISITION

Office Use Only

DP1231638

PLAN OF ACQUISITION FOR RAILWAY PURPOSES

LGA: WILLOUGHBY, LANE COVE, NORTH SYDNEY

Locality: ARTARMON, ST LEONARDS

Parish: WILLOUGHBY

County: CUMBERLAND

Crown Lands NSW/Western Lands Office Approval

I, ... (Authorised Officer) in approving this plan certify that all necessary approvals in regard to the allocation of the land shown herein have been given.

Signature: .....

Date: .....

File Number: .....

Office: .....

Subdivision Certificate

I, ...

*Authorised Person/*General Manager/*Accredited Certifier, certify that the provisions of s.109J of the *Environmental Planning and Assessment Act 1979* have been satisfied in relation to the proposed subdivision, new road or reserve set out herein.

Signature: .....

Accreditation number: .....

Consent Authority: .....

Date of endorsement: .....

Subdivision Certificate number: .....

File number: .....

*Strike through if inapplicable.

Survey Certificate

I, DAVID WALLACE FAIRLIE.....

of RPS AUST EAST PTY LTD .....

a surveyor registered under the *Surveying and Spatial Information Act 2002*, certify that:

*(a) The land shown in the plan was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on 12.05.2017

~~*(b) The part of the land shown in the plan (*being/*excluding ^ .....) was surveyed in accordance with the *Surveying and Spatial Information Regulation 2012*, is accurate and the survey was completed on, ... the part not surveyed was compiled in accordance with that Regulation.~~

~~*(c) The land shown in this plan was compiled in accordance with the *Surveying and Spatial Information Regulation 2012*.~~

Signature: DFairlie Dated: 1-08-2017

Surveyor ID: 1007 .....

Datum Line: "X"-"Y" .....

Type: *Urban/~~*Rural~~

The terrain is *Level-Undulating / ~~*Steep-Mountainous.~~

*Strike through if inapplicable.

^Specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey.

Statements of intention to dedicate public roads, create public reserves and drainage reserves, acquire/resume land.

IT IS INTENDED TO ACQUIRE LOT 50 FOR RAILWAY PURPOSES

Plans used in the preparation of survey/~~compilation.~~

DP1126778, DP805818, DP 833059, DP806092, DP1048901, DP1130724, DP1047418, DP858099, DP868438, DP730544, DP858277, DP790473, DP533025, DP576119, DP1162895, DP1061909, DP1212720, DP1204680, DP842305, DP1003022, DP 816029, DP1027235, DP1169573, DP881725, DP1034099, DP1053541, DP733528, DP1083469, DP1216746, DP749690, DP1188654, DP1060663, DP1042066, DP1013802, DP 1211595, DP1073691, DP859385, DP 1234823

If space is insufficient continue on PLAN FORM 6A

Signatures, Seals and Section 88B Statements should appear on PLAN FORM 6A

Surveyor's Reference: PR124856-DP5
2017M7100(792 & 799)

Req:R400692 /Doc:DP 1231638 P /Rev:06-Apr-2018 /Sts:SC.OK /Pgs:ALL /Prt:09-Apr-2018 03:31 /Seq:15 of 15
Ref:lrs:eplan-eplan FOR SURVEYORS USE ONLY /Src:W

PLAN FORM 6A (2012) WARNING: Creasing or folding will lead to rejection ePlan

DEPOSITED PLAN ADMINISTRATION SHEET

Office Use Only

Registered: 06.04.2018

Office Use Only

DP1231638

PLAN OF ACQUISITION FOR RAILWAY PURPOSES

Subdivision Certificate number: .....

Date of Endorsement: .....

This sheet is for the provision of the following information as required:

- A schedule of lots and addresses - See 60(c) *SSI Regulation 2012*
- Statements of intention to create and release affecting interests in accordance with section 88B *Conveyancing Act 1919*
- Signatures and seals- see 195D *Conveyancing Act 1919*
- Any information which cannot fit in the appropriate panel of sheet 1 of the administration sheets.

Surveyor's Reference: PR124856-DP5 2017M7100(792 & 799)

SYDNEY METRO
L43 680 George St
Sydney NSW 2000 Australia

smcswdbyd@transport.nsw.gov.au

Emergency only (24hrs) 1800 171 386

Dear Sir / Madam,

Dial Before You Dig – Potential impact on tunnel assets

Thank you for your Dial Before You Dig enquiry. Sydney Metro has identified underground tunnel and/or station assets in the vicinity of the enquiry location. These assets may include, but are not limited to running tunnels, cross passages, cross over caverns, station structures and associated services.

Please be aware that damage to these assets could cause serious injury or death as well as major disruption to Sydney Metro rail infrastructure. Guidelines regarding works in the vicinity of Sydney Metro corridors can be found through an internet search for "Sydney Metro Corridor Protection".

A subsurface property stratum has been registered with the Land and Property Information office which describes the space in both plan and reduced level within which the tunnel assets are located. A copy of the relevant stratum plan is attached. The plan is provided subject to the provisions set out below.

- The actual depth of existing tunnel assets may vary significantly from the location shown on the attached plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Any reliance placed on these plans by you is entirely at your risk. You must undertake your own investigations and enquiries to confirm the exact locations of underground assets.
- Sydney Metro is not responsible for any loss suffered by you or any other party (including indirect or consequential loss) in connection with the provision of the plan, however that loss may arise (including losses arising as a result of negligence by Sydney Metro and/or its employees, officers, consultants and contractors).
- Whilst Sydney Metro has taken all reasonable steps to ensure that the information contained in the plan is as accurate as possible, Sydney Metro gives no guarantee, warranty or undertaking as to the accuracy, currency, adequacy, suitability or completeness of the plan and does not assume any duty of care to you or any third party nor accept any liability for inaccuracies in the information shown on these plans.
- Sydney Metro's plans are frequently updated. The attached plans are valid for 6 months from date of issue.

You must review the attached plan(s) to ensure that any proposed works by you are not in conflict with Sydney Metro's assets.

The potential to impact the tunnels will depend upon the nature of works proposed. You must contact Sydney Metro prior to carrying out any works if any of the following apply:

1. your proposed excavation is greater than 2 metres below existing ground level (this includes trenching, bore holes, piles and similar ground penetrations) and is located in, above, below, or within 25m horizontally of the subsurface property stratum; **or**
2. significant additional loads are to be placed over, or within 25m horizontally of, the stratum area whether temporarily or permanently; **or**

3. significant vibration (i.e. driving piles) is to occur over or in the vicinity of the stratum.

In the event that the proposed works trigger any one of the above conditions:

- do not commence works;
- contact Sydney Metro via email smcswdbyd@transport.nsw.gov.au;
- provide sufficient information to Sydney Metro to enable accurate review of the proposed work; and
- await positive confirmation from Sydney Metro that the works are allowed to proceed.

Any further information you may require can be requested during this contact.

You must:

- provide Sydney Metro with information about the proposed works with sufficient time to allow for adjustments to meet Sydney Metro's requirements;
- not modify the extent of work in the vicinity of the tunnels without prior notification to Sydney Metro;
- exercise due care and take all reasonable precautions in the vicinity where underground assets are indicated to avoid destroying, damaging or interfering with Sydney Metro assets and infrastructure;
- not relocate or alter any Sydney Metro tunnel assets or infrastructure under any circumstance;
- immediately notify Sydney Metro of any damage or threat of damage to its infrastructure that occurs as a result of your work, by telephoning the emergency contact number 1800 171 386; and
- ensure information provided in this response is printed and remains available on-site at all times throughout your construction phase.

Due to the inherent dangers associated with excavation in the vicinity of underground tunnel assets, precautions should be taken in the undertaking of any excavation or underground works, including, but not limited to the following:

- all personnel must be properly briefed, particularly those associated with the use of earthmoving equipment, trenching, boring and pneumatic equipment; and
- all excavations by you must be undertaken in accordance with all relevant laws and regulations including, in accordance with but not limited to, Work Cover NSW "Work near underground assets: Guide" and "Work Cover NSW "Excavation work: Code of practice".

You will be held responsible for any damage to any of Sydney Metro's assets or infrastructure or other loss caused (including consequential loss) as a result of excavation or earthworks by you or on your behalf.

The provision of the attached drawing/s does not provide approval for your proposed works or diminish your obligations under NSW legislation. This includes the requirement to contact Sydney Metro prior to any work commencing which could affect our assets to discuss necessary safety and design aspects as detailed above.

Yours sincerely,

Sydney Metro

Sydney Water

Referral
269943783

Member Phone
13 20 92

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	159
Guide_to_Sydney_Water_DBYD_Plans.pdf	160
Important_Information_Sydney_Water_DBYD_Plans.pdf	162
MAP_26994378352659214.pdf	165

Asset Name: 80210

Date of enquiry: 18/03/2026 3:05:00 AM
Notification No: 52659214 (Job No)
Sequence No: 269943783

Customers Name: Marko Djukanovic
Customers Phone No: +61475520426,

Address supplied for dig site location
601 Pacific Hwy, St Leonards, NSW

Notice: Please DO NOT REPLY TO THIS EMAIL as it has been automatically generated and replies are not monitored. Should you wish to advise Dial Before You Dig of any issues with this enquiry, please Call 13 20 92.

[Facebook] [Twitter] [YouTube] [Instagram]

NOTICE: This email is confidential. If you are not the nominated recipient, please immediately delete this email, destroy all copies and inform the sender. Sydney Water Corporation (Sydney Water) prohibits the unauthorised copying or distribution of this email. This email does not necessarily express the views of Sydney Water. Sydney Water does not warrant nor guarantee that this email communication is free from errors, virus, interception or interference.

Guide to reading Sydney Water Before You Dig Plans

This guide will help you understand our plans and what our services are.

Sewer

- Sewer Main (with flow arrow & size type text) — 225 PVC
- Disused Main
- Rising Main
- Maintenance Hole (with upstream depth to invert) — 1.7
- Sub-surface chamber
- Maintenance Hole with Overflow chamber
- Ventshalft EDUCT — VSE
- Ventshaft INDUCT — VSI
- Property Connection Point (with chainage to downstream MH) — 10.6
- Concrete Encased Section — Concrete Encased
- Terminal Maintenance Shaft — TMS
- Maintenance Shaft — MS
- Rodding Point — RP
- Lamphole
- Vertical — VERT
- Pumping Station — SP0882
- Sewer Rehabilitation

Pressure Sewer

- Pressure Sewer Main
- Pump Unit (Alarm, Electrical Cable, Pump Unit)
- Property Valve Boundary Assembly
- Stop Valve
- Reducer / Taper
- Flushing Point — FP

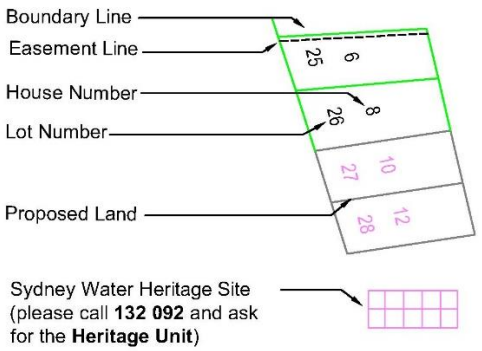
Vacuum Sewer

- Pressure Sewer Main
- Division Valve
- Vacuum Chamber
- Clean Out Point

Stormwater

- Stormwater Pipe
- Stormwater Channel
- Stormwater Gully
- Stormwater Maintenance Hole

Property Details



Sydney Water Heritage Site (please call **132 092** and ask for the **Heritage Unit**)

Water

- WaterMain - Potable (with size type text) — 200 PVC
- Disconnected Main - Potable
- Proposed Main - Potable
- Water Main - Recycled
- Special Supply Conditions - Potable
- Special Supply Conditions - Recycled
- Restrained Joints - Potable
- Restrained Joints - Recycled
- Hydrant
- Maintenance Hole
- Stop Valve
- Stop Vale with By-pass
- Stop Valve with Tapers
- Closed Stop Valve
- Air Valve
- Valve
- Scour
- Reducer / Taper
- Vertical Bends
- Reservoir
- Recycled Water is shown as per Potable above. Colour as indicated

Private Mains

- Potable Water Main
- Recycled Water Main
- Sewer Main
- Symbols for Private Mains shown grey

Pipe types

ABS	Acrylonitrile Butadiene Styrene	**AC**	Asbestos Cement
BRICK	Brick	**CI**	Cast Iron
CICL	Cast Iron Cement Lined	**CONC**	Concrete
COPPER	Copper	**DI**	Ductile Iron
DICL	Ductile Iron Cement (mortar) Lined	**DIPL**	Ductile Iron Polymeric Lined
EW	Earthenware	**FIBG**	Fibreglass
FL BAR	Forged Locking Bar	**GI**	Galvanised Iron
GRP	Glass Reinforced Plastics	**HDPE**	High Density Polyethylene
MS	Mild Steel	**MSCL**	Mild Steel Cement Lined
PE	Polyethylene	**PC**	Polymer Concrete
PP	Polypropylene	**PVC**	Polyvinylchloride
PVC - M	Polyvinylchloride, Modified	**PVC - 0**	Polyvinylchloride, Oriented
PVC - U	Polyvinylchloride, Unplasticised	**RC**	Reinforced Concrete
RC-PL	Reinforced Concrete Plastics Lined	**S**	Steel
SCL	Steel Cement (mortar) Lined	**SCL IBL**	Steel Cement Lined Internal Bitumen
SGW	Salt Glazed Ware	**SPL**	Steel Polymeric Lined
SS	Stainless Steel	**STONE**	Stone
VC	Vitrified Clay	**WI**	Wrought Iron
WS	Woodstave		

In an emergency, or to notify Sydney Water of damage or threats to its structures, call 13 20 90 (24 hours, 7 days)

Further information and guidance is available in the 'Plumbing, building and developing' section of Sydney Water's website at www.sydneywater.com.au, where you will find the following under 'Before You Dig':

- Essential references
  - Avoid Damaging Water and Sewer Pipelines
  - Important Information about Before You Dig
  - Technical guidelines: Building over and adjacent to pipe assets
- See Also
  - Building over or next to assets, section of Sydney Water's website at www.sydneywater.com.au

Or call **13 20 92** for Customer Enquiries.

Note: The lodging of enquiries via www.byda.com.au will enable you to receive, via email, colour plans in PDF format 24 hours a day, 7 days a week.

This communication is confidential. If you are not the intended recipient, please destroy all copies immediately. Sydney Water Corporation prohibits unauthorised copying or distribution of this communication.

Important information about Before You Dig

The material provided or made available to you by Sydney Water (including on the Sydney Water website) in relation to your Before You Dig enquiry (Information) is provided on each of the following conditions, which you are taken to have accepted by using the Information:

1 The Information has been generated by an automated system based on the area highlighted in the "Locality Indication Only" window on your Confirmation Email. It is your responsibility to ensure that the dig site is properly defined when submitting your Before You Dig enquiry and, if the Information does not match the dig site, to resubmit your enquiry for the correct dig site.

2 Neither Sydney Water nor Before You Dig make any representation or give any guarantee, warranty or undertaking (express or implied) as to the currency, accuracy, completeness, effectiveness or reliability of the Information. The Information, including Sydney Water plans and work-as-executed diagrams, amongst other things:

   (a) may not show all existing structures, including Sydney Water's pipelines, particularly in relation to newer developments and in relation to structures owned by parties who do not participate in the Before You Dig service;

   (b) may be out of date and not show changes to surface levels, road alignments, fences, buildings and the like;

   (c) is approximate only and is therefore not suitable for scaling purposes; and

   (d) does not show locations of property services (often called house service lines) belonging to or servicing individual customers, which are usually connected to Sydney Water's structures.

3 You are responsible for, amongst other things:

   (a) exposing underground structures, including Sydney Water's pipelines, by pot-holing using hand-held tools or vacuum techniques so as to determine the precise location and extent of structures before any mechanical means of excavation are used;

   (b) the safe and proper excavation of and for underground works and structures, including having regard to the fact that asbestos cement pipelines, which can pose a risk to health, may form part of Sydney Water's water and sewerage reticulation systems;

   (c) protecting underground structures, including Sydney Water's pipelines, from damage and interference;

   (d) maintaining minimum clearances between Sydney Water's structures and structures belonging to others;

   (e) ensuring that backfilling of excavation work in the vicinity of Sydney Water's structures complies with Sydney Water's standards contained on its website or otherwise communicated to you;

   (f) notifying Sydney Water immediately of any damage caused or threat of damage to Sydney Water's structures;

   (g) ensuring that plans are approved by Sydney Water (usually signified by stamping) prior to landscaping or building over or in the vicinity of any Sydney Water structure;

   (h) ensuring that the Information is used only for the purposes for which Sydney Water and Before You Dig intended.

4 You acknowledge that you use the Information at your own risk. In consideration for the provision of the Before You Dig service and the Information by Sydney Water and Before You Dig, to the fullest extent permitted by law

(a) all conditions and guarantees concerning the Information (whether as to quality, outcome, fitness, care, skill or otherwise) expressed or implied by statute, common law, equity, trade, custom or usage or otherwise are expressly excluded and to the extent that those statutory guarantees cannot be excluded, the liability of Sydney Water and Before You Dig to you is limited to either of the following as nominated by Sydney Water in its discretion, which you agree is your only remedy:

(i) the supplying of the Information again; or

(ii) payment of the cost of having the Information supplied again;

(b) in no event will Sydney Water or Before You Dig be liable for, and you release Sydney Water and Before You Dig from, any Loss arising from or in connection with the Information, including the use of or inability to use the Information and delay in the provision of the Information:

(i) whether arising under statute or in contract, tort or any other legal doctrine, including any negligent act, omission or default (including willful default) by Sydney Water or Before You Dig; and

(ii) regardless of whether Sydney Water or Before You Dig are or ought to have been aware of, or advised of, the possibility of such loss, costs or damages;

(c) you will indemnify Sydney Water and Before You Dig against any Loss arising from or in connection with Sydney Water providing incorrect or incomplete information to you in connection with the Before You Dig service; and

(d) you assume all risks associated with the use of the Before You Dig and Sydney Water websites, including risk to your computer, software or data being damaged by any virus, and you release and discharge Sydney Water and Before You Dig from all Loss which might arise in respect of your use of the websites.

5 "**Sydney Water**" means Sydney Water Corporation and its employees, agents, representatives and contractors. "**Before You Dig**" means Before You Dig Australia and its employees, agents, representatives and contractors. References to "**you**" include references to your employees, agents, representatives, contractors and anyone else using the Information. References to "**Loss**" include any loss, cost, expense, claim, liability or damage (including arising in connection with personal injury, death or any damage to or loss of property and economic or consequential loss, lost profits, loss of revenue, loss of management time, opportunity costs or special damages). To the extent of any inconsistency, the conditions in this document will prevail over any other information provided to you by Sydney Water and Before You Dig.

In an emergency, or to notify Sydney Water of damage or threats to its structures, call 13 20 90 (24 hours, 7 days)

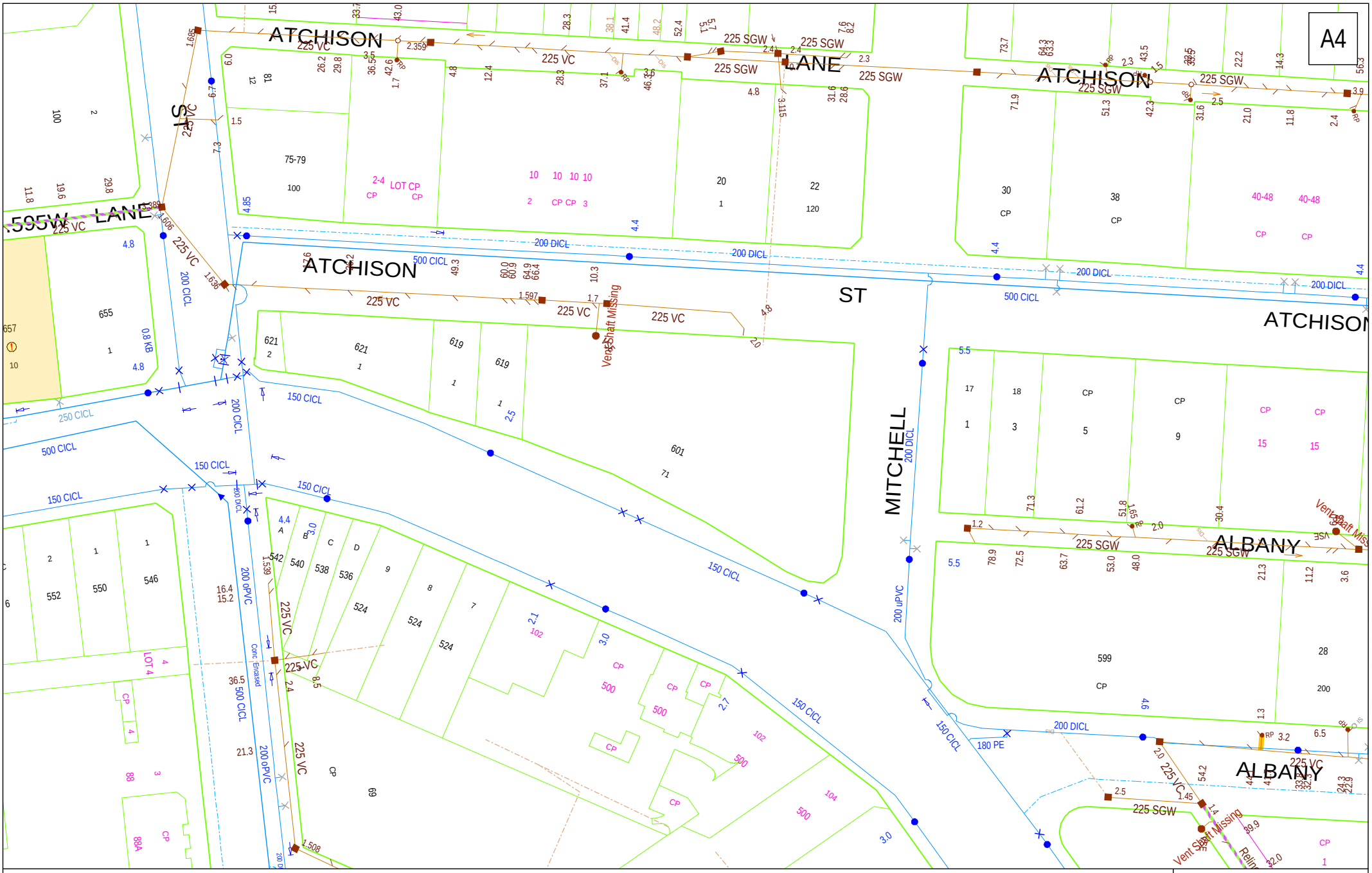
Further information and guidance is available in the 'Plumbing, building and developing' section of Sydney Water's website at www.sydneywater.com.au, where you will find the following under 'Before You Dig':

- Essential references
    - Guide to Reading Sydney Water BYDA Plans
    - Avoid Damaging Water and Sewer Pipelines
    - Technical guidelines: Building over and adjacent to pipe assets
- See Also
    - Building over or next to assets, section of Sydney Water's website at www.sydneywater.com.au

Or call **13 20 92** for Customer Enquiries.

Note: The lodging of enquiries via www.byda.com.au will enable you to receive, via email, colour plans in PDF format 24 hours a day, 7 days a week.

This communication is confidential. If you are not the intended recipient, please destroy all copies immediately. Sydney Water Corporation prohibits unauthorised copying or distribution of this communication.



DBYD Address:
601 Pacific Hwy
St Leonards NSW
2065

DBYD Job No: 52659214

DBYD Sequence No: 269943783

Copyright Reserved Sydney Water 2026

No warranty is given that the information shown is complete or accurate.

SYDNEY WATER CORPORATION

Scale: 1:1000

Date of Production: 18/03/2026

Plan 1 of 1

N

0m 5m 10m 15m 20m

Referral
269943788

Member Phone
1800 653 935

Responses from this member

Response received Wed 18 Mar 2026 2.13pm

File name	Page
Response Body	167
269943788.pdf	169
AccreditedPlantLocators 2026-03-17a.pdf	171
Telstra Duty of Care v33.0a.pdf	172
Telstra Map Legend v4_0c.pdf	174

Attention: Marko Djukanovic

Site Location: 601 Pacific Hwy, St Leonards, NSW 2065

Your Job Reference: 601 Pacific Hwy

Please do not reply to this email, this is an automated message -
Thank you for requesting Telstra information via Before You Dig Australia (BYDA). This response contains Telstra Information relating to your recent request.

Accredited Plant Locator	General Contact Information including applications required to view Cable Plans - DWF & PDF
Telstra Duty of Care v33.0a	Your responsibility and Legal requirements working near Telstra's Assets
Telstra Map Legend v4_0c	Common Symbols on Cable Plans and Safe Clearance distances when working near Telstra Assets

Please note:
When working in the vicinity of telecommunications plant you have a 'Duty of Care' that must be observed.
Ensure you read all documents (attached) - they contain important information.
In particular please read and familiarise yourself with the Before you Dig Australia - BEST PRACTISE GUIDES and The five Ps of safe excavation https://www.byda.com.au/before-you-dig/best-practice-guides/, as these documents set out the essential steps that must be undertaken prior to commencing construction activities.

Best practice guides and the five P's of safe excavation	These are the essential steps to be undertaken prior to commencing construction activities	Essential Steps : Link 5 P's: Link
	Telstra highly recommends using Certified Locators	CERTLOC : Link
1800 653 935 Telstra Plan Services	Whenever in doubt please contact this number for Telstra BYDA map related enquiries email Telstra.Plans@team.telstra.com	Note: that Telstra plans are only valid for **60** days from the date of issue
How to Report Damage to Telstra Equipment	If you think you have damaged Telstra Assets, please Report it ASAP.	Call: **13 22 03** Report Online: Link

	It is a criminal offence under the ‘Criminal code act 1995’ to tamper or interfere with Telecommunications infrastructure. Telstra will take action to recover compensation for the damage caused to property and assets, and for interference with the operation of Telstra's networks and customer service.
	Telstra plans contain confidential information and are provided on the basis that they are used solely for identifying location or vicinity of Telstra's infrastructure to avoid damage to this infrastructure occurring as part of any digging or other excavation activity. You must not use Telstra's plans for any other purpose or in a way that will cause loss or damage. You must comply with any other terms of access to the data that have been provided by you by Telstra (including conditions of use or access).

WARNING - MAJOR CABLES and/or OPTIC FIBRE IN THE AREA.
Phone 1800 653 935 for further assistance.

Note: In some areas Telstra fibre routes may be marked as "Amcom", as Telstra has purchased much of this infrastructure. If in doubt, please contact Telstra Plan services on the number above. Telstra plans and information are only valid for 60 days from the date of issue.

WARNING:
Telstra plans and location information conform to Quality Level ’D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing them. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy. Further on site investigation is required to validate the exact location of Telstra assets prior to commencing work. A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the assets are protected during construction works. See the **Before You Dig Australia - BEST PRACTISE GUIDES and The five Ps of safe excavation** https://www.byda.com.au/before-you-dig/best-practice-guides/.

Please note that:
- it is a criminal offence under the *Criminal Code Act* 1995 (Cth) to tamper or interfere with telecommunications infrastructure.
- Telstra will take action to recover compensation for damage caused to property and assets, and for interference with the operation of Telstra’s networks and customers’ services.

Telstra’s plans contain Telstra’s confidential information and are provided on the basis that they are used solely for identifying the location or vicinity of Telstra’s infrastructure to avoid damage to this infrastructure occurring as part of any digging or other excavation activity. You must not use Telstra’s plans for any other purpose or in a way that will cause Telstra loss or damage and you must comply with any other terms of access to the data that have been provided to you by Telstra (including Conditions of Use or Access).

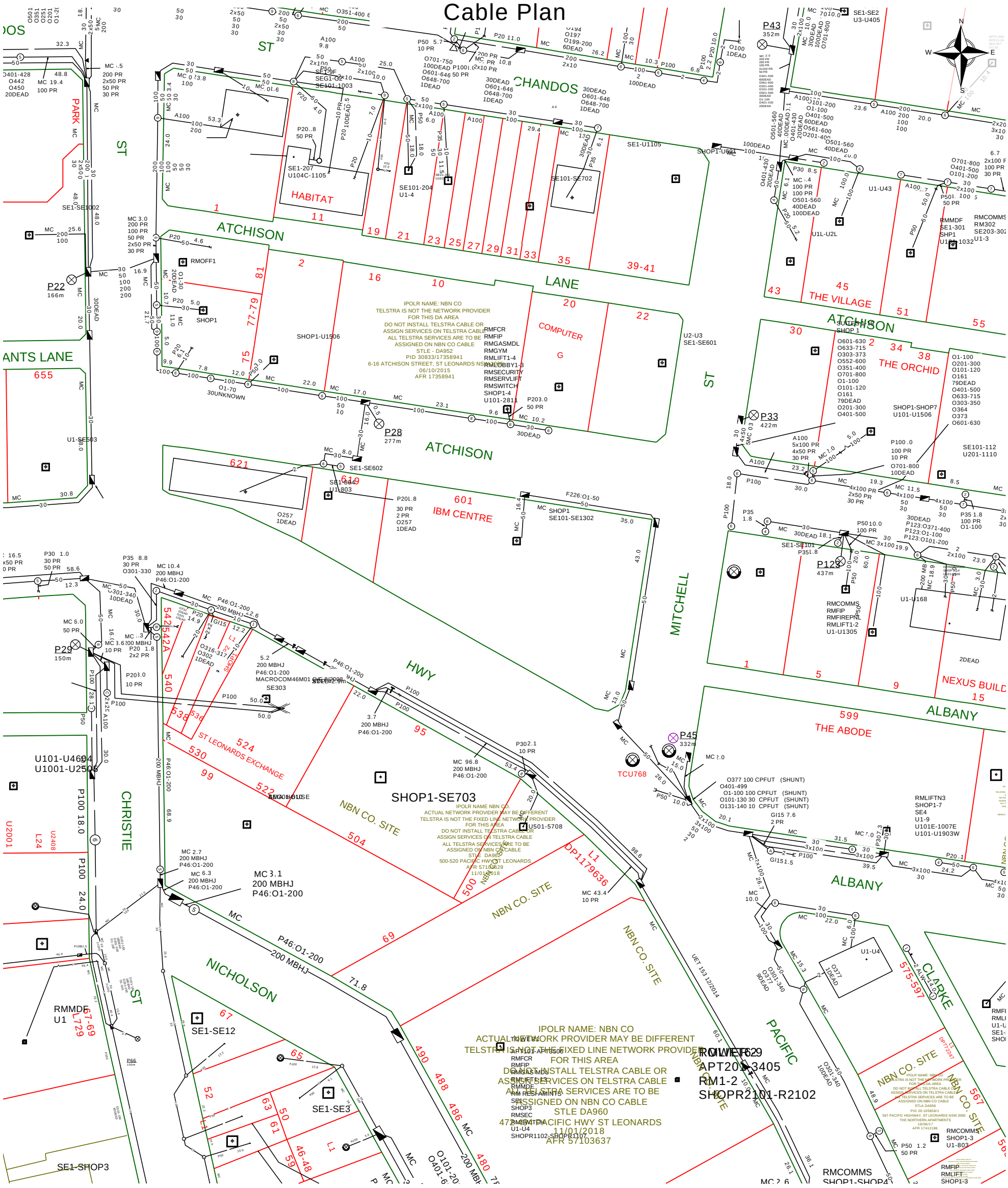
(See attached file: Telstra Duty of Care v33.0a.pdf)

(See attached file: Telstra Map Legend v4_0c.pdf)

(See attached file: AccreditedPlantLocators 2026-03-17a.pdf)

(See attached file: 269943788.pdf)

Cable Plan



Report Damage:https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-
Ph - 13 22 03
Email - Telstra.Plans@team.telstra.com
Planned Services - ph 1800 653 935 (AEST bus hrs only) General Enquiries

TELSTRA LIMITED A.C.N. 086 174 781

Generated On 18/03/2026 14:11:08

Sequence Number: 269943788

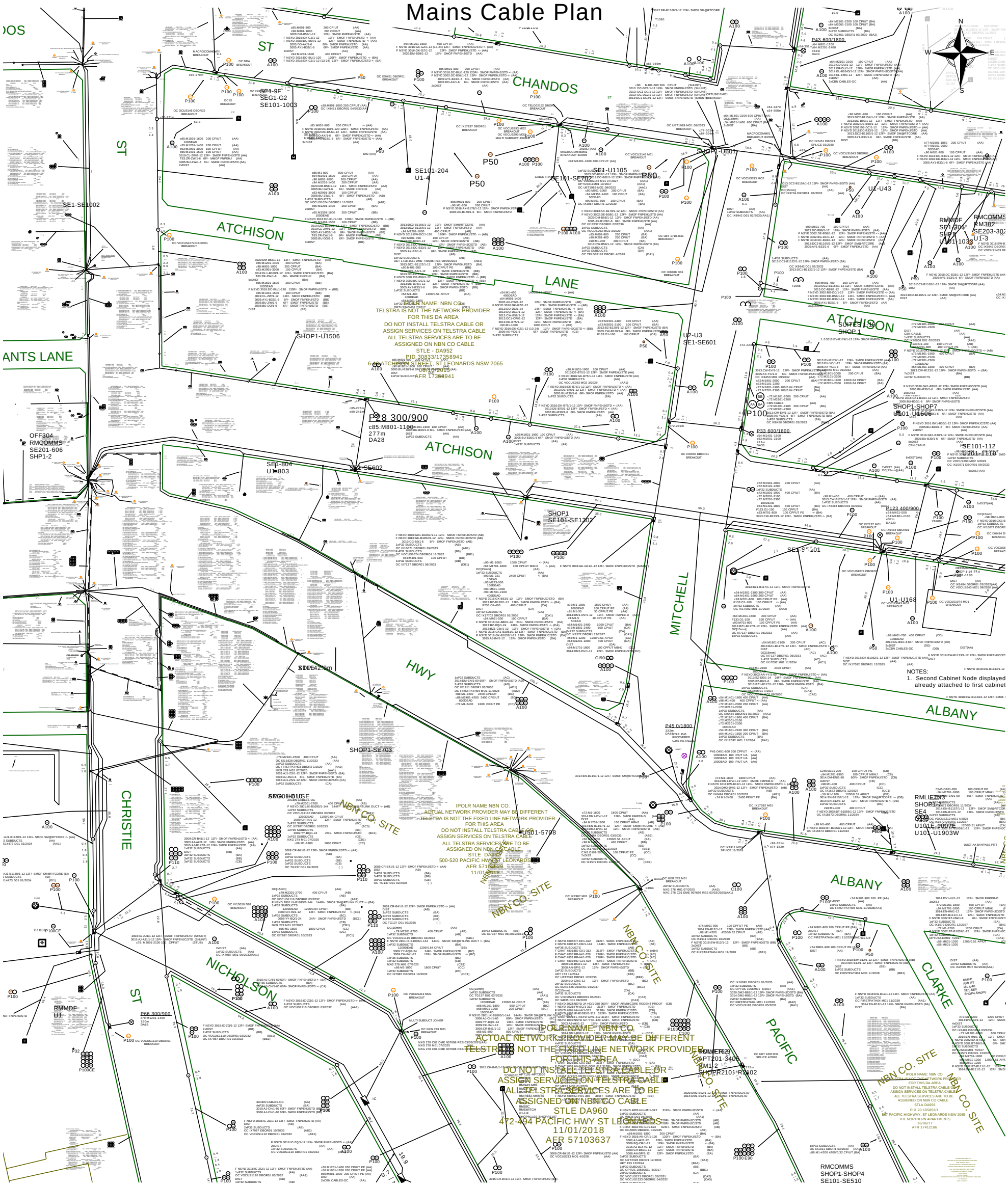
CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact InfraCo Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING
Telstra plans and location information conform to Quality Level "D" of the Australian Standard AS 5488-Classification of Subsurface Utility Information.
As such,Telstra supplied location information is indicative only.Spatial accuracy is not applicable to Quality Level D.
Refer to AS 5488 for further details. The exact position of Telstra assets can only be validated by physically exposing it.
Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy.
Further on site investigation is required to validate the exact location of Telstra plant prior to commencing construction work.
A Certified Locating Organisation is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works.

See the Steps- Telstra Duty of Care that was provided in the email response.

Mains Cable Plan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ATCHISON
LANE
ANTS LANE
SE1-SE1002
SE1-SE1004
SE1G1-G2
SE101-10C3
SE101-204
U1-4
SE1-U1105
SHOP1-U601
U2-U3
SE1-SE601
U1-U43
RMMDF
SE1-304
SHOP1
U101-1033
RMCOMMS
RM302
SE203-302
U1-3
SUITE 1-SHOP 1
U101-1006
SHOP1-U1506
SHOP1-SE703
SHOP1-SE602
SE1-804
U1-803
OFF304
RMCOMMS
SE201-606
SHP1-2
P28 300/900
c85:M801-1100
277m
DA28
P33 600/1800
P123 400/900
P45 0/1800
P66 300/900
SHOP1
SE101-SE1302
SHOP1-SHOP7
U101-U1506
SE101-112
U101-U1106
SE1-SE1101
U101-U1168
SHOP1-U1901
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SHOP1-U1946

General Information

Telstra highly recommends using Certified Locators.

For more info contact a CERTLOC Certified Locating Organisation (CLO) or Telstra Location Intelligence Team 1800 653 935

Before you Dig Australia – BEST PRACTISE GUIDES
https://www.byda.com.au/before-you-dig/best-practice-guides/

OPENING ELECTRONIC MAP ATTACHMENTS –

Telstra Cable Plans are generated automatically in either PDF or DWF file types.
Dependent on the site address and the size of area selected.
You may need to download and install free viewing software from the internet e.g.

DWF Map Files (all sizes over A3)
Autodesk Viewer (Internet Browser) https://viewer.autodesk.com/ or
Autodesk Design Review http://usa.autodesk.com/design-review/ for DWF files.
(Windows PC)

PDF Map Files (max size A3)
Adobe Acrobat Reader http://get.adobe.com/reader/

Telstra New Connections / Disconnections
13 22 00

Telstra Protection & Relocation: 1800 810 443 (AEST business hours only).
Email
Telstra Protection & Relocation Fact Sheet: Link
Telstra Protection & Relocation Home Page Link

Telstra Aerial Assets Group (overhead network)
1800 047 909

Protect our Network:

by maintaining the following distances from our assets:

- **1.0m Mechanical Excavators, Farm Ploughing, Tree Removal**
- **500mmVibrating Plate or Wacker Packer Compactor**
- **600mm Heavy Vehicle Traffic (over 3 tonnes) not to be driven across Telstra ducts or plant.**
- **1.0mJackhammers/Pneumatic Breakers**
- **2.0m Boring Equipment (in-line, horizontal and vertical**



Before You Dig Australia

Think before you dig

This document has been sent to you because you requested plans of the Telstra network through Before You Dig Australia (BYDA).

If you are working or excavating near telecommunications cables, or there is a chance that cables are located near your site, you are responsible to avoid causing damage to the Telstra network.

Please read this document carefully. Taking your time now and following the BYDA's Best Practices and 5 Ps of Safe Excavation https://www.byda.com.au/before-you-dig/best-practice-guides/

can help you avoid damaging our network, interrupting services, and potentially incurring civil and criminal penalties.

Our network is complex and working near it requires expert knowledge. Do not attempt these activities if you are not qualified to do so.

Disclaimer and legal details

*Telstra advises that the accuracy of the information provided by Telstra conforms to Quality Level D as defined in AS5488-2013.

It is a criminal offence under the Criminal Code Act 1995 (Cth) to tamper or interfere with telecommunications infrastructure.

Telstra will also take action to recover costs and damages from persons who damage assets or interfere with the operation of Telstra's networks.

By receiving this information including the indicative plans that are provided as part of this information package you confirm that you understand and accept the risks of working near Telstra's network and the importance of taking all the necessary steps to confirm the presence, alignments and various depths of Telstra's network. This in addition to, and not in replacement of, any duties and obligations you have under applicable law.

When working in the vicinity of a telecommunications plant you have a "Duty of Care" that must be observed. Please read and understand all the information and disclaimers provided below.

The Telstra network is complex and requires expert knowledge to interpret information, to identify and locate components, to pothole underground assets for validation and to safely work around assets without causing damage. If you are not an expert and/or qualified in these areas, then you must not attempt these activities. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers. Construction activities and/or any activities that potentially may impact on Telstra's assets must not commence without first undertaking these steps. Construction activities can include anything that involves breaking ground, potentially affecting Telstra assets.

If you are designing a project, it is recommended that you also undertake these steps to validate underground assets prior to committing to your design.

This Notice has been provided as a guide only and may not provide you with all the information that is required for you to determine what assets are on or near your site of interest. You will also need to collate and understand all information received from other Utilities and understand that some Utilities are not a part of the BYDA program and make your own enquiries as appropriate. It is the responsibility of the entities arranging for the works to be performed, supervising the works, and undertaking the works to protect Telstra network during excavation / construction works.

Telstra owns and retains the copyright in all plans and details provided in conjunction with the applicant's request. The applicant is authorised to use the plans and details only for the purpose indicated in the applicant's request. The applicant must not use the plans or details for any other purpose.

Telstra plans or other details are provided only for the use of the applicant, its servants, agents, or CERTLOC Certified Locating Organisation (CLO). The applicant must not give the plans or details to any parties other than these and must not generate profit from commercialising the plans or details. If the Applicant is aware of another party or parties about to perform or performing works at the location, it should ensure that the other party or parties have lodged a BYDA enquiry and obtained plans for that location. If you are undertaking excavations works you must follow the 5Ps of Safe Excavation. The 5 Ps of Safe Excavation are set out in the video in the below link.

https://www.byda.com.au/education/resources/

Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.

Please ensure Telstra plans and information provided always remains on-site throughout the inspection, location, and construction phase of any works.

Telstra plans are valid for 60 days after issue and must be replaced if required after the 60 days.

Data Extraction Fees

In some instances, a data extraction fee may be applicable for the supply of Telstra information. Typically, a data extraction fee may apply to large projects, planning and design requests or requests to be supplied in non-standard formats. For further details contact Telstra Location Intelligence Team.

Telstra does not accept any liability or responsibility for the performance of or advice given by a CERTLOC Certified Locating Organisation (CLO). Certification is an initiative taken by Telstra towards the establishment and maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.

Neither the Certified Locating Organisation nor any of its employees are an employee or agent for Telstra. Telstra is not liable for any damage or loss caused by the Certified Locating Organisation or its employees.

Once all work is completed, the excavation should be reinstated with the same type of excavated material unless specified by Telstra.

The information contained within this pamphlet must be used in conjunction with other material supplied as part of this request for information to adequately control the risk of potential asset damage.

When using excavators and other machinery, also check the location of overhead power lines.

Workers and equipment must maintain safety exclusion zones around power lines

WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK. A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the assets are protected during construction works. The exact position of Telstra assets can only be validated by physically exposing them. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Privacy Note

Your information has been provided to Telstra by BYDA to enable Telstra to respond to your BYDA request. Telstra keeps your information in accordance with its privacy statement. You can obtain a copy at www.telstra.com.au/privacy or by calling us at 1800 039 059 (business hours only).

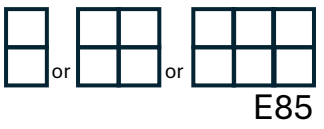
LEGEND

Leadin terminates at a Customer Address	Cable Jointing Pit Number / Letter indicating Pit type/size
Exchange Major Cable Present	Elevated Joint (above ground joint on buried cable)
Pillar / Cabinet Above ground Free Standing	Telstra Plant in shared Utility trench
Above ground Complex Equipment Please note: Powered by 240v electricity	Aerial cable / or cable on wall
OC — Other Carrier Telecommunication Cable/ Asset. Not Telstra Owned	Aerial cable (attached to joint use Pole e.g., Power Pole)
DIST — Distribution cables in Main Cable Ducts	Marker Post Installed
MC — Main Cable ducts on a Distribution Plan	Buried Transponder
Blocked or Damaged Duct	Marker Post & Transponder
Footway Access Chamber (can vary between 1-lid to 12-lid	Optical Fibre Cable Direct Buried
NBN Pillar	Direct Buried Cable
Third Party Owned Network Non-Telstra	nbn owned network



Single to Multiple Round Conduit Configurations 1,2,4,9 respectively

(attached text denotes conduit type and size)



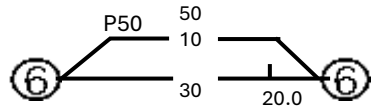
Multiple Square Conduit configurations 2,4,6 respectively

(attached text denotes conduit type and size)

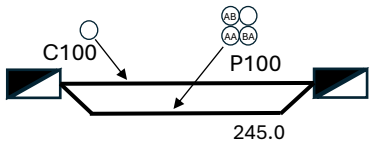
Some examples of conduit type and size:

A - Asbestos cement, P - PVC / Plastic, C - Concrete,
GI - Galvanised Iron, E - Earthenware
Conduit sizes nominally range from 20mm to 100mm
P50 50mm PVC conduit
P100 100mm PVC conduit
A100 100mm asbestos cement conduit

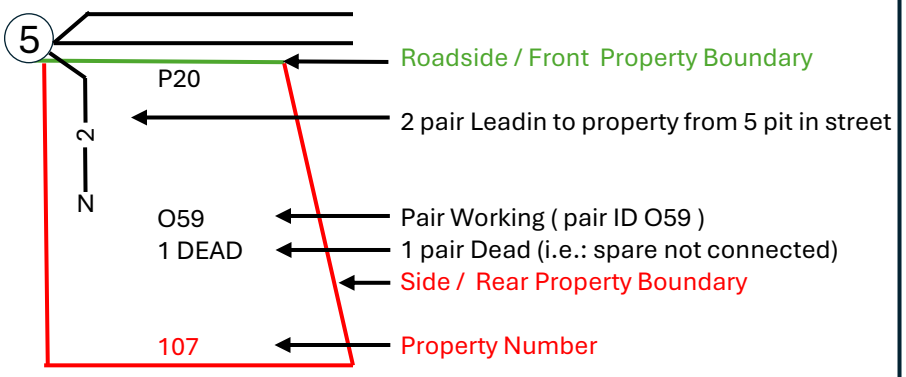
Some Examples of how to read Telstra Plans



One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6 pits. approximately 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) approximately 245m apart A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.



The 5 Ps of Safe Excavation

https://www.byda.com.au/before-you-dig/best-practice-guides/

Plan

Plan your job. Use the BYDA service at least one day before your job is due to begin, and ensure you have the correct plans and information required to carry out a safe project.

Prepare

Prepare by communicating with asset owners if you need assistance. Look for clues onsite. Engage a Certified Locator.

Pothole

Potholing is physically sighting the asset by hand digging or hydro vacuum extraction.

Protect

Protecting and supporting the exposed infrastructure is the responsibility of the excavator. Always erect safety barriers in areas of risk and enforce exclusion zones.

Proceed

Only proceed with your excavation work after planning, preparing, potholing (unless prohibited), and having protective measures in place.

TPG Telecom (NSW)

Referral
269943784

Member Phone
1800 786 306

Responses from this member

Response received Wed 18 Mar 2026 2.35pm

File name	Page
Response Body	176
269943784.pdf	177

Request: 269943784 Enquirer: Stockland - 3831362 Contact: Marko Djukanovic Email: marko.djukanovic@stockland.com.au Phone: +61475520426 Address: Level 25 133-145 Castlereagh Street Sydney NSW 2000 Site Address: 601 Pacific Hwy St Leonards NSW 2065 Activity: Planning and Design Job Number: 52659214

PIPE NETWORKS PTY LIMITED
ABN 21 099 104 122
Level 10, 452 Flinders Street
Melbourne VIC 3000
Phone: 1800 786 306 (24hrs)

Date: 18/03/2026

Enquirer Name: Marko Djukanovic
Enquirer Address: Level 25 133-145 Castlereagh Street
Email: marko.djukanovic@stockland.com.au
Phone: +61475520426

Dear Marko Djukanovic

The following is our response on behalf of each of the carriers (listed below) to your Before You Dig Australia enquiry – Sequence 269943784
It is provided to you on a confidential basis under the following conditions and must be shredded or securely disposed of after use.

Assets Affected: 601 Pacific Hwy St Leonards

Carriers (each a "Pipe Networks carrier") and assets affected:

AAPT/PowerTel, PIPE Networks

Location:

According to our records, the underground assets in the vicinity of the location stated in your enquiry are **AFFECTED**. Please read the below information and disclaimers in addition to the any attached plans provided prior to any construction activities.

IMPORTANT INFORMATION

- The information provided is valid for 30 days from the date of this response. If your work site area changes or your construction activity is beyond 30 days please contact Before You Dig Australia on 1100 or www.1100.com.au to re-submit a new enquiry.
- Due to the nature of underground assets and the age of some assets and records, our plans are indicative of the general location only and may not show all assets in the location. You should not solely rely on these plans when undertaking construction works. It is also inaccurate to assume depth or that underground network conduit and cables follow straight lines, and careful on-site investigations are essential to locate an asset's exact position prior to excavation. It is your responsibility to locate and confirm the exact location of our infrastructure using non-destructive techniques. We make no warranty or guarantee that our plans are complete, current or error free, and to the maximum extent permitted by law we exclude all liability to you, your employees, agents and contractors for any loss, damage or claim arising out of or in connection with using our plans.
- Please note that some of our conduits carry electrical cables and gas pipes. Please exercise extreme care when working within the vicinity of these conduit and take into account the minimum clearance distances under Duty Of Care below.
- You (and your employee and contractors) must not open, move, interfere, alter or relocate any of our assets without our prior approval.
- **Note** It is a criminal offence under the *Criminal Code Act 1995 (Cth)* to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by us as a result of such unauthorised works may be claimed against you.

DAMAGE

- You must report immediately any damage to our network on **1800 786 306** (24hrs). We will hold you liable and seek compensation for any loss or damage to our network, our property and our customers that is caused by or arises out of your activities.

DUTY OF CARE

You have a duty of care to carefully locate, validate and protect our assets when carrying out works near our infrastructure. For construction activities that may impact on or interfere with our network, you will need to call us on **1800 786 306** to discuss a suitable engineering solution, lead time and cost involved. The below precautions must be taken when working in the vicinity of our network:

- Contact us on **1800 786 306** to discuss and obtain relevant information and plans on our infrastructure in a particular location if the information provided in this response is insufficient.
- Physically locate and mark on-site our network infrastructure using non-destructive techniques i.e. pot holing or hand digging every 5 metres prior to commencing any construction activities. Assets located must be marked to AS5488 standard. **NO CONSTRUCTION WORK IS ALLOWED UNTIL THIS STEP IS COMPLETED**. You must use an approved telecommunications accredited locator, or we can provide a locator for you at your expense. If we provide you with a locator, and this locator attended the site and is proven to be grossly negligent in physically locating and marking our infrastructure, then to the extent any Pipe Networks carrier is liable for this locator's negligence, acts and omissions, the total liability aggregated for all Pipe Networks carriers is limited, at our option, to attend the site and re-mark the infrastructure or to pay for a third party to re-mark the infrastructure.
- If you require us to locate or monitor our infrastructure, please allow five business days' notice for us to respond.
- Ensure all information, including our network requirements and any associated plans provided by us are kept confidential and remain on-site throughout your construction works.

- Use suitably qualified and supervised professionals, particularly if you are working near assets that contain electricity cables or gas pipes.

- Ensure the below minimum clearance distances between the construction activities and the actual location of our assets are met. If you need clearance distances for our above ground assets, or if the below distances cannot be met, call **1800 786 306** to discuss.

  Minimum assets clearance distances.

  - 300mm when laying asset inline, horizontal or vertical.
  - 1000mm when operating vibrating equipment. Eg: vibrating plates. No vibrating equipment on top of asset.
  - 1000mm when operating mechanical excavators or jackhammers/pneumatic breakers.
  - 2000mm when performing directional bore in-line, horizontal and vertical.
  - No heavy vehicle over 3 tonnes to be driven over asset with less than 600mm of cover.

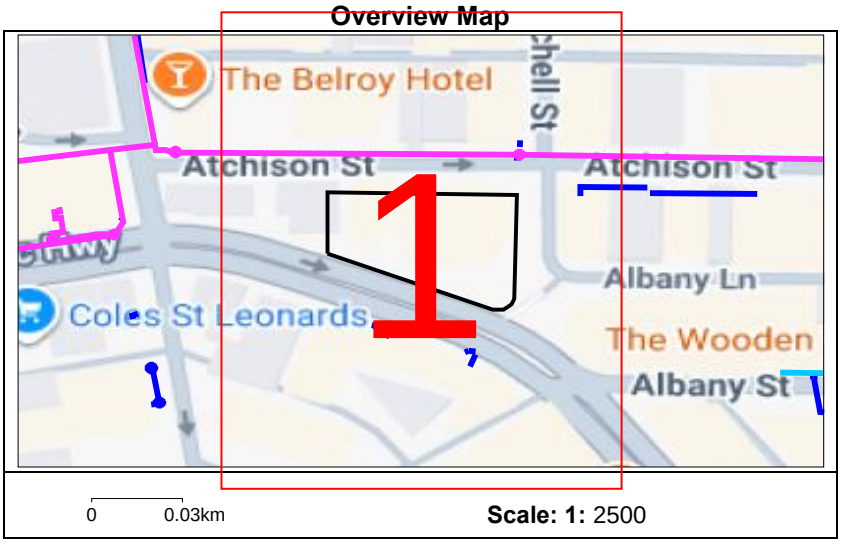
- Reinstate exposed Pipe Networks network infrastructure back to original state.

PRIVACY & CONFIDENTIALITY

- Privacy Notice – Your information has been provided to us by Before You Dig Australia to respond to your Before You Dig Australia enquiry. We will keep your personal information in accordance with Pipe Networks's privacy policy.

- Confidentiality – The information we have provided to you is confidential and is to be used only for planning and designing purposes in connection with your Before You Dig Australia enquiry. Please dispose of the information by shredding or other secure disposal method after use. We retain all intellectual property rights (including copyrights) in all our documents and plans.

Overview Map



Pipe Networks Pty Limited



Enquiry Number: 269943784

Map Sheet: 1

Scale: 1: 750

0 0.008km

N

LEGEND

BYDA Work Area	
AAPT/PowerTel Pit	TransACT Pit
AAPT/PowerTel Duct	TransACT Duct
DDA Pit	SOUL Pattinson Telecoms Pit
DDA Duct	SOUL Pattinson Telecoms Duct
Agile/Adam Pit	PIPE Networks Pit
Agile/Adam Duct	PIPE Networks Duct

DISCLAIMER: *No responsibility/liability is taken by Pipe Networks Pty Limited for any inaccuracy, error, omission or action based on the information supplied in this correspondence. © 2026 Pipe Networks Pty Limited.*

Transport for NSW

Referral
269943778

Member Phone
(02) 9983 3030

Responses from this member

Response received Wed 18 Mar 2026 2.08pm

File name	Page
Response Body	181
Survey Marks Information Sheet 269943778.pdf	183
VV0768_12B_INS.pdf	185
VV0769_14A_INS.pdf	186

BEFORE YOU DIG

1100.com.au

response from

Transport for NSW

Attached are Transport for NSW drawings that are available for this Before You Dig request.

Underground location plans provide information about network presence only, they do not pinpoint the exact location. Also, subsequent works and changes made during construction might not be shown on the traffic signal drawings. Remote sensing and non-destructive water jet digging should be used to verify that excavation sites are free of cables before excavation commences.

If you are working on a Motorway, Bus Transitway, near a Variable Message Sign or a Closed Circuit Television Camera, there might be other types of Transport for NSW underground facilities of which you need to be aware. Please **forward** this email to PlanManagementCentre@transport.nsw.gov.au and ask for more information.

If you damage a cable you must notify Transport for NSW immediately by phoning 131 700.

Location Details	
Address	601 Pacific Hwy
Suburb	St Leonards
State	NSW
Postcode	2065
Activity description	Planning & Design
Location in road	Road, Nature Strip, Footpath
Message	
Caller Details	
Customer id	3831362
Contact name	Marko Djukanovic
Company	Stockland
Address	Level 25 133-145 Castlereagh Street
Suburb	Sydney
State	NSW
Postcode	2000
Telephone	0475 520 426
Mobile	
Fax	
Email	marko.djukanovic@stockland.com.au
Referral Details	
Sequence no	269943778
Job number	52659214
Utility id	30203
Utility company	Transport for NSW

Enquiry time	18 March 2026
Commencement date	24 March 2026
Completion date	1 June 2032
User ref	601 Pacific Hwy
Working for authority	Private
Authority name	Private

Regards,

Plan Management Centre
Digital Engineering Enablement
Infrastructure Projects & Engineering
E PlanManagementCentre@transport.nsw.gov.au
https://www.transport.nsw.gov.au

NSW GOVERNMENT
Transport for NSW



I acknowledge the Aboriginal people of the country on which I work, their traditions, culture and a shared history and identity. I also pay my respects to Elders past and present and recognise the continued connection to country.

Please consider the environment before printing this email.

Protecting survey marks

Information Sheet June 2024

What are survey marks?

Survey marks support billions of dollars of investment, property rights and infrastructure. There are many types of survey marks used for various proposes.

Survey marks – what to look for





Paint

Yellow or white paint on the mark, or surrounding features.



Identification plates

Identification plates in rural areas help to locate permanent survey marks.



Star picket

Painted star pickets in rural areas may indicate a survey mark in the vicinity.



Reference Tree

A blazed tree may indicate a permanent mark or a cadastral boundary corner is located near by. It is most common in rural areas.



Alignment marks

Alignment stones, posts, pins and old stone kerbs are important cadastral marks.

Types of survey marks

Permanent survey marks

Permanent survey marks are fundamental marks that define location for surveying, mapping and engineering projects. Uses include housing developments, new road and bridge construction, improving railways and environmental mapping.



Trig Station



Permanent Mark



State Survey Mark

Cadastral (Boundary) Marks

Cadastral marks are used to mark property corners. Cadastral Reference marks also define property boundaries and are buried approx 100-200mm deep, or placed in the footpath, kerb or gutter.



Concrete Block references boundary corner (peg)



Galvanised Iron Pipe references boundary corner



Drill Hole & Wing in Kerb references adjacent boundary corner



Alignment Pin references road alignment

Why protect survey marks?

Survey marks provide a wealth of important information to a wide range of people in the community. They are used to support the surveying of property boundaries, but are also important to engineering, road building, mapping and other land surveys. The loss of survey marks can significantly degrade the integrity of the legal property boundaries and impact on the costs of development projects that depend on position and height.

How survey marks are lost?

Over the last decade in excess of $1 million worth of permanent survey marks have been destroyed in NSW per year*. This does not include the loss in value of destroyed cadastral marks or the lost value to the community and industry that survey marks provide. Survey marks are usually destroyed by development activity, particularly:

- road works and footpath construction
- roadside slashing
- shopping mall developments
- street beautification projects
- underground utility upgrade or replacement
  - gas
  - water
  - electricity
  - telecommunication cable installation.

* Based upon cost of mark placement and survey

Survey marks may need to be removed

As a result of construction or development works it may be necessary to remove some survey marks.

There are procedures in place for times when a survey mark has to be removed or replaced. The Surveyor-General has guidelines for the replacement of survey marks. See Surveyor General's Directions No. 11 Preservation of Survey Infrastructure on the Spatial Services website.



How to protect survey marks?

1. Before Works Commence

Find out if there are survey marks located in the area of interest by:

1.1. Viewing the Permanent Survey Mark layer on SIX Maps - maps.six.nsw.gov.au and print the map showing location of survey marks.

1.2. Downloading the Permanent Survey Mark Locality Sketches.

1.3. Conducting a thorough search of plans on public record (e.g. Deposited Plans) to determine the location of cadastral reference marks. It is recommended a Registered Land Surveyor or a person under their supervision to undertake this task. A registered surveyor should be consulted as early as possible (at the planning stage).

1.4. Inspect the site paying particular attention to survey marks located in the footpath, kerb or gutter.

1.5. If no survey marks are affected by the proposed works then commence works.

2. If any survey marks could be affected by the works, e.g. disturbed or removed

2.1. Submit an Application for Surveyor General Approval - Survey Mark(s) Removal.

2.2 If only Permanent Survey Marks are affected, a declaration made by a Registered Land Surveyor stating that no Reference Marks are affected needs to be submitted with the application.

2.3. Allow 10 working days for a formal response.

2.4. Where required contact a registered surveyor to assist with the conditions of approval.

3. Protect survey marks

3.1. Comply with the conditions of the approval, place new marks and arrange a survey where required.

3.2. Protect adjacent marks from disturbance for the duration of the works. Note that up to 3 weeks may be needed to complete the survey (dependent on the complexity).

Penalties for disturbing survey marks

The unauthorised removal, disturbance or destruction of survey marks is costly to the community. Section 24(1) of the Surveying and Spatial Information Act 2002 states a person must not remove, damage, destroy, displace, obliterate or deface any survey mark unless authorised to do so by the Surveyor-General. In addition to a maximum penalty of 25 penalty units (currently $110 per penalty unit) a person found guilty by a court may be ordered to pay compensation up to $10,000 towards the cost of reinstatement and up to $10,000 towards loss or damage suffered.

For more information, please visit the Preservation of Survey Infrastructure webpage.

For any enquiries contact DCS Spatial Services.

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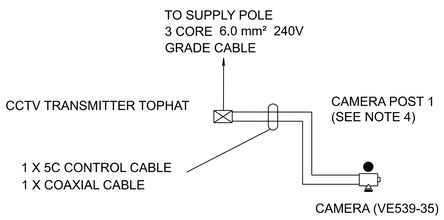
Author: DCS NSW Spatial Services

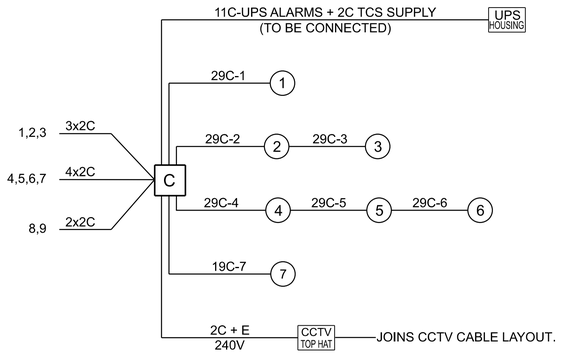
TCS 0768

DRAWN BY CADD
DO NOT AMEND MANUALLY

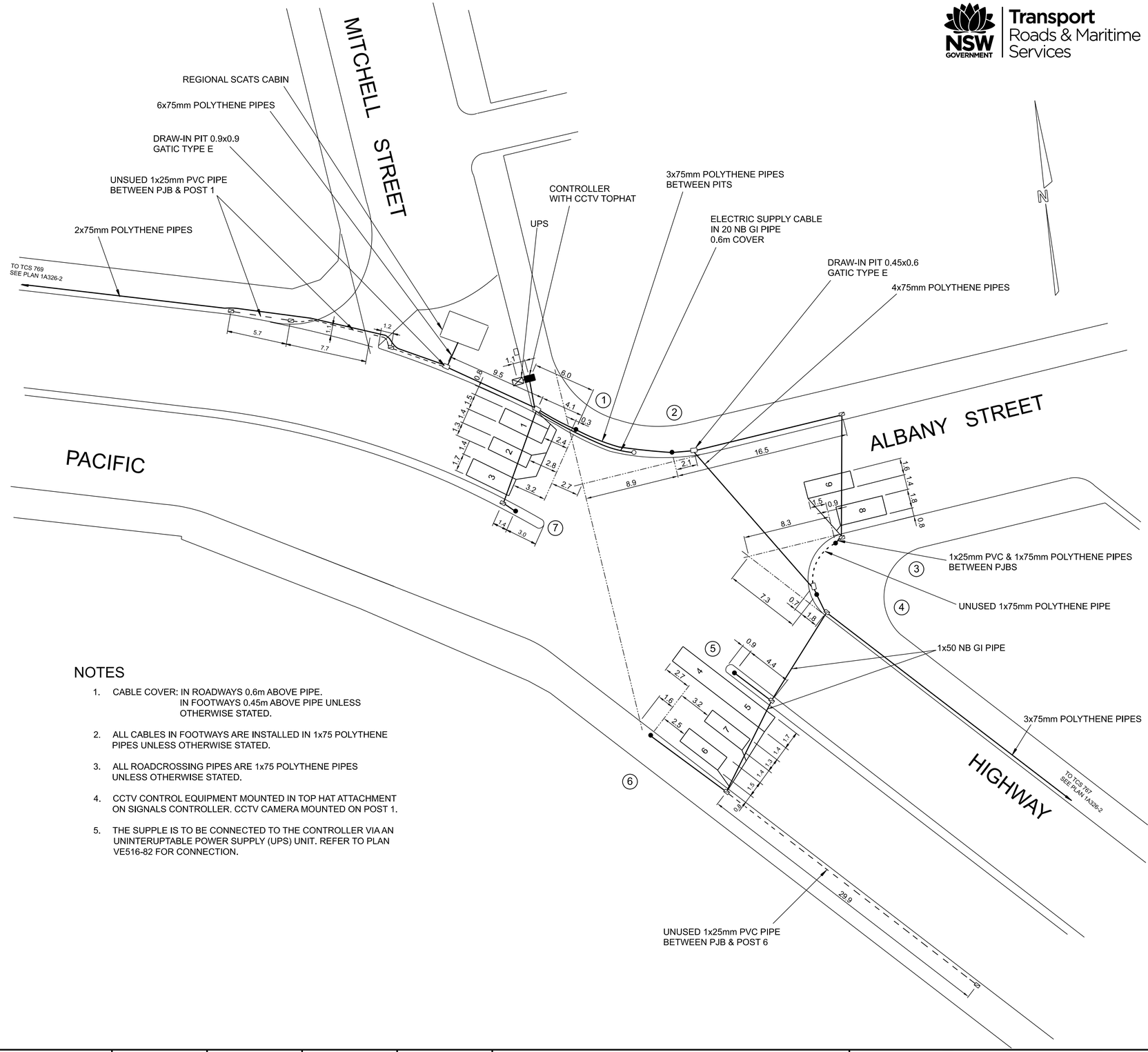
NSW GOVERNMENT | Transport Roads & Maritime Services



CCTV CABLE LAYOUT



CABLE LAYOUT



NOTES

1. CABLE COVER: IN ROADWAYS 0.6m ABOVE PIPE.
   IN FOOTWAYS 0.45m ABOVE PIPE UNLESS OTHERWISE STATED.
2. ALL CABLES IN FOOTWAYS ARE INSTALLED IN 1x75 POLYTHENE PIPES UNLESS OTHERWISE STATED.
3. ALL ROADCROSSING PIPES ARE 1x75 POLYTHENE PIPES UNLESS OTHERWISE STATED.
4. CCTV CONTROL EQUIPMENT MOUNTED IN TOP HAT ATTACHMENT ON SIGNALS CONTROLLER. CCTV CAMERA MOUNTED ON POST 1.
5. THE SUPPLE IS TO BE CONNECTED TO THE CONTROLLER VIA AN UNINTERUPTABLE POWER SUPPLY (UPS) UNIT. REFER TO PLAN VE516-82 FOR CONNECTION.

A ORIGINAL ISSUE

B ISSUE: WAE AFTER DETECTOR UPGRADE TO HOUSING. 09/04/2020
CCTV ADDED
LT/V
ZH 30/06/2020 AL

PUBLIC UTILITY LEGEND	
HYDRANT	□
STOP VALVE	▲
GAS VALVE	#
SEWER MANHOLE	⊗
TELECOM PIT	◪
ELECT LIGHT POLE	☾
POWER POLE	○
STAY POLE	⊘
TELEPHONE BOX	T
TELECOM PILLAR	◕

REFERENCE PLANS	
SYMBOLS/ABBS.	VD003-6
STD POSIT	VD001-5
DET SCHED EXP	VD018-10
PRES. DETECT	VC005-17
MAX CABLE CAP	VR007-6
DESIGN LAYOUT	VV0768-5
CABLE CHART	VV0768-13
SURVEYOR :	
DATE :	

U.B.D. Ref.
I.S.G. CO-ORDS E: N:

DESIGNED: LAWSON/MEYER

CHECKED: C.AYO

SITE CHECKED

RECOMMENDED

APPROVED

R.C. BIRD
ELECTRICAL DESIGN MANAGER

08.04.96
DATE

ROADS AND MARITIME SERVICES

NORTH SYDNEY COUNCIL AREA
TRAFFIC SIGNALS AT
PACIFIC HIGHWAY AND
ALBANY STREET
ST. LEONARDS

CABLE INSTALLATION

EXISTING ☒ PROPOSED ☐

CADD FILE: VV0768_12B_INS.dgn

SCALE 5 0 (1:200) 5 10

ISSUE B

FILE SF2014/009823

SUPERSEDES SHEET/ISSUE 2B

REG No. DS2014/001160

TCS No. 0768

SHEET 12

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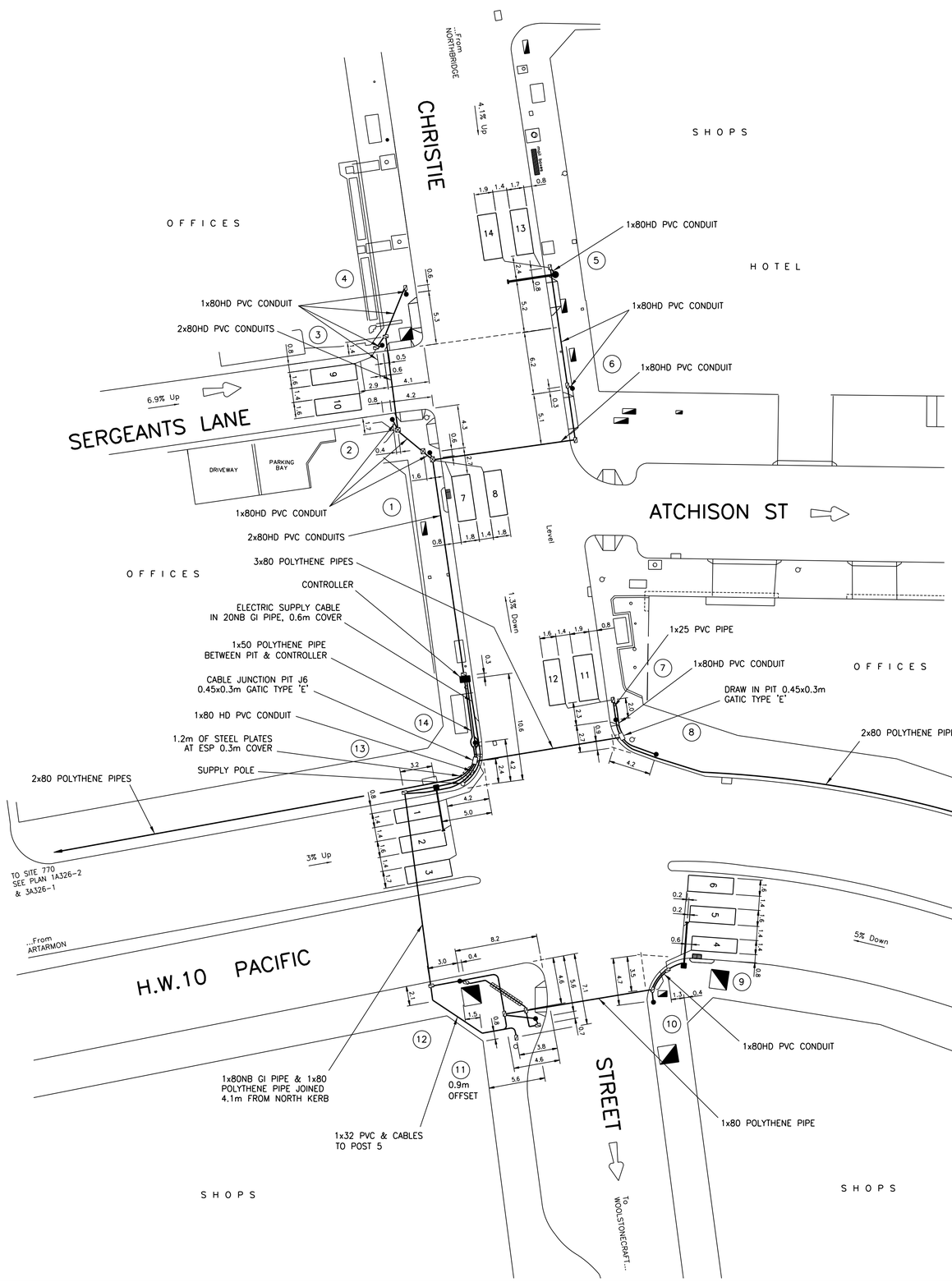
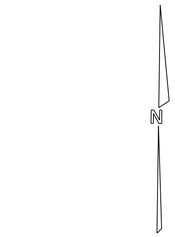
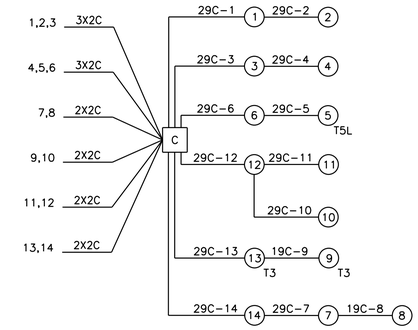
TCS 0769

Transport Roads & Maritime Services
NSW GOVERNMENT







CABLE LAYOUT

NOTES

1. CABLE COVER: IN ROADWAYS 0.6m ABOVE PIPE. IN FOOTWAYS 0.45m ABOVE PIPE OR APPROVED PROTECTIVE MATERIAL UNLESS OTHERWISE STATED.
2. SIGNAL CABLES 7, 8, 9, 12, 13 & 14 IN FOOTWAY ARE DIRECT BURIED.
3. ALL ROADWAY PIPES ARE AS INDICATED.
4. SIGNAL POSTS 2, 3, 7, 8, 9, 10, 12, 13 & 14 ARE OFFSET 0.6m FROM KERB.

A ORIGINAL ISSUE

A ISSUE: SIGNALS IN INTERSECTION ADDED

PUBLIC UTILITY LEGEND		REFERENCE PLANS	
HYDRANT	□	SYMBOLS/ABBS.	VD003-6
STOP VALVE	▲	STD POSIT	VD001-5
GAS VALVE	⌗	DET SCHED EXP	VD018-10
SEWER MANHOLE	⊗	PRES. DETECT	VC005-17
TELECOM PIT	◪	SSG DIS. SEQ.	VD018-8
ELECT LIGHT POLE	○	DESIGN PLAN	SHEET 13
POWER POLE	○	CABLE CHART	SHEET 15
STAY POLE	⊘		
TELEPHONE BOX	⚿	SURVEYOR : North Sydney CCL	
TELECOM PILLAR	◍	DATE : 2009	

U.B.D. Ref. Map 21 - N10
I.S.G. CO-ORDS E: 309 290 N: 1 250 000
DESIGNED: CORRIGAN
CHECKED:
LTJV
SITE CHECKED
A. LIYANAGE
RECOMMENDED

APPROVED
Michael Mahinthan
Digitally signed by Michael Mahinthan Date: 2020.08.13 10:49:05 +10'00'
ELECTRICAL DESIGN MANAGER
DATE: 13/08/2020

RMS ACCEPTANCE
RECOMMENDED
POSITION
DATE
ACCEPTED
POSITION
DATE

ROADS AND MARITIME SERVICES

NORTH SYDNEY COUNCIL AREA
H.W.10 PACIFIC HIGHWAY, CHRISTIE ST AND SERGEANTS LANE
ST LEONARDS

CABLE INSTALLATION

EXISTING ☒ PROPOSED ☐
CADD FILE: VV0769_14A_INS.dgn
SCALE 5 0 (1:200) 5 10
ISSUE: A
FILE SF2014/009827
SUPERSEDES SHEET/ISSUE 11/D
REGN. DS2014/001161
TCS No. 0769
SHEET 14

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Verizon Business (Nsw)

Referral
269943776

Member Phone
(02) 8210 3243

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

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Response Body	188
DBYD Response 2021 269943776.pdf	189
SOUTHERN CROSS NORTH (11-23).pdf	190
SOUTHERN CROSS NORTH (13-23).pdf	191

Attention: **Marko Djukanovic**

Thank you for your Before You Dig (BYDA) enquiry.

Job Number: **52659214**

Sequence Number: **269943776**

Dig Site Location: **601 Pacific Hwy St Leonards NSW 2065**

According to our records, your enquiry with the following details **impacts our infrastructure**. Please ensure that you read the attached documents, it contains important information including essential steps that must be undertaken prior to commencing construction activities.

This enquiry is valid for 30 days from the enquiry date.

If you require further information or assistance with interpretation of plans, please contact Verizon BYDA Team on +61 2 8210 3400 or DBYD.AUS@verizon.com.

This enquiry response, including any associated documentation, has been assessed and compiled from the information detailed within the BYDA enquiry outlined above. Please ensure that the BYDA enquiry details and this response accurately reflect your proposed works.

Verizon DBYD Response

The following drawing(s) is/are provided from Verizon records (formerly known as Worldcom) in response to your DBYD request to show the approximate location of our infrastructure within the vicinity requested.

This reply relates only to the location requested and is valid for *30 days* from the date of this reply. Where additional works are planned that have not been specified within this request, Verizon require that an additional location request be submitted.

All Verizon/Worldcom pits are secured, for access please contact the Verizon DBYD team.

Do not access Verizon pits without prior consent by Verizon DBYD team.

GPS Coordinates for the pit can be provided upon request.

Please contact the Verizon DBYD team to arrange a survey time.

Non-destructive digging within 1 meter of Verizon assets.

Contacts:

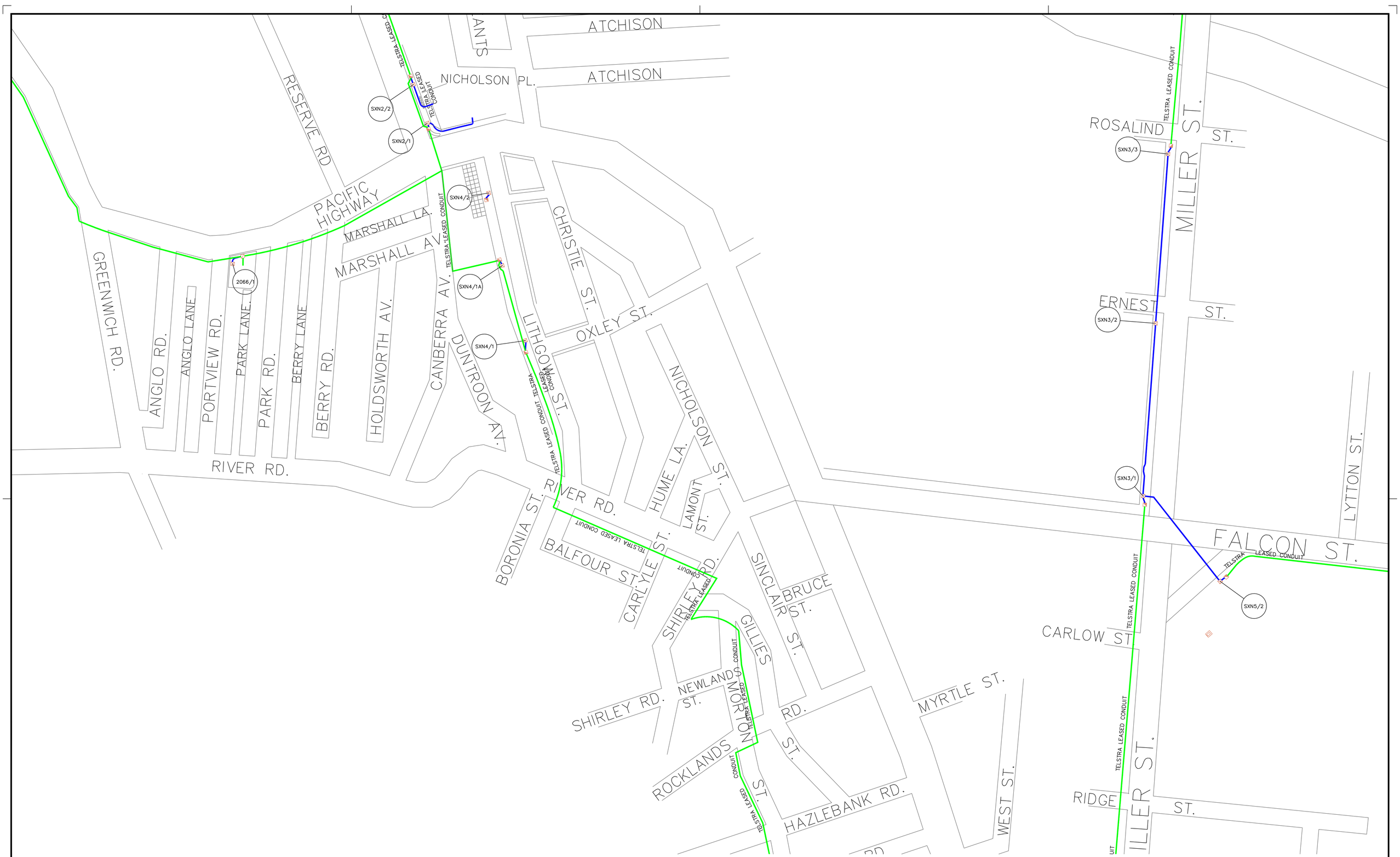
Verizon DBYD Team

+61 2 8210 3400 (24x7)

DBYD.AUS@verizon.com

Disclaimer:

Documents have been prepared for Verizon's own use and indicate the position of underground optical fibre networks and installations relative to property lines, kerb lines etc. as at the time the infrastructure were installed. Verizon will accept no liability for inaccuracies in the information or lack of information on such drawings for any cause whatsoever arising. Persons excavating or carrying out other earthworks will be held responsible for any damage caused to Verizon's Infrastructure. Verizon also reserves the right to recover compensation for any damages and loss of services.



LEGEND

- VERIZON DUCT
- VERIZON DUCT
- TELSTRA DUCT
- VERIZON PIT
- TELSTRA PIT

REV	DATE(D/M/Y)	DESCRIPTION	DRAWN	CHECKED	APPROVED
C1	20/5/13				

Do not scale this drawing. Information on this document is proprietary & shall not be used, copied, reproduced or disclosed in whole or in part without written consent of Verizon.

PROJECT
Verizon
SOUTHERN CROSS NORTH

DRAWING TITLE
SOUTHERN CROSS NORTH
SHEET 11 OF 23

REVISION
C1

DRAWING NUMBER
VZ

SCALE
N.T.S.

SIZE
A1


M'WAY
RD.
PUNCH ST.
WALL
CLEG ST.
FREDERICK ST.
ELLA ST.
HERBERT ST.
RNS
HOSPITAL
EVANS
NORTHCOTE
CHRISTIE ST.
SERGEANT
HENRY
CHANDOS
ATCHISON
BARINGA RD.
STRATHALLEN RD.
BAROONA ROAD
CALBINA RD.
CLIFF AV.
STRATHALLEN AV.
CAMBRIDGE ST.
VALE
ABBOTT ST.
PALMER
AMHERST
PINE ST.
ST.
THE
SXN2/25
SXN2/26
SXN2/6
SXN2/5
SXN2/4
SXN2/3
TELSTRA LEASED CONDUIT
TELSTRA LEASED CONDUIT
TELSTRA LEASED CONDUIT

Vocus Communications 2

Referral
269943786

Member Phone
1800 262 663

Responses from this member

Response received Wed 18 Mar 2026 2.06pm

File name	Page
Response Body	193
269943786 - Vocus Group Response letter.pdf	194
269943786 - Vocus Response Plan.pdf	199

Dear Marko Djukanovic

Thank you for your request regarding the location of telecommunication services. You requested the information for the below area:

Before You Dig Australia Job No: 52659214
Sequence No: 269943786

Enquiry Date: 18/03/2026
Address: 601 Pacific Hwy
Suburb: St Leonards
State: NSW

Please find attached a copy of the services plan for the location of the works. Please note that these plans have a life of 30 days from the date you requested (above), as future works may affect your enquiry.

Kind regards,

Vocus Group BYDA Team
Level 12, 60 Miller Street
North Sydney NSW 2060
Australia

18/03/2026

Marko Djukanovic
Stockland
Level 25 133-145 Castlereagh Street
Sydney NSW 2000

Dear Marko Djukanovic

BEFORE YOU DIG AUSTRALIA - JOB: 52659214 SEQ: 269943786

Thank you for your enquiry regarding the below mentioned area.

Enquiry Date:	18/03/2026
Address:	601 Pacific Hwy
Suburb:	St Leonards
State:	NSW, 2065

Additional Information:

YES – We can confirm, the Vocus Group has Fibre Optic Services within the vicinity.

Please find attached a copy of the services plan for the location you have specified. These plans are valid for 30 days from the date requested.

IMPORTANT INFORMATION

Drawings and plans provided by the Vocus Group are reference diagrams which were correct at the time the asset was built. Exact ground cover and alignments cannot be provided with any certainty, as these may alter over time. Depth of the Telecommunications asset can vary considerably as can alignments. The plans provided are to be used as a guide only.

Identifying the Vocus Group asset visually is critical. Information on how this can be arranged is provided in this document.

Please email Damage.Relocations@vocus.com.au for general enquiries about the information provided within this response.

Yours sincerely,
Vocus Group

EMERGENCY CONTACT: 1800 262 663

Vocus Group
Level 12, 60 Miller Street
NORTH SYDNEY NSW 2060
T: 1300 88 99 88 **E**: info@vocus.com.au

The Vocus Group includes related bodies corporate of Vocus Communications Limited ACN 084 115 499.

DUTY OF CARE

The Constructor has a legal "Duty of Care" that must be observed when working in the vicinity of any Vocus Group asset.

It is the responsibility of the Constructor to design their works with no impact to the Vocus Group asset.
The Constructor must;

a. Obtain and review plans for a specified area through Before You Dig Australia within a reasonable timeframe before construction begins.
b. Visually locate the Vocus Group asset, using a Vocus Group Accredited Locator who will vacuum excavate (potholing) where construction activities may damage or interfere with the Vocus Group asset. Refer to ***"Clearances for Work in the Vicinity of the Vocus Group Asset"*** section below for more information.
c. Contact the Vocus Group if the Vocus Group asset is wholly or partly located near planned construction activities.

NOTE: Plans are provided free of charge from BYDA. Request for plans of a larger area may incur a cost.

DAMAGE

The Constructor will be held responsible for all asset damage when work commences prior to obtaining the Vocus Group plans, or failure to follow instructions.

ANY DAMAGE TO THE VOCUS GROUP ASSET
MUST BE REPORTED TO 1800 262 663 IMMEDIATELY

The Vocus Group reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

ASSET RELOCATIONS

The Constructor is not permitted to relocate or alter any Vocus Group asset or network under any circumstance.
For all enquiries relating to the relocation of a Vocus Group asset please email Damage.Relocations@vocus.com.au

RESOLUTION OF POINTS OF CONFLICT

Should asset location and potholing reveal points of conflict between the Constructors planned works and the existing Vocus Group asset, the Constructor should contact the Vocus Group for advice and to discuss possible solutions.

Please contact the Fibre Assurance Team
Phone: 1800 262 663
Email: Damage.Relocations@vocus.com.au

ASSESSMENT OF RISK AND PROTECTIVE ACTIONS

Where "Protective works" are required around existing the Vocus Group asset, a solution will be confirmed on a case by case basis. The cost of the Protective works are the responsibility of the Constructor and the works will be carried out by a Vocus Group Accredited Contractor.

Where "Relocation works" of the Vocus Group asset is part of an agreed solution, a Project Manager will be assigned to work with the Constructor. The cost of the Relocation works are the responsibility of the Constructor and the works will be carried out by a Vocus Group Accredited Contractor.

Region	Onsite Locations Contact	Phone	Mobile	Fax	After Hours
Sydney, NSW	QC Communications	(02) 9620 2407		(08) 9620 1701	
Alice Springs, NT	Chambers Engineering	(08) 8955 5022	0418 837 833 0427 971 931	(08) 8955 5322	
Darwin, NT	Anywair Electrics		0418 890 071		0418 890 071
Darwin, NT	Northern Comm.'s		0407 904 319		0407 904 319
Brisbane, QLD	Optilinx	(07) 3901 7353	A/Hours or Emergency 0404 010 658	(07) 3901 7352	
Adelaide, SA	TPC	(08) 8376 5911		(08) 8376 5944	
Melbourne, VIC	Linktech	(03) 8805 0300			
Perth, WA	Abaxa	1300 369 642	A/Hours or Emergency 0411 746 657	(08) 9256 2922	

If any of the above numbers are uncontactable and your call is urgent, please call the Vocus National Service Desk on 1800 262 663

The Vocus Group accepts no liability for the information provided to the Constructor by the Locators listed above.

Further to this, the Constructor acknowledges that the Locator is the agent of the Constructor and that the Vocus Group takes no responsibility for the Locators' acts or omissions.

- For all work within 2.5 metres of nominal location, the Constructor is required to prove the actual location of the asset by potholing and exposing before commencing work.
- Potholing to expose and locate the Vocus Group asset is required before work commences and every 3 metres where the Constructors works are parallel to the Vocus Group asset.
- The Constructor is responsible for all asset damages when works commence without the Vocus Group plans or by failure to follow advice and/or instructions from the Vocus Group.

NOTE: No machinery shall be used within 1 metre of the Vocus Group asset until the actual location has been determined by potholing using hand tools.

NOTE: No heavy earth working machinery shall be used within 5 metres of the Vocus Group asset until the actual location has been determined by potholing using hand tools.

CLEARANCES FOR WORK IN THE VICINITY OF THE VOCUS GROUP ASSET

These figures represent the minimum clearance cover to be maintained over the Vocus Group asset. Please note that the actual cover over existing asset may be greater or less than recommended figures. Exact alignment and depths cannot be given with certainty as such levels can change over time.

Footpath and Verge Areas	450mm
Roadways	600mm

These figures represent the minimum clearance between construction and actual location of the Vocus Group asset.

Jackhammers / Pneumatic Breakers	Not within 2.5 metres of actual location
Vibrating Plate or Wacker Packer Compactors	Not within 500mm of actual location
Heavy Vehicle Traffic	Not to be driven across the Vocus Group asset with less than 600mm cover. The Constructor is to check the depth by potholing using hand tools.
Mechanical Excavators	Not within 1 metre of actual location. The Constructor is to pothole and expose the asset using hand tools.
Boring Equipment (in-line, horizontal and vertical)	Not within 2.5 metres of actual location. The Constructor is to pothole and expose the asset.

Access to the Vocus Group pits must remain accessible and at ground level at all times.

Any information provided is valid for 30 days only from the date of issue of this document. If the works extend beyond this period, or if the designs are altered in any way, you are requested to re-submit your proposal for re-assessment by contacting Before You Dig Australia.

Phone 1100 or check the website for more details http://www.1100.com.au

Schedule The Criminal Code
Chapter 10 National infrastructure
Part 10.6 Telecommunications Services
Division 474 Telecommunications offences

474.6 Interference with facilities

(1) A person is guilty of an offence if the person tampers with, or interferes with, a facility owned or operated by:

(a) a carrier; or
(b) a carriage service provider; or
(c) a nominated carrier.

Penalty: Imprisonment for 1 year.

(2) For the purposes of an offence against subsection (1), absolute liability applies to the physical element of circumstance of the offence, that the facility is owned or operated by a carrier, a carriage service provider or a nominated carrier.

(3) A person is guilty of an offence if:

(a) the person tampers with, or interferes with, a facility owned or operated by:

(i) a carrier; or
(ii) a carriage service provider; or
(iii) a nominated carrier; and

(b) this conduct results in hindering the normal operation of a carriage service supplied by a carriage service provider.

Penalty: Imprisonment for 2 years.

(4) For the purposes of an offence against subsection (3), absolute liability applies to the following physical elements of circumstance of the offence:

(a) that the facility is owned or operated by a carrier, a carriage service provider or a nominated carrier;

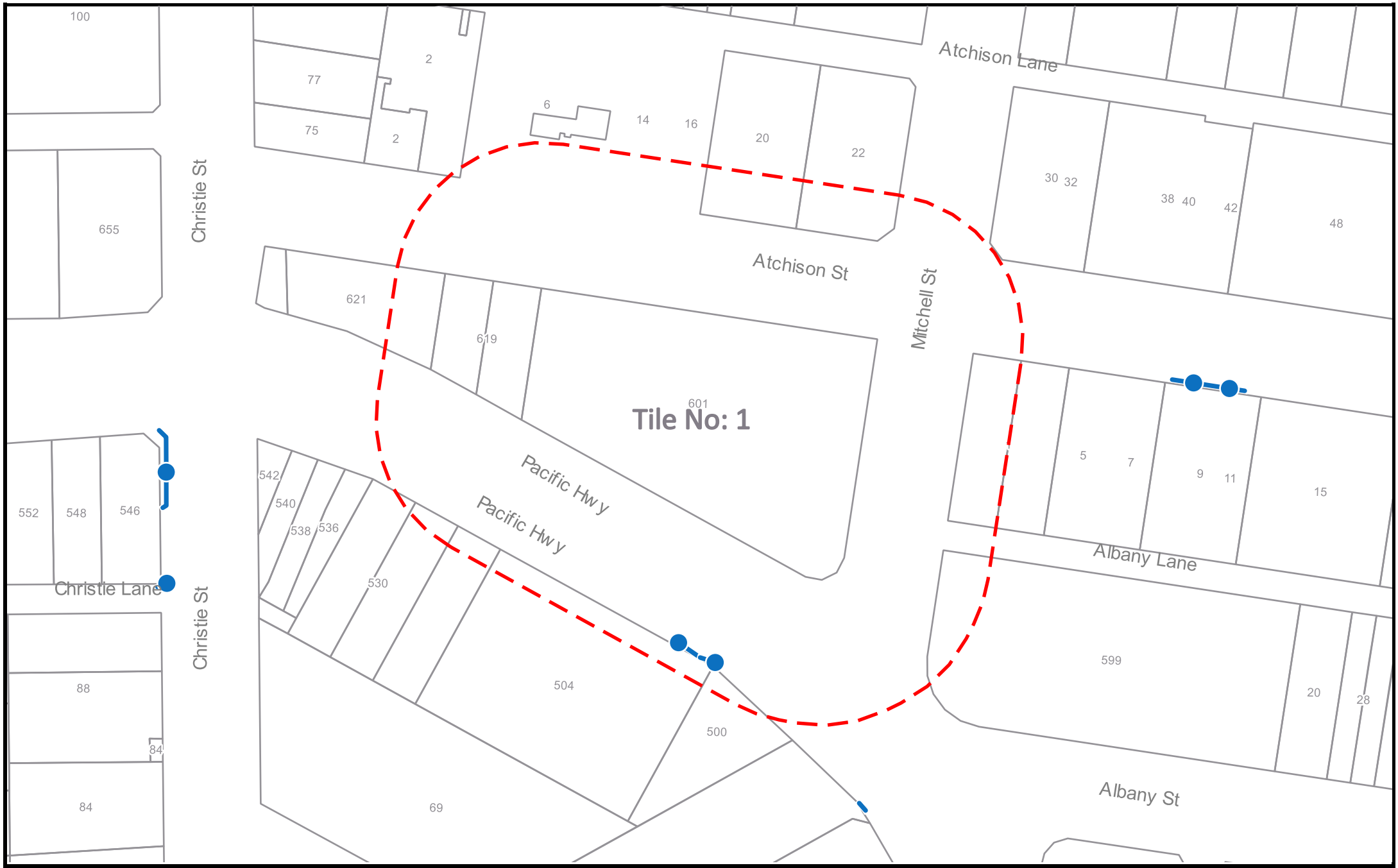
(b) that the carriage service is supplied by a carriage service provider.

(5) A person is guilty of an offence if:

(a) the person uses or operates any apparatus or device (whether or not it is comprised in, connected to or used in connection with a telecommunications network); and

(b) this conduct results in hindering the normal operation of a carriage service supplied by a carriage service provider.

Penalty: Imprisonment for 2 years.



VOCUS communications

N W E S

SEQUENCE NUMBER: 269943786
JOB NUMBER: 52659214
ADDRESS: 601 Pacific Hwy, St Leonards, NSW 2065

LEGEND
Vocus Group Pit
Vocus Group Conduit

SCALE: 1:1000

The Vocus Group includes related bodies corporate of Vocus Communications Limited ACN 084 115 499.

End of document

This document may exclude some files (eg. DWF or ZIP files)

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AUSTRALIAN STANDARD AS5488-2019 CLASSIFICATION OF SUBSURFACE UTILITY INFORMATION (SUI)

THIS STANDARD (AS5488-2019) PROVIDES A FRAMEWORK FOR THE CLASSIFICATION OF SUBSURFACE UTILITY LOCATION AND ATTRIBUTE INFORMATION IN TERMS OF SPECIFIED QUALITY LEVELS. THE OBJECTIVE OF THIS STANDARD IS TO PROVIDE UTILITY OWNERS, OPERATORS AND LOCATORS WITH A FRAMEWORK FOR THE CONSISTENT CLASSIFICATION OF INFORMATION CONCERNING SUBSURFACE UTILITIES. THIS AIMS TO ASSIST WITH THE MANAGEMENT OF PROJECT RISK RELATED TO UNDERGROUND UTILITIES.
A QUALITY LEVEL DESCRIBES THE ACCURACY OF INFORMATION THAT IS COLLECTED OR HELD ON A SUBSURFACE UTILITY. THERE ARE FOUR QUALITY LEVELS - A,B,C AND D. QUALITY LEVEL A IS CONSIDERED TO BE THE HIGHEST QUALITY LEVEL AND QUALITY LEVEL D TO BE THE LOWEST. THE HIGHER THE QUALITY LEVEL, THE MORE INFORMATION IS KNOWN ABOUT THE SUBSURFACE UTILITY. THE QUALITY LEVEL OF A SUBSURFACE UTILITY MAY VARY ALONG ITS LENGTH DEPENDING ON THE ASSOCIATED ATTRIBUTE INFORMATION AND METADATA AVAILABLE.

QUALITY LEVEL D (QL-D) IS THE LOWEST OF THE FOUR QUALITY LEVELS. THE ATTRIBUTE INFORMATION CAN BE COMPILED FROM ANY, OR A COMBINATION OF THE FOLLOWING:
(1) EXISTING RECORDS (DBYD PLANS)
(2) CURSORY SITE INSPECTION
(3) ANECDOTAL EVIDENCE

QUALITY LEVEL C (QL-C) IS DESCRIBED AS A SURFACE FEATURE CORRELATION OR AN INTERPRETATION OF THE APPROXIMATE LOCATION AND ATTRIBUTES OF A SUBSURFACE UTILITY ASSET USING A COMBINATION OF EXISTING RECORDS (AND/OR ANECDOTAL EVIDENCE) AND A SITE SURVEY OF VISIBLE EVIDENCE. THE MINIMUM REQUIREMENT FOR A QUALITY LEVEL C IS A RELATIVE HORIZONTAL SPATIAL POSITION WITH A MAXIMUM TOLERANCE OF +/- 300MM.

QUALITY LEVEL B (QL-B) DESCRIBES ASSETS LOCATED USING ELECTROMAGNETIC PIPE AND CABLE LOCATORS AND LOCATING TECHNIQUES. THE INFORMATION REQUIRED TO ATTAIN QL-B MAY BE SOURCED THROUGH THE FOLLOWING METHODS:
(1) SURVEY
(2) TRACE
THE MINIMUM REQUIREMENT FOR A QUALITY LEVEL B IS A RELATIVE HORIZONTAL SPATIAL POSITION WITH A MAXIMUM TOLERANCE OF +/- 300MM AND A MAXIMUM VERTICAL TOLERANCE OF +/- 500MM. IF QUALITY LEVEL B INFORMATION IS COMPILED USING ELECTRONIC DETECTION, IT IS ONLY AN INDICATION OF THE EXISTENCE OF SUBSURFACE UTILITIES AND DOES NOT VALIDATE THE UTILITY LOCATION OR ATTRIBUTES.

QUALITY LEVEL A (QL-A) IS THE HIGHEST QUALITY LEVEL AND CONSISTS OF THE PHYSICAL IDENTIFICATION OF THE ATTRIBUTE AND LOCATION OF A SUBSURFACE UTILITY AT A POINT TO AN ABSOLUTE SPATIAL POSITION IN THREE DIMENSIONS. THE MAXIMUM TOLERANCE FOR BOTH HORIZONTAL AND VERTICAL POSITION IS +/- 50MM. IT IS THE ONLY QUALITY LEVEL THAT DEFINES A SUBSURFACE UTILITY AS 'VALIDATED'. IF THE WHOLE LINE SEGMENT CANNOT BE VERIFIED BY LINE OF SIGHT, QUALITY LEVEL A SHALL NOT BE ATTRIBUTED TO THE LINE SEGMENT BETWEEN VALIDATED POINTS. THE VERTICAL INFORMATION FOR THIS LOCATING METHOD IS TO THE TOP OR SHALLOWEST PART OF THE LOCATED SERVICE. IN THE CASE OF SEWER AND STORMWATER ASSETS THE INFORMATION COLLECTED FOR THESE ASSETS IS RECORDED TO THE INVERT LEVEL, WHERE AVAILABLE, AT THE RESPECTIVE ACCESS POINTS.

IT REMAINS THE RESPONSIBILITY OF THE COMPANY AND INDIVIDUAL CONDUCTING PHYSICAL WORKS TO ENSURE UP TO DATE DIAL BEFORE YOU DIG (DBYD) PLANS ARE CONSULTED AND AVAILABLE ON HAND DURING ANY WORKS.

NULCA AUSTRALIA INC National Utility Locating Contractors Association

DIAL BEFORE YOU DIG® CERTIFIED LOCATOR

ACCREDITED PLANT LOCATOR

OPTUS

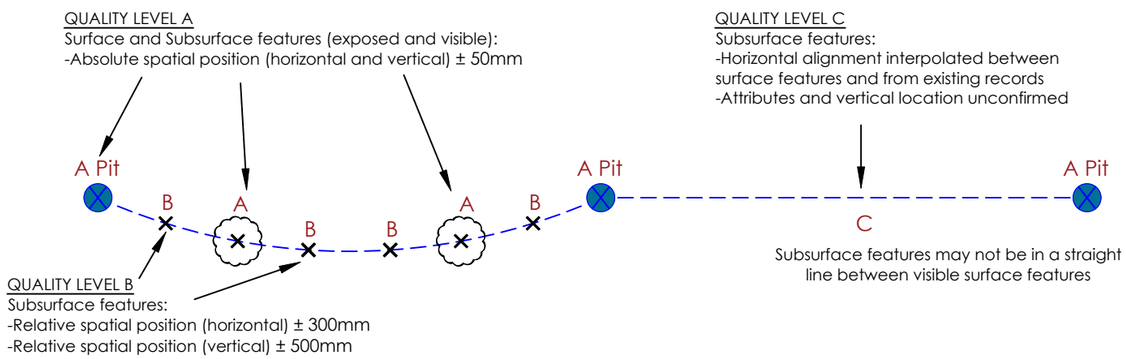
OHS Management System ISO 45001 Global-Mark.com.au®

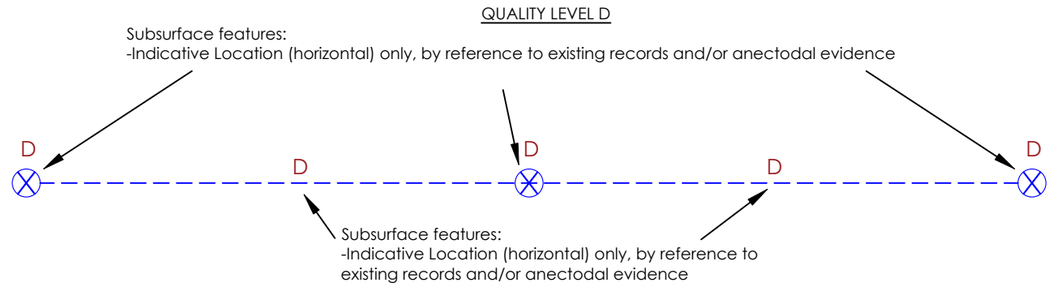
Environmental Management ISO14001 Global-Mark.com.au®

Quality Management ISO 9001 Global-Mark.com.au®

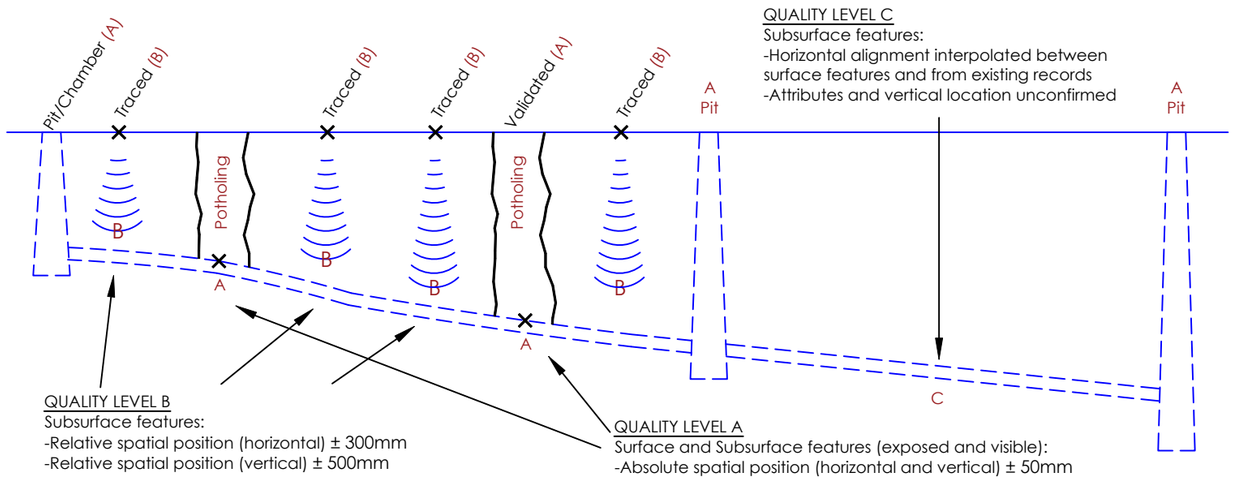
VARYING QUALITY LEVELS

(Taken from AS 5488-2019)





PLAN VIEW



LONGITUDINAL SECTION

VERIS LEGEND

WATER MAIN (WM)	W
WATER HOUSE CONNECTION (WY)	WH
WATER MAIN - DIGITISED (WZ)	WZ
UNIDENTIFIED PIPELINE (?P)	?P
GAS MAIN - JEMENA HIGH PRESSURE PIPELINE (HG)	HG
GAS MAIN - JEMENA LOW PRESSURE (LG)	LG
GAS HOUSE CONNECTION (DG)	GH
GAS MAIN - JEMENA DIGITISED (GZ)	GZ
ELECTRIC LINE - UNDERGROUND (EU)	EU
ELECTRIC HOUSE CONNECTION (EY)	EH
ELECTRIC LINE - DIGITISED (EZ)	EZ
SEWER MAIN (SM)	S
SEWER HOUSE CONNECTION (SY)	SH
SEWER MAIN - DIGITISED (SZ)	SZ
DRAINAGE PIPE - (Ø225)	Ø225
DRAINAGE PIPE - (Ø300)	Ø300
DRAINAGE PIPE - (Ø375)	Ø375
DRAINAGE PIPE - (Ø450)	Ø450
DRAINAGE PIPE - (Ø525)	Ø525
DRAINAGE PIPE - (Ø600)	Ø600
DRAINAGE PIPE - (Ø750)	Ø750
DRAINAGE PIPE - (Ø900)	Ø900
DRAINAGE PIPE - (Ø1200)	Ø1200
DRAINAGE PIPE - UNSPECIFIED DIAMETER (?)	?
DRAINAGE PIPE - DIGITISED (DZ)	DZ
TELEPHONE LINE (TC)	T
TELEPHONE HOUSE CONNECTION (TY)	TH
TELEPHONE LINE - DIGITISED (TZ)	TZ
OPTICAL FIBRE - UNDERGROUND (OU)	OU
OPTICAL FIBRE - DIGITISED (OZ)	OZ
WATER TAP (PTAP)	
WATER AIR VALVE (PWAV)	
WATER HYDRANT (PWHY)	WH
WATER STOP VALVE (PWSV)	
WATER FIRE HYDRANT (PWFB)	
WATER METER (PWMR)	
METER (PGMR)	
PIPELINE MARKER (PGPM)	GP
TELSTRA SINGLE CONC. PIT (PTSP)	
TELSTRA TWIN CONC. PIT (PTTP)	
TELSTRA DISTRIBUTION PILLAR	TDP
OPTICAL FIBRE PIT (POFP)	OFP
ELECTRIC CABLE MANHOLE (PEMH)	EMH
POLE - LIGHT (PLPL)	
POLE - POWER & LIGHT (PPLP)	
ELECTRIC CABLE JUNCTION BOX (PEJB)	EJB
TRAFFIC SIGNAL CONTROLLER (PSCL)	TSC
POWER SERVICE PILLAR - UNDERGROUND (PEUP)	
GULLY PIT POINT (PGUL)	
DRAINAGE JUNCTION MANHOLE (PDJM)	
SEWER MANHOLE COVER (PSMH)	
SEWER VENT PIPE (PSVP)	SVP
SEWER LAMPHOLE/INSPECTION POINT (PSLH)	SLH
POTHOLE INDICATOR	PHOLE
END OF TRACE	EOT
UNABLE TO LOCATE	UTL
UNABLE TO TRACE	UTT
UNABLE TO OPEN	UTO
INVERT LEVEL/OBVERT LEVEL	IL/OL
DENOTES INVESTIGATION AREA	

DEPTH — QUALITY LEVEL
E U 2.25 B

ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

DISCLAIMER:

SUBSURFACE FEATURES SHOWN IN THIS PLAN WERE LOCATED OR IDENTIFIED THROUGH A RANGE OF TECHNIQUES. AS SUCH THE ACCURACY AND ASSOCIATED INFORMATION IS LIMITED BY THE ASSOCIATED QUALITY LEVEL AS PER AS5488. VERIS CANNOT GUARANTEE THE PLAN IS WITHOUT FLAW AND EXPRESSLY DISCLAIMS ALL LIABILITY FOR ERRORS OR OMISSIONS OF ANY KIND WHATSOEVER OR FROM ANY LOSS, DAMAGE OR OTHER CONSEQUENCES WHICH MAY ARISE FROM ANY PERSON RELYING ON THIS PLAN. IN PARTICULAR, VERIS RECOMMENDS THAT USERS SATISFY THEMSELVES AS TO THE LOCATION OF SUBTERRANEAN FEATURES WHICH MAY OR MAY NOT BE SHOWN ON THE PLAN.

veris
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45 Jones Street
Ultimo NSW 2007
T: (02) 9052 4200
E: info.nsw@veris.com.au
W: www.veris.com.au
ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE: 601 PACIFIC HWY ST LEONARDS NSW 2065

DRAWING TITLE: SUB-SURFACE UTILITY PLAN

NORTH:

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

DIAL BEFORE YOU DIG www.1100.com.au
THIS PLAN DOES NOT REPLACE DBYD PLANS

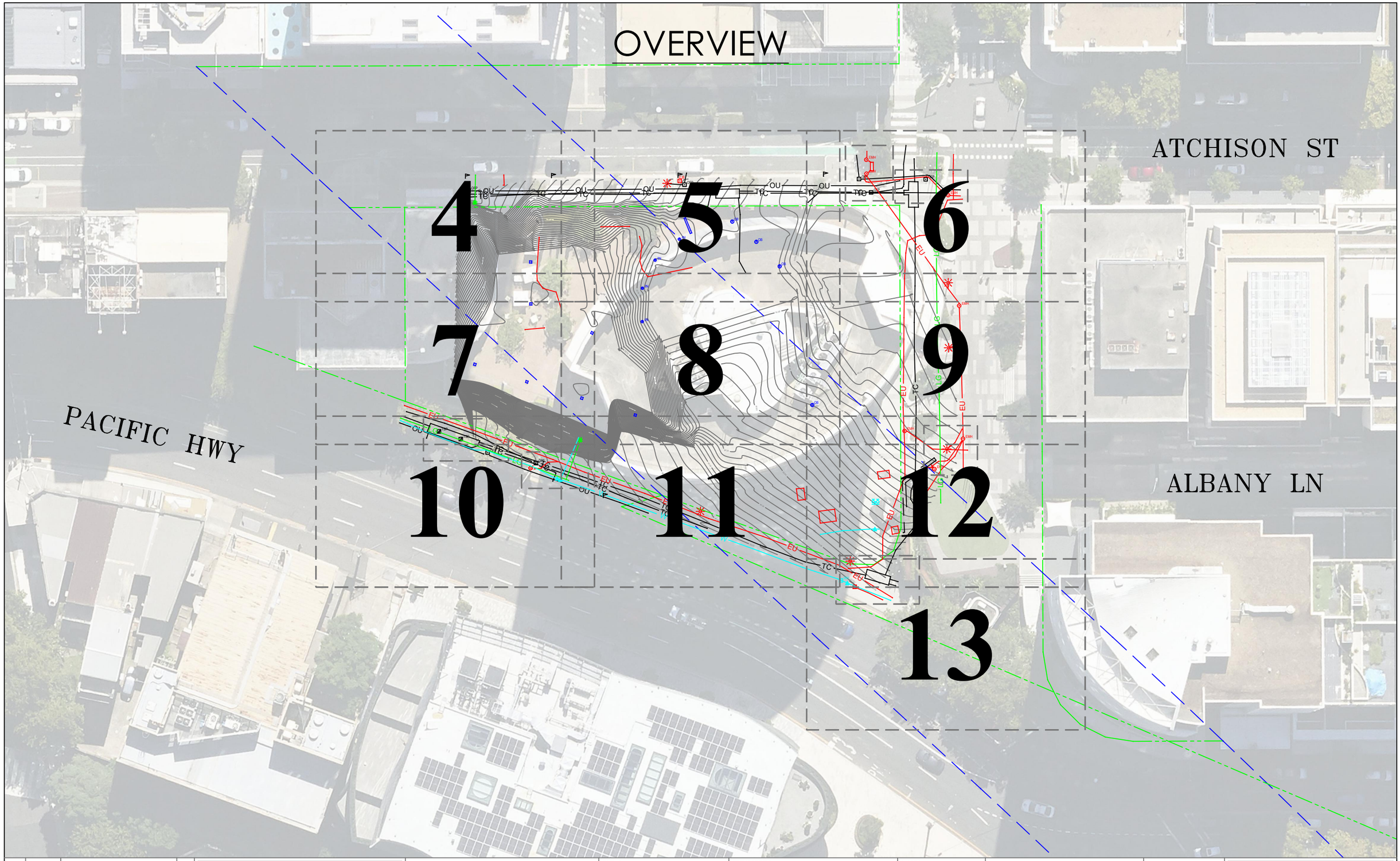
JOB NUMBER: 203610

THIS PLAN MUST BE READ IN CONJUNCTION WITH SHEET 1 FOR ADDITIONAL NOTES, WARNINGS & LEGEND

DATE OF SURVEY: 13/04/23	DATE OF PLAN: 03/05/23
HEIGHT DATUM: AHD71	COORD: MGA20 Z56
DBYD JOB#: N/A	DBYD DATE: N/A
ORIGINAL SIZE: A3	SHEET: 1 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

OVERVIEW



ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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veris

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E: info.nsw@veris.com.au
W: www.veris.com.au

ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE:
601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: MGA

0 5 10 15 20
SCALE IN METERS 1:500

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

DIAL BEFORE YOU DIG www.1100.com.au

THIS PLAN DOES NOT REPLACE DBYD PLANS

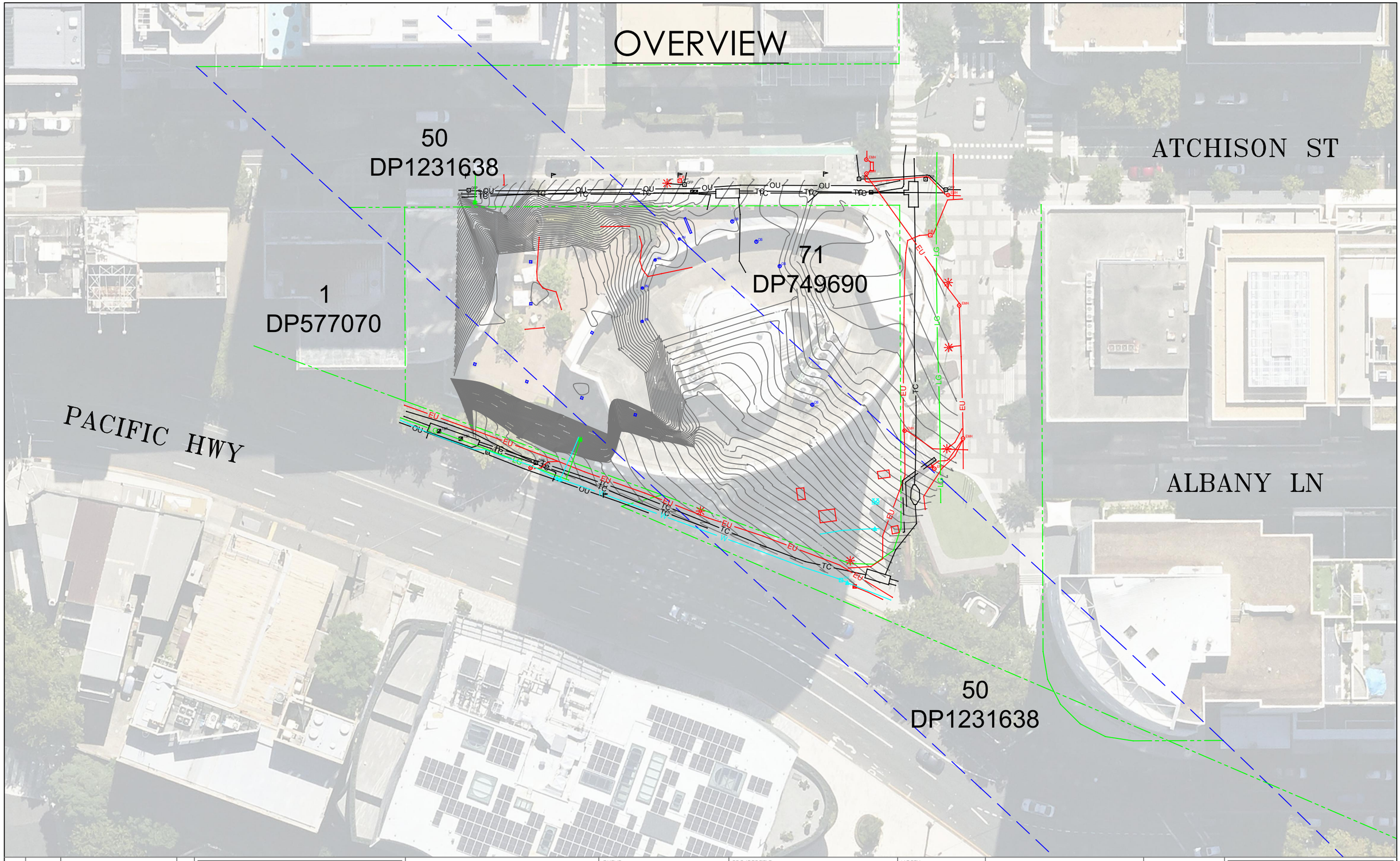
JOB NUMBER: 203610

THIS PLAN MUST BE READ IN CONJUNCTION WITH SHEET 1 FOR ADDITIONAL NOTES, WARNINGS & LEGEND

DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET: 2 OF	14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

OVERVIEW



ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

DISCLAIMER:

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T: (02) 9052 4200
E: info.nsw@veris.com.au
W: www.veris.com.au

ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE:
601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: M.G.A

0 5 10 15 20
SCALE IN METERS 1:500

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

DIAL BEFORE YOU DIG www.1100.com.au
THIS PLAN DOES NOT REPLACE DBYD PLANS

JOB NUMBER: 203610

THIS PLAN MUST BE READ IN CONJUNCTION WITH SHEET 1 FOR ADDITIONAL NOTES, WARNINGS & LEGEND

DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET: 3 OF 14	

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ATCHISON ST

132°37'00"
9.170

EXTENT OF METRO TUNNEL

132°37'00"
29.575

179°46'30"
27.580

132°37'00"
39.835

89°46'00"
41.970

JEMENA PE
0.10 D OL
RL 89.22

COUNCIL
SIGN
RL 89.21

0.45 B OL
RL 88.81

OPTUS Ø 100 PVC
OPTIC FIBRE
0.45 B OL
RL 88.70

0.40 B OL
RL 88.81

0.50 B OL
RL 88.73

OFP

COUNCIL
PARKING
METER
ASSET 1124
RL 89.71

OTHER PVC
0.10 D OL
RL 89.55

OTHER PVC
0.10 D OL
RL 89.60

OPTUS Ø 100 PVC OPTIC FIBRE
TELSTRA 1 X P100 PVC
TELSTRA 8 X P100 PVC

0.50 B OL
RL 89.45

0.50 B OL
RL 89.48

JEMENA PE
0.10 D OL
RL 89.34

JEMENA
RL 89.44

OPTUS
CONC. PIT
RL 89.29

0.40 B OL
RL 88.93

0.40 B OL
RL 89.58

0.60 B OL
RL 89.69

COUNCIL
SIGN
RL 90.16

OPTUS Ø 100 PVC OPTIC FIBRE
TELSTRA
1 X P100 PVC
TELSTRA
8 X P100 PVC

0.50 B OL
RL 89.82

0.40 B OL
RL 90.11

0.30 B OL
RL 92.98

OTHER PVC

PRIVATE
320 X 320
METAL PIT
RL 93.07
UTT

0.30 B OL
RL 92.79

0.30 B OL
RL 92.78

0.30 B OL
RL 92.80

OTHER PVC

0.10 B OL
RL 93.04

ADJOINS SHEET 7

ADJOINS SHEET 5

IMPORTANT NOTES:

1. INFORMATION SHOWN ON THIS PLAN WAS COLLATED FROM ON SITE FEATURES, DIAL BEFORE YOU DIG PLANS & AS-BUILTS PLANS (WHERE APPLICABLE).

2. THIS PLAN IS NOT COMPLETE OF ALL SERVICES. IT IS THE RESPONSIBILITY OF INDIVIDUALS TO SATISFY THEMSELVES AS TO THE WHEREABOUTS OF ANY EXISTING UTILITIES. THIS PLAN DOES NOT REPLACE DBYD PLANS

3. STORMWATER HAS ONLY BEEN INVESTIGATED AT PITS WHERE ACCESSIBLE. TO VERIFY DRAINAGE NETWORK CCTV INVESTIGATION MAY BE REQUIRED TO CONFIRM ALIGNMENTS AND CONNECTIVITY.

4. TO CONFIRM DEPTH & POSITION OF ALL LOCATED UTILITIES, POTHOLING IS HIGHLY RECOMMENDED.

5. THIS PLAN HAS BEEN GENERATED FOR DESIGN PURPOSES ONLY. IT NEEDS TO BE PRINTED IN COLOR AND AT THE SPECIFIC PAGE SIZE . FAILURE TO DO THIS WILL VOID ALL INFORMATION INDICATED

ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

DISCLAIMER:

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W: www.veris.com.au
ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE:
601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: M.G.A

SCALE IN METERS 1:100

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

DIAL BEFORE YOU DIG www.1100.com.au

THIS PLAN DOES NOT REPLACE DBYD PLANS

JOB NUMBER: 203610

THIS PLAN MUST BE READ IN CONJUNCTION WITH SHEET 1 FOR ADDITIONAL NOTES, WARNINGS & LEGEND

DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	4 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ATCHISON ST

132°37'00"
29.575

EXTENT OF METRO TUNNEL

COUNCIL SIGN
RL 91.16

OTHER
RL 91.19
UTO

OTHER EMPTY PVC
0.50 B OL
RL 90.69

0.37 B OL
RL 90.84

EJB

OTHER
METAL LIGHT POLE
RL 91.10

OFP

0.50 B OL
RL 90.72

0.60 B OL
RL 90.69

0.45 B OL
RL 90.91

0.50 B OL
RL 90.94

TELSTRA EMPTY
Ø 100 PVC
0.60 B OL
RL 90.84

OPTUS Ø 100 PVC
OPTIC FIBRE

0.40 B OL
RL 91.15

0.77 B OL
RL 90.77

0.66 B OL
RL 90.91

COUNCIL
SIGN
RL 91.99

0.60 B OL
RL 91.41

OPTUS
Ø 50 PVC
OPTIC FIBRE

0.60 B OL
RL 91.36
EOT (BLOCKED)

OPTUS Ø 100 PVC OPTIC FIBRE
TELSTRA
1 X P100 PVC
TELSTRA
8 X P100 PVC

0.40 B OL
RL 90.42

0.50 B OL
RL 90.32

0.40 B OL
RL 90.11

0.50 B OL
RL 90.39

TELSTRA
1 X P100 PVC
TELSTRA
8 X P100 PVC

TELSTRA 8 X P100 PVC
TELSTRA 4 X P100 PVC

0.60 B OL
RL 90.48

0.70 B OL
RL 90.56

0.53 B OL
RL 90.84

TELSTRA
Ø 100 PVC

0.90 B OL
RL 90.55

89°46'00"
36.255

OTHER
EMPTY PVC
0.50 B OL
RL 90.60

OTHER
CONC. PIT
RL 91.23

TELSTRA
CONC. PIT
RL 91.32

0.50 B OL
RL 90.98
EOT

0.44 B OL
RL 91.14

TELSTRA
METAL PIT
RL 91.58
PIT VOID

0.20 B OL
RL 91.41

0.40 B OL
RL 90.90

DISH DRAIN
RL 91.57

OB
Ø 100 STEEL
RL 91.56
UTO

0.60 B OL
RL 91.90

OTHER PVC
EU — EU

0.60 B OL
RL 91.81

132°37'00"
9.065

IN
PRIVATE Ø 200 PVC
0.10 A IL
RL 91.47
UTT

0.40 B OL
RL 91.86

0.40 B OL
RL 91.82

OTHER PVC

0.30 B OL
RL 91.98

IN
PRIVATE Ø 200 PVC
0.10 A IL
RL 91.48
UTT

0.30 B OL
RL 91.79

OTHER PVC
EU — EU

0.20 B OL
RL 91.46

0.30 B OL
RL 91.31

0.20 B OL
RL 91.43

IN
PRIVATE Ø 200 PVC
0.10 A IL
RL 91.48
UTT

TELSTRA 4 X P100 PVC

0.40 B OL
RL 91.26

0.30 B OL
RL 91.37

OB
Ø 100 STEEL
RL 91.59
UTO

Ø 100 STEEL
RL 91.62
UTO
OB

ADJOINS SHEET 4

ADJOINS SHEET 6

ADJOINS SHEET 8

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ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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CLIENT: Stockland

PROJECT TITLE: 601 PACIFIC HWY ST LEONARDS NSW 2065

DRAWING TITLE: SUB-SURFACE UTILITY PLAN

NORTH: MGA

SCALE IN METERS 1:100 (0 1 2 3 4)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

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HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	5 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ATCHISON ST

ADJOINS SHEET 5

ADJOINS SHEET 9

SEE DETAIL 1
SHEET 14

SEE DETAIL 2
SHEET 14

COUNCIL SIGN
RL 91.99

EMH

EMH

OFP

OFP

OFP

OFP

EMH

0.60 B OL
RL 91.41

OPTUS
Ø 50 PVC
OPTIC FIBRE

0.60 B OL
RL 91.36
EOT (BLOCKED)

0.70 B OL
RL 91.69

OPTUS Ø 50 PVC

0.70 B OL
RL 91.75

0.70 B OL
RL 91.77

TELSTRA
6XP100 PVC

0.80 C OL
RL 91.74

JEMENA
Ø 100 STEEL
32NY IN 4NB

1.00 B OL
RL 91.70

AUSGRID
4XP150 PVC

7XP32 PVC

1.22 B OL
RL 91.28

TELSTRA
CONC. PIT
RL 92.56

TELSTRA 6XA100 AC

0.70 B OL
RL 91.74

0.70 B OL
RL 91.72

EJB

AUSGRID
RL 92.43

0.90 B OL
RL 91.76

0.50 B OL
RL 91.87

0.60 B OL
RL 91.75

0.60 B OL
RL 91.78

0.80 B OL
RL 91.53

0.80 B OL
RL 91.55

AUSGRID DB

0.60 B OL
RL 91.75

TELSTRA
6XA100 AC

0.50 C OL
RL 92.00

JEMENA
Ø 100 STEEL
32NY IN 4NB

0.70 B OL
RL 91.85

RL 92.56

0.40 B OL
RL 92.16

0.40 B OL
RL 92.16

7XP32 PVC

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ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE:
601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: MGA

SCALE IN METERS 1:100 (0 1 2 3 4)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

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JOB NUMBER: 203610

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DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	6 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 4

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179°46'30"
27.580

132°37'00"
39.835

EXTENT OF METRO TUNNEL

0.30 B OL
RL 92.78

OTHER PVC
EU

0.30 B OL
RL 92.80

0.10 B OL
RL 93.04

EU

PRIVATE
320 X 320
METAL PIT
RL 93.08
UTT

0.10 B OL
RL 93.01

OTHER PVC
EU

0.10 B OL
RL 93.04

0.10 B OL
RL 93.03

PRIVATE
320 X 320
METAL PIT
RL 93.09
UTT

PRIVATE
320 X 320
METAL PIT
RL 93.07
UTT

PRIVATE
320 X 320
METAL PIT
RL 93.06
UTT

PRIVATE
320 X 320
METAL PIT
RL 93.02
UTT

1.00 B OL
RL 86.45

0.60 B OL
RL 86.85

TELSTRA
10XP100 PVC
0.80 B OL
RL 86.61

AUSGRID 4XP140, 2XDB PVC
EU

OPTUS Ø 100 PVC
OU

JEMENA Ø 450 STEEL
50NY IN 18NB
QL-D OL
RL 87.38

SYDNEY WATER Ø 150 CICL
0.80 B OL
RL 86.57

0.60 B OL
RL 86.76

RMS 2XP80 PVC
OU

0.80 B OL
RL 86.75

TSP

TSP

132°37'00"
20.540

0.60 C OL
RL 88.48

0.80 B OL
RL 88.25

RL 89.06

ADJOINS SHEET 10

ADJOINS SHEET 8

ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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CLIENT: Stockland

PROJECT TITLE: 601 PACIFIC HWY ST LEONARDS NSW 2065

DRAWING TITLE: SUB-SURFACE UTILITY PLAN

NORTH: MGA

SCALE IN METERS 1:100 (0 1 2 3 4)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

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JOB NUMBER: 203610

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DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	7 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 5

ADJOINS SHEET 7

ADJOINS SHEET 9

ADJOINS SHEET 11

0.30 B OL
RL 91.31

0.20 B OL
RL 91.43

IN

PRIVATE Ø 200 PVC
0.10 A IL
RL 91.48
UTT

0.10 B OL
RL 93.01

IN

PRIVATE Ø 200 PVC
0.10 A IL
RL 91.50
UTT

PRIVATE
320 X 320
METAL PIT
RL 93.09
UTT

EXTENT OF METRO TUNNEL

132°37'00"
40.400

PRIVATE
320 X 320
METAL PIT
RL 93.02
UTT

PRIVATE
320 X 320
METAL PIT
RL 93.08
UTT

132°37'00"
20.540

0.60 C OL
RL 88.48

0.60 B OL
RL 88.28

RL 89.06

OB

Ø 150 CONC.
RL 90.58
UTO

93.00 92.50 92.00 91.50 91.00 90.50 90.00

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PROJECT TITLE:
601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: M.G.A.

SCALE IN METERS 1:100 (0 1 2 3 4)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
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DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	8 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 6

ADJOINS SHEET 8

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0.80 B OL
RL 91.55

AUSGRID DB

0.60 B OL
RL 91.75

TELSTRA
6XA100 AC

0.50 C OL
RL 92.00

JEMENA
Ø 100 STEEL
32NY IN 4NB

0.70 B OL
RL 91.85

RL 92.56

0.40 B OL
RL 92.16

0.40 B OL
RL 92.16

7XP32 PVC

92.50

EMH

0.58 B OL
RL 91.94

RL 92.51

0.56 B OL
RL 91.94

7XP32 PVC

0.70 B OL
RL 91.52

359°45'10"
33.640

0.60 B OL
RL 91.67

0.60 C OL
RL 91.89

0.40 B OL
RL 92.10

0.40 B OL
RL 92.09

RL 92.49

0.50 B OL
RL 91.91

0.60 B OL
RL 91.58

0.70 B OL
RL 91.43

92.00

92.00

EXTENT OF METRO TUNNEL

OB

Ø 150 CONC.
RL 90.58
UTO

91.50

0.60 C OL
RL 91.74

0.60 B OL
RL 91.39

0.40 B OL
RL 91.55

92.00

AUSGRID
RL 91.83
UTO

EMH

0.50 B OL
RL 91.37

91.00

EMH

ADJOINS SHEET 12

ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: MGA

SCALE IN METERS 1:100 (0 1 2 3 4)

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SURVEYED BY:	S.L.
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HEIGHT DATUM: AHD71	COORD: MGA20 Z56
DBYD JOB#: N/A	DBYD DATE: N/A
ORIGINAL SIZE: A3	SHEET: 9 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 7



DETAIL 3

SCALE 1:50

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ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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W: www.veris.com.au
ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE: 601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE: SUB-SURFACE UTILITY PLAN

NORTH: MGA

SCALE IN METERS 1:100

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

DIAL BEFORE YOU DIG www.1100.com.au
THIS PLAN DOES NOT REPLACE DBYD PLANS

JOB NUMBER: 203610

THIS PLAN MUST BE READ IN CONJUNCTION WITH SHEET 1 FOR ADDITIONAL NOTES, WARNINGS & LEGEND

DATE OF SURVEY:	13/04/23	DATE OF PLAN:	03/05/23
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET: 10 OF	14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 11

ADJOINS SHEET 8

ADJOINS SHEET 10

ADJOINS SHEET 12

PACIFIC HWY

132°37'00"
20.540

EXTENT OF METRO TUNNEL

0.60 C OL
RL 88.48

0.60 C OL
RL 88.28

RL 89.06

0.70 B OL
RL 88.57

0.60 B OL
RL 88.63

1.00 B OL
RL 88.17

COUNCIL SIGN
RL 89.00

RMS
2XP80 PVC

0.90 B OL
RL 88.16
SS86488

0.50 B OL
RL 88.64

0.70 B OL
RL 88.46
EOT

AUSGRID 4XP140 2XDB PVC

TELSTRA 6XP100 PVC

TELSTRA 8XP100 PVC

SYDNEY WATER Ø 150 CICL

OTHER
METAL LIGHT POLE
RL 89.42

1.00 B OL
RL 88.42

0.50 B OL
RL 88.89

110°04'10"
27.925

0.50 B OL
RL 88.83

1.00 B OL
RL 88.36
EOT

1.00 B OL
RL 88.57

0.50 B OL
RL 89.01

0.50 B OL
RL 88.98

132°37'00"
30.460

UASGRID
CONC. PIT
RL 90.44
UTO

AUSGRID
CONC. PIT
RL 90.38
UTO

0.80 B OL
RL 89.31
EOT

110°04'10"
5.500

0.60 B OL
RL 89.07

0.50 B OL
RL 89.11

TELSTRA 8XP100 PVC

SYDNEY WATER Ø 150 CICL

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ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE:
601 PACIFIC HWY
ST LEONARDS NSW 2065

DRAWING TITLE:
SUB-SURFACE UTILITY PLAN

NORTH: N MGA

SCALE IN METERS 1:100 (0 1 2 3 4)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

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JOB NUMBER: 203610

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HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	11 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 9

ADJOINS SHEET 11

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ALBANY LN

AUSGRID RL 91.83 UTO
EMH
AUSGRID DB
TELSTRA 6XA100 AC
0.50 B OL RL 91.37
0.70 B OL RL 91.09
0.60 B OL RL 91.21
359°45'10" 12.190
AUSGRID CONC. PIT RL 91.50 UTO
0.60 B OL RL 91.12
1.00 B OL RL 90.65
RL 91.63
RL 92.07
1.25 B OL RL 90.79
PVC
132°37'00" 10.605
EXTENT OF METRO TUNNEL
TELSTRA CONC. PIT RL 92.04
0.50 B OL RL 91.51
JEMENA Ø 100 STEEL 32NY IN 4NB
0.60 C OL RL 91.30
0.50 B OL RL 91.47
RL 92.05
FENCE
1.25 B OL RL 90.76
0.80 B OL RL 91.16
6XA100 PVC
RL 90.83
RL 90.83
SYDNEY WATER RL 91.07 NO SIGNAL UTT
AUSGRID CONC. PIT RL 90.38 UTO
JUNCTION BOX UTO
0.70 B OL RL 90.05 NO SIGNAL UTT
0.70 B OL RL 90.04
RL 90.74
0.80 B OL RL 89.31 EOT
0.80 B OL RL 89.58
0.70 B OL RL 90.08 EOT
0.70 B OL RL 90.02
19°09'10" 3.425
TELSTRA
1.00 B OL RL 89.62
110°04'10" 5.500
TELSTRA 8XP100 PVC
SYDNEY WATER Ø 150 CICL
WH
91.00
91.50
92.00
90.50
90.00

SEE DETAIL 5
SHEET 13

ADJOINS SHEET 13

ISSUE	DATE	AMENDMENT	BY
A	03/05/23	ORIGINAL UTILITIES PLAN	J.V.

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CLIENT: Stockland

PROJECT TITLE: 601 PACIFIC HWY ST LEONARDS NSW 2065

DRAWING TITLE: SUB-SURFACE UTILITY PLAN

NORTH: MGA

SCALE IN METERS 1:100 (0 1 2 3 4)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

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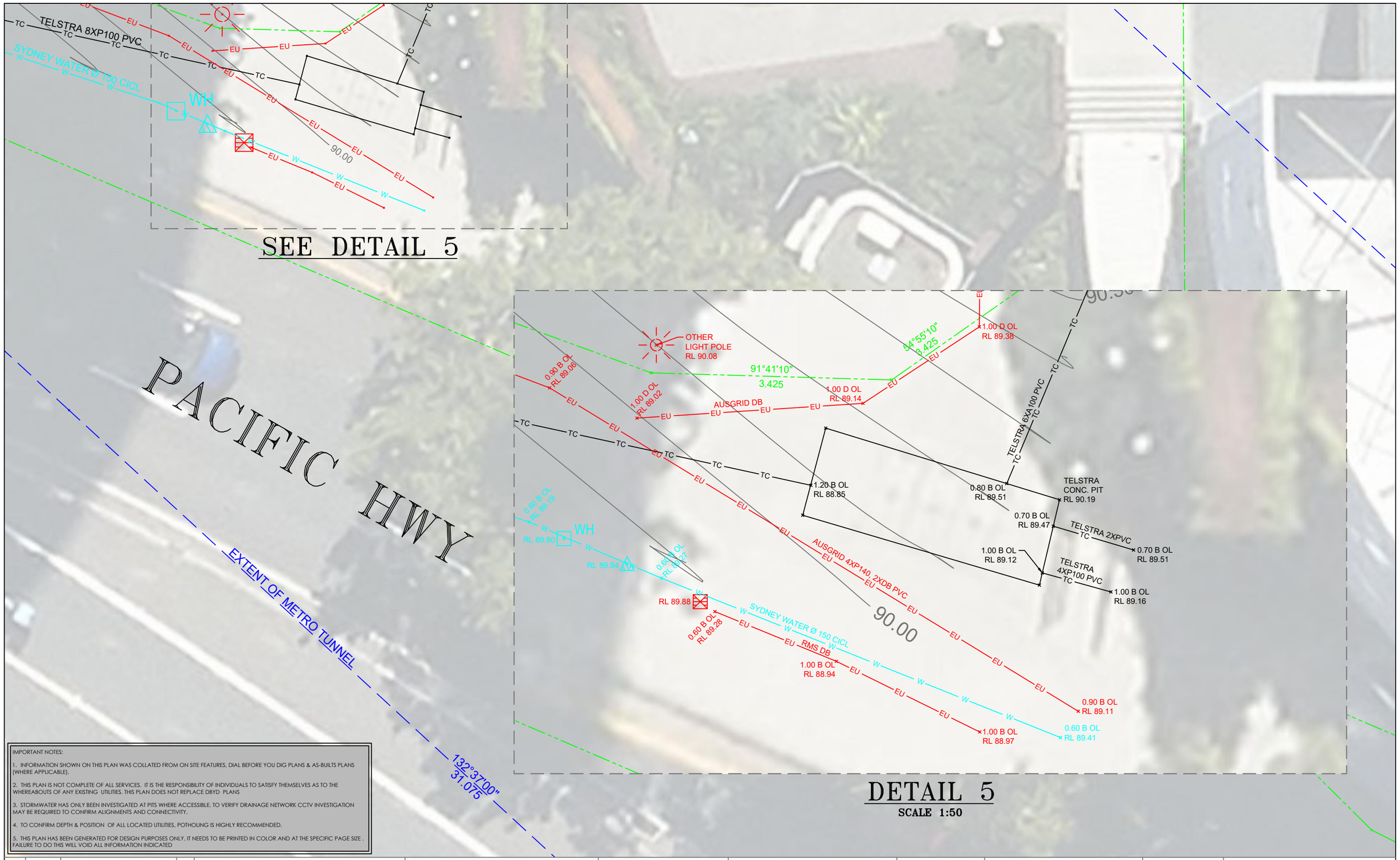
HEIGHT DATUM:	AHD71	COORD:	MGA20 Z56
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET:	12 OF 14

DRAWING NUMBER/ISSUE: 203610-UTILS-001A

ADJOINS SHEET 12



DETAIL 5

SCALE 1:50

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ABN: 53 615 735 727

CLIENT: Stockland

PROJECT TITLE: 601 PACIFIC HWY ST LEONARDS NSW 2065

DRAWING TITLE: SUB-SURFACE UTILITY PLAN

NORTH: M.G.A

SCALE IN METERS 1:50 (0, 0.5, 1, 1.5, 2)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
DRAFTED BY:	J.V.
CHECKED BY:	S.L.
APPROVED BY:	D.M.

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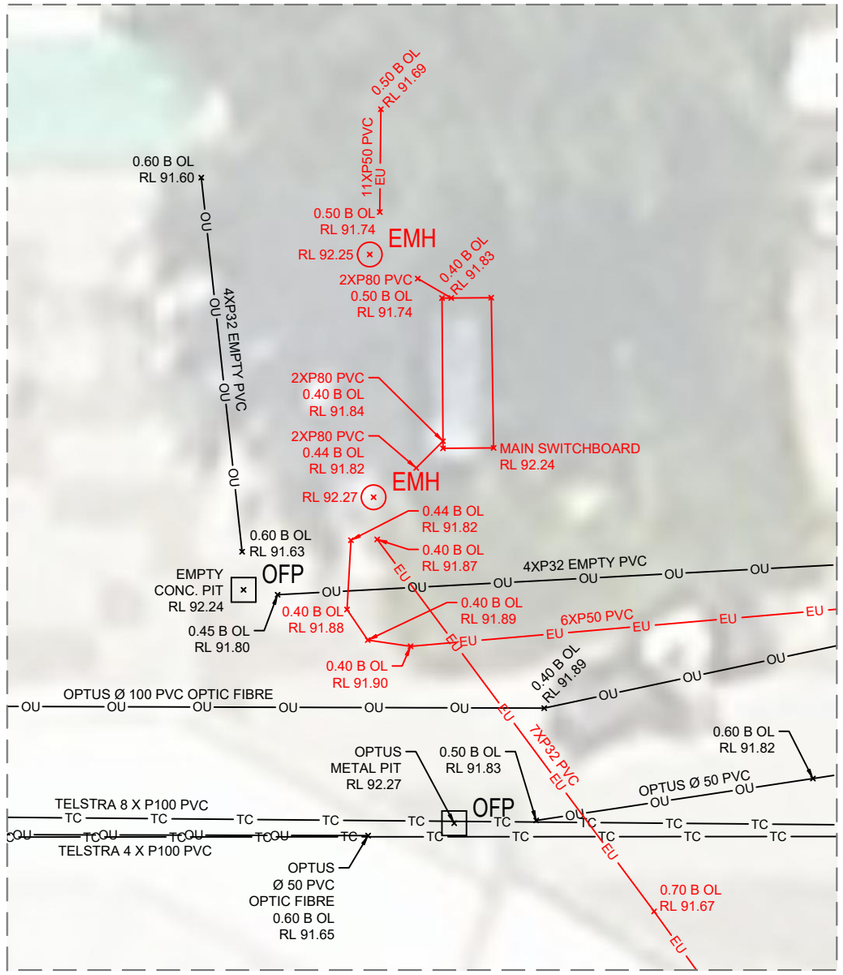
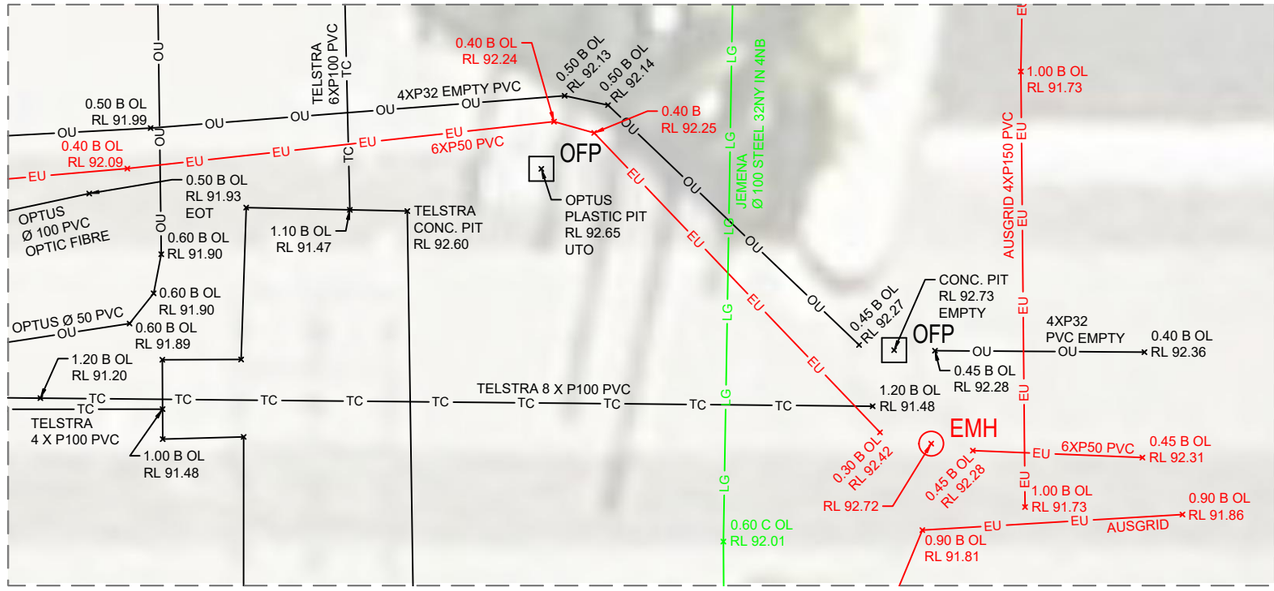
DBYD JOB#:	N/A	DBYD DATE:	N/A
ORIGINAL SIZE:	A3	SHEET: 13 OF 14	

DRAWING NUMBER/ISSUE: 203610-UTILS-001A



DETAIL 1

SCALE 1:50
SHEET 6



DETAIL 2

SCALE 1:50
SHEET 6

DETAIL 4

SCALE 1:50
SHEET 10

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NORTH: MGA

SCALE IN METERS 1:50 (0, 0.5, 1, 1.5, 2)

LOCATED BY:	V.M./E.B.
SURVEYED BY:	S.L.
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ORIGINAL SIZE: A3	SHEET: 14 OF 14

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