Douglas PARTNERS

GROUNDED EXPERTISE

Groundwater Impact Assessment

Proposed Mixed-Use Development

270 Pacific Hwy, Crows Nest, NSW

Prepared for Silvernight (Crows Nest) Landowner Pty Ltd

Project 214296.02

15 August 2025

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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.

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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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Report on Geotechnical Investigation
Proposed Mixed-Use Development
270 Pacific Hwy, Crows Nest, NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents a Groundwater Impact Assessment (GIA) undertaken for a proposed mixed-use development at 270 Pacific Hwy, Crows Nest, NSW (the site). The work was undertaken in accordance with Douglas' proposal 214296.02.P.001.Rev0 dated 16 December 2024.

A brief overview of the development is provided in Section 2. The site location is shown on Drawing 1, Appendix A.

The purpose of this GIA is to support the submission of a State Significant Development Application (SSD-79658964), addressing the assessment requirements specified in Section 1.2. Additionally, this document aims to assist in obtaining the necessary approvals for the disposal of extracted groundwater, where applicable.

This GIA is based on the findings of site-specific investigations and monitoring, including:

- Geotechnical investigation (Douglas, Report on Geotechnical Investigation - Proposed Mixed-Use Development, 2025a);
- Groundwater monitoring (Douglas, 2025b), and;
- Detailed (contamination) site investigation (Douglas, 2025c).

The following key information is relevant to the preparation of this GIA:

- The proposed works will intercept the groundwater table;
- Groundwater levels on site have been observed at approximately RL 93.3 m AHD;
- The proposed finished floor level of the second basement level is RL 90.5 m AHD;
- The basement is intended to be drained; and
- The extracted groundwater will be disposed of via stormwater.

This GIA is intended as a preliminary document and will be superseded by a detailed dewatering management plan that includes water treatment and discharge schematics, monitoring plans, and triggers to be implemented during construction.

This report must be read in conjunction with all appendices including the notes provided in Appendix B.

1.1 Regulatory framework and guidance

The following key guidelines and documents were consulted in preparation of this report:

- *Guidelines for Groundwater Protection in Australia*, National Water Quality Management Strategy (Australian Government, 2013);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018);
- *Minimum requirements for building site groundwater investigations and reporting* (NSW DPE, 2022);
- *NSW Aquifer Interference Policy* (DPI-NSW Office of Water, 2012); and
- *NSW Aquifer Interference Policy* (NSW DPI, 2013), supplementary version.
- *Groundwater assessment toolbox for Major Projects in NSW* (NSW DPE, 2022);
- *Guidelines for Groundwater Documentation for SSD/SSI Projects* (NSW DPE, 2022);
- *Minimum Groundwater Modelling Requirements for SSD/SSI Projects* (NSW DPE, 2022); and
- *Cumulative Groundwater Impact Assessment Approaches* (NSW DPE, 2022).

Additional regulatory requirements may also apply, including WaterNSW approvals for water take and disposal (see Section 9), and local council or EPA conditions depending on the nature and location of discharge.

1.2 Conditions of approval

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 31 January 2025 and issued for the SSDA (SSD-79658964). Specifically, this report has been prepared to respond to the SEARS requirements for ground and groundwater conditions as listed in Table 1.

Table 1: Summary of SEARS compliance for ground and groundwater conditions

Project Stage Design (D) Construction (C) Operation (O)	Geotechnical Risk	Mitigation Measure	Relevant Section of Report
D/C/O	Groundwater levels, seepage inflow to basement excavation, groundwater management.	Seepage inflows are expected to be low. Inflows should be readily controllable by pumping from sumps for discharge to the stormwater network.	Section 7.2.1
D/C	Impact on adjacent structures.	Groundwater drawdown is predicted to occur within the siltstone. Therefore, risk of subsidence due to lowering of the water table is expected to be minimal.	Section 8

Project Stage Design (D) Construction (C) Operation (O)	Geotechnical Risk	Mitigation Measure	Relevant Section of Report
D	Acid sulfate soils and salinity	Assessed as low risk and not applicable.	Section 4.7

2. Proposed development

The application seeks development consent for the development of a 16 storey mixed use development at 270 Pacific Highway, Crows Nest, comprising 168 build to rent units and non-residential uses in the podium. Specifically, the SSDA seeks development consent for:

- demolition of two existing 5 storey commercial buildings;
- construction of a maximum 16 storey building, including:
  - 2 basement parking levels (with 82 carparks, 8 motorbike spaces and 230 bicycle spaces);
  - 3 podium levels comprising non-residential uses such as medical centre, retail, and residential uses (build to rent units and residential amenity facilities such as a gym and sauna, steam room, outdoor pool, class space, cinema room, coworking space);
  - 13 storeys of residential uses in the tower, comprising build-to-rent units;
  - communal open space;
  - landscaping on ground, level 2 – level 15;
  - rooftop solar panels;
  - internal and external residential amenities space on roof top;
- streetscape upgrades; and
- office and substation along the northwestern boundary.

The development consists of a stepped basement plan, with the second level basement area covering approximately half of the site. The two-level basement will be in the eastern portion of the site and a single-level basement will be in the western portion of the site.

The current basement finished floor level (FFL) is at an approximate RL of 93.5 m AHD, which is the same level as the proposed single-level basement in the western portion of the site. It is understood that the finished floor level of the new two-level basement in the eastern portion of the site is proposed to be at RL 90.5 m AHD (Drawing ref: 22501, DA-1001 & DA-1002, Fitzpatrick and Partners 2025) (Appendix A).

3. Site description

The site is located at 270 Pacific Highway, Crows Nest. The site has an approximate area of 3,800 m^2 and includes Lot 22 in Deposited Plan 706776. The site is currently occupied by a pair of five-storey concrete commercial and office buildings with a shared single level basement carpark.

Douglas has been provided with a detailed basement survey plan by RYGATE Surveyors (Ref. 80385, dated 7 November 2023) included in Appendix A. These indicate that the existing one level basement on site has a finished level at RL 93.5 m AHD.

The site has an approximate 75 m frontage to Pacific Highway (TfNSW asset) to the north-east. The site is also bounded by a five-storey building and Bruce Street to the south-east, eight residential properties to the south-west and a two-storey commercial building to the north-west. The neighbouring buildings are mostly extended to the common boundaries of the site.

The site is located at an approximate offset of about 60 m to the Sydney Metro rail tunnel that runs underneath the corner of Falcon Street and Pacific Highway, as shown in Figure 1. It is understood that the site is located outside the second protection reserve (further than 25 m away from the tunnel stratum). This however should be confirmed with TfNSW/Sydney Metro.

Figure 1: Site overview with 2 m surface contours and Metro rail corridor shown

4. Hydrogeological setting

4.1 Topography

The site area is relatively flat, located adjacent to a ridge underlying Pacific Highway. The local topography in the vicinity of the site is shown in Figure 1.

Supplied site survey plans (RYGATE Surveyors Ref. 79262, dated 4 May 2020) detail the existing ground level around the site varies between RL 96.0 m AHD at southeast corner and RL 98.4 m AHD at northwest corner of the site.

4.2 Climate

The average annual rainfall in Sydney is 1.2 m/year (www.bom.gov.au), in a temperate climate with warm summers, mild winters, and no dry seasons.

4.3 Geology

Reference to the Sydney 1:100,000 Geological Series Map indicates that the site is underlain by rock of the lower Ashfield Shale formation, overlying the Mittagong Formation which is a transitional unit between the Ashfield Shale and underlying Hawkesbury Sandstone. The lower Ashfield Shale formation typically comprises shale, siltstone and finely laminated sandstone and siltstone (laminite). The Mittagong formation comprises interbedded shale, laminite and medium grained quartz sandstone. Hawkesbury Sandstone typically comprises medium to coarse grained quartz sandstone with some shale bands and lenses.

4.4 Hydrogeology and groundwater source

Groundwater is expected to flow south-west following the topography of the area.

Based on the site's geology, it is expected that the perennial groundwater table occurs within minor fractured aquifers hosted by the underlying Ashfield Shale and Hawkesbury Sandstone bedrock. These formations typically act as aquitards or aquicludes, although minor secondary permeability can occur where defects are present. Perched seepage water with limited volumes can be expected at levels above the perennial groundwater table.

The site is located within the Sydney Basin Central Groundwater Source and is subject to the Greater Metropolitan Region Groundwater Sources 2023 water sharing plan.

4.5 Hydrology

The closest watercourse to the site is Berrys Creek, located approximately 850 m south (down gradient) of the site.

4.6 Groundwater receptors

A search of the NSW groundwater bore database indicated that there are no registered groundwater bores within a 1 km radius of the site.

A review of the Groundwater Dependent Ecosystems Atlas from the Australian Bureau of Meteorology indicates that there are no listed groundwater dependent ecosystems within 1 km of the site.

4.7 **Acid sulfate soils**

Reference to the 1:25,000 Acid Sulfate Soils (ASS) Risk map indicates that the site is in an area of no known occurrence of ASS. The nearest mapped occurrence of ASS is bottom sediments of Balls Head Bay at about 1.2 km distance to the southwest of the site.

4.8 **Salinity**

Reference to the NSW Salinity Risk mapping indicates that the site is not located within an area that is considered likely to have salinity issues.

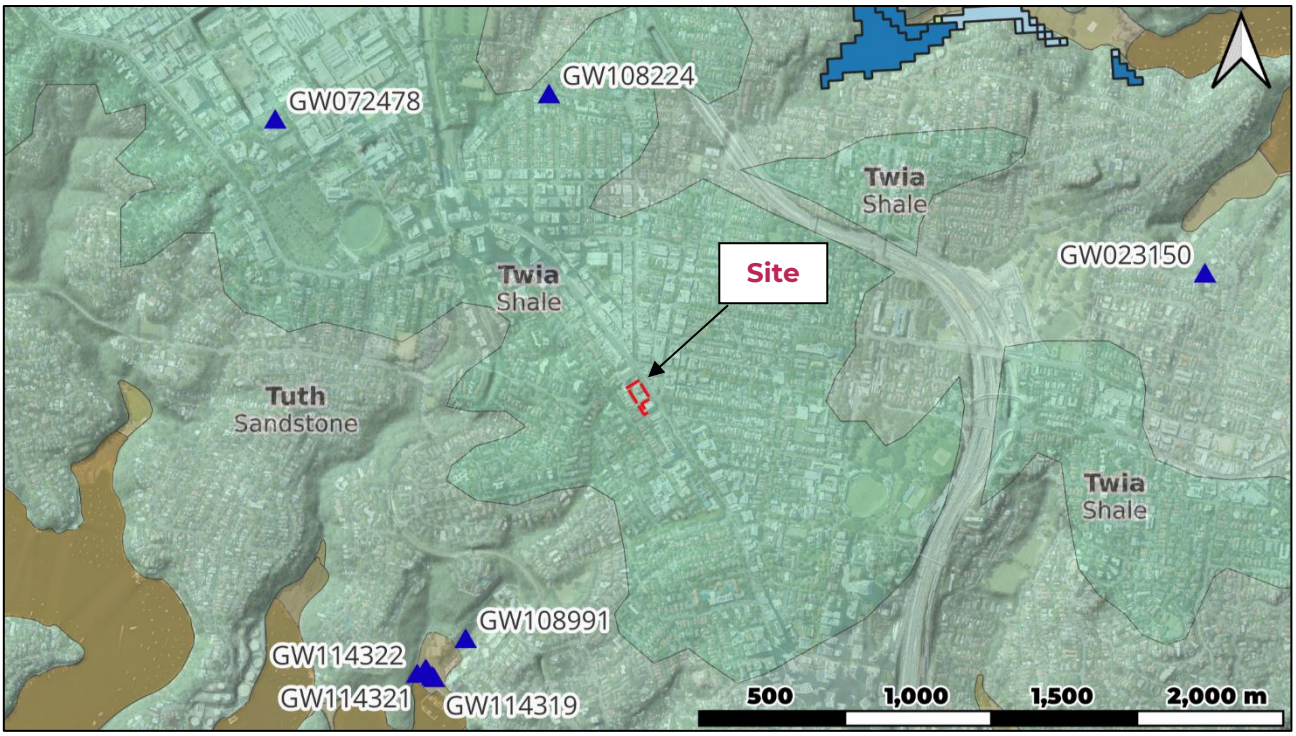

Figure 2: Groundwater receptors outside a 1 km vicinity, underlying site geology shown.

5. Investigation results

A geotechnical investigation was undertaken by Douglas in February 2025 (Douglas, 2025a). The test locations are shown in Drawing 1 (Appendix A). The interpreted geotechnical model is illustrated in Cross-Sections A-A', B-B', C-C' and D-D' in Drawings 2 to 5 in Appendix A.

Six cored boreholes were drilled to depths ranging between 10.0 and 15.9 m below ground level. The subsurface conditions encountered in the geotechnical boreholes (and concurrent environmental boreholes) are presented on the engineering logs in Appendix C, along with

standard notes defining the descriptive terms and the classification methods used. The general subsurface profile encountered at the borehole locations (which are from the existing single level basement level) may be summarised as follows:

Concrete slab Thicknesses of between 110 mm and 230 mm were observed in the basement concrete slab. Note borehole location BH3A initially encountered 0.7 m of concrete before being discontinued and relocated 1.5 m away to BH3;

Fill At all locations below the slab, to depths ranging between 0.3 m and 0.9 m, except at BH6. The fill varied between sand and clay across locations with variable amounts of ripped sandstone gravel. Drainage gravel was encountered below the slab at BH1 and BH4;

Residual Clay Below the fill in all boreholes to depths between 0.4 m and 1.2 m, comprising medium to high plasticity clay;

Ashfield Shale Fractured, highly weathered to fresh, very low to low strength siltstone to depths ranging between 9.8 m and 10.8 m. BH1 was terminated within the Ashfield Shale at 10.0 m;

Mittagong Formation Excluding BH1, highly to slightly weathered, very low to medium strength Mittagong Formation sandstone and laminite was encountered below the Ashfield Shale. BH2, BH3 and BH6 were terminated within this stratum. The thickness of the Mittagong Formation was observed to vary from about 1.5 m to 4.3 m in BH4 and BH5;

Hawkesbury Sandstone BH4 and BH5 terminated in slightly weathered to fresh, medium to high strength Hawkesbury sandstone with laminite and siltstone interbeds.

5.1 Groundwater monitoring

Three groundwater wells were installed within the site. Groundwater results are summarised in subsequent sections.

Table 2summarises the monitoring wells' attributes. Their location is shown on Drawing 1 (Appendix A).

Table 2: Monitoring well details

Borehole	Surface Level (m, AHD)	Monitoring Well Installation Date	Screen Interval (m) / Material
BH2	93.4	17/02/2025	1.5 – 10.5 / Siltstone
BH4	93.5	20/02/2025	1.5 – 7.5 / Siltstone
BH6	93.3	19/02/2025	1.5 – 7.5 / Siltstone

5.1.1 Groundwater levels

Groundwater levels have been continuously recorded at hourly intervals since 20 March 2025 using data loggers installed in the monitoring wells. Hydrographs showing recorded levels in comparison with rainfall data over time are presented in Appendix C.

The groundwater levels in the monitoring wells have continued to be relatively stable with fluctuations of about 0.1 m to 0.3 m over the monitoring period. The highest groundwater levels were recorded in late April 2025 and late May 2025, following periods of sustained rainfall.

A summary of the measured groundwater levels manually measured within the site is provided in Table 3. Maximum, minimum and average groundwater levels recorded by the dataloggers are presented in Table 4.

Table 3: Groundwater levels – manual measurements

Borehole No.	Surface RL (m, AHD)	Date	Manual Water Level Measurements in Wells	
			Depth (m, bgl)	Reduced Level (m, AHD)
BH2	93.4	05/03/25	1.1	92.3
		05/05/25	1.0	92.4
		27/06/25	0.9	92.5
BH4	93.5	05/03/25	0.4	93.1
		05/05/25	0.4	93.1
		27/06/25	0.4	93.1
BH6	93.3	05/03/25	2.4	90.9
		05/05/25	1.7	91.6
		27/06/25	1.7	91.6

Table 4: Summary of logger data

Well ID	Depth to groundwater (m bgl)			Groundwater elevation (m AHD)		
	Maximum	Minimum	Average	Lowest	Highest	Average
BH2	1.0 (13/04/25)	0.7 (27/05/25)	0.9	92.4 (13/04/25)	92.7 (27/05/25)	92.5
BH4	0.5 (21/06/25)	0.2 (27/05/25)	0.3	93.0 (21/06/25)	93.3 (27/05/25)	93.2
BH6	1.8 (10/05/25)	1.5 (02/04/25)	1.7	91.5 (10/05/25)	91.8 (02/04/25)	91.6

Notes: m bgl: metres below ground level

5.2 Hydraulic conductivity

Rising head hydraulic conductivity tests were carried out in the monitoring wells following well development. The tests were undertaken by using a pump to lower the groundwater level in the wells and monitoring the subsequent recovery (rising head test) using a data logger.

Hydraulic conductivity tests were analysed using Hvorslev (1951) solution for slug testing interpretation. Results are presented in Table 5 and the detailed results of the tests are attached in Appendix E.

Table 5: Interpreted hydraulic conductivity results

Well ID	Screened Depth (m bgl)	Screened Material	Test No.	Test Date	Hydraulic conductivity k (m/sec)
BH2	1.5 – 10.5 m	Siltstone	1	21/02/2025	7.2×10^{-9}
			2	25/02/2025	7.2×10^{-9}
			3	5/03/2025	6.9×10^{-9}
BH4	1.5 – 7.5 m	Siltstone	1	21/02/2025	3.3×10^{-9}
			2	25/02/2025	5.0×10^{-9}
			3	5/03/2025	4.7×10^{-9}
BH6	1.5 – 7.5 m	Siltstone	1	21/02/2025	3.1×10^{-9}
			2	25/02/2025	2.2×10^{-9}
			3	5/03/2025	1.8×10^{-9}

5.3 Groundwater quality

Groundwater quality testing was undertaken as part of the DSI (Douglas, 2025c) from the monitoring wells. The results provide an indication of background groundwater conditions and inform potential disposal pathways and management requirements (further discussed in Section 9.3).

Groundwater samples were collected and dispatched to a NATA accredited laboratory for the analysis of physical parameters, major ions, dissolved heavy metals, total recoverable hydrocarbons (TRH), volatile organic compounds (VOC) polycyclic aromatic hydrocarbons (PAH) and organochlorine pesticides (OCP).

The results were assessed against the following guideline criteria (further discussed in Section 9.2):

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018), specifically the 95% level of protection for non-bioaccumulating contaminants, and the 99% level of protection for bioaccumulating contaminants for freshwater ecosystems;
- *NSW Water Quality Objectives*; and
- Relevant discharge criteria of Sydney Water / North Sydney Council for stormwater disposal

Groundwater quality results can be summarised as follows:

- pH values ranged from 4.0 to 4.4, indicating acidic conditions.
- Electrical conductivity (EC) values ranged from [738 to 1883] µS/cm, indicating brackish water typical of groundwater within Ashfield Shale.

All results were below the SAC for TRH, BTEX, PAH, OCP. OPP, PCB and VOC. The results exceeded the SAC for the following contaminants:

- Cadmium exceedances of (hardness adjusted) DGV of 0.7 µg/L in samples BH2 at 1.4 µg/L, BH4 at 4.7 µg/L, BH6 at 7.9 µg/L and BD1 (replicate of BH6) at 6.6 µg/L;
- Copper exceedances (DGV of 1.4) in samples BH2 at 49 µg/L, BH4 at 640 µg/L, BH6 at 1100 µg/L and BD1 at 1000 µg/L;
- Nickel exceedances (hardness adjusted DGV of 36.9 µg/L) in samples BH4 at 110 µg/L, BH6 at 330 µg/L and BD1 at 280 µg/L; and
- Zinc exceedances (hardness adjusted DGV of 26.8 µg/L) in samples BH2 at 160 µg/L, BH4 at 670 µg/L, BH6 at 930 µg/L and BD1 at 750 µg/L.

The heavy metal concentrations are likely to be associated with general background conditions in the area, noting similarly elevated concentrations in both BH4 and BH6. It is also possible that the elevated concentrations could be associated with the historical service station, dry cleaners and motor garages on site and/or hydraulic upgradient (Douglas DSI, Section 6.1.2)

Where exceedances of guideline values were identified, appropriate treatment and disposal controls will be implemented (refer to Section 9.3).

Summary tables of analytical results and laboratory reports are provided in Appendix F and Appendix G, respectively.

6. Conceptual hydrogeological model

The geotechnical investigation identified that the site is generally underlain by highly weathered to fresh, very low to low strength siltstone. Groundwater levels were steady throughout the monitoring period, ranging between 93.3 and 91.5 m AHD, sloping approximately south, which is consistent with the local surface topography.

It is expected that water inputs to the ground profile beneath the site include:

- Rainfall infiltration on the site and surrounds, including water flowing downslope laterally through the natural soils and bedrock from areas of higher topography; and
- Possible anthropogenic recharge from seepage from nearby leaking water mains and / or stormwater pipes, garden irrigation etc.

It should be noted that groundwater levels are transient and fluctuate with climatic variations and other factors (e.g. adjacent basements). Therefore, the water levels will temporarily rise during periods of heavy or prolonged rainfall and fall during dry periods.

7. Groundwater inflow assessment

7.1 Methodology

Seepage modelling was undertaken to assess the potential inflow rates into the proposed basement during and after construction, as well as induced groundwater level changes in adjacent and surrounding areas.

A 2-dimensional (2D) numerical groundwater model was developed. The modelling was carried out using the 2D finite element hydrogeological software SEEP/W (a component of GeoStudio) developed by GEOSLOPE International Ltd. The transient conditions during construction dewatering and the long-term 'steady-state' flow to the 'drained' excavation were modelled in the analysis.

7.1.1 Model geometry

A cross section in the north-west to south-east direction intercepting the basement footprint was selected to run the 2D analysis. The cross section is presented in Figure 3.

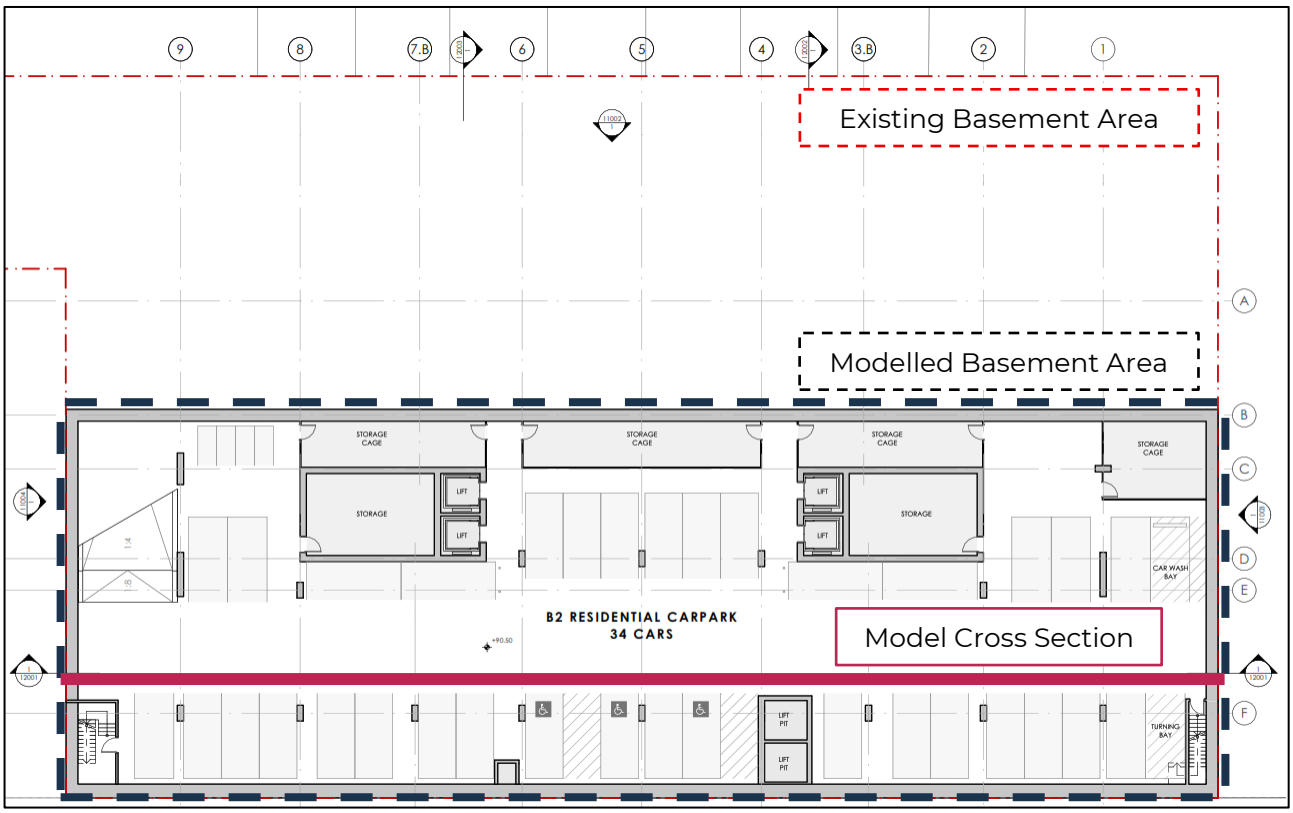

Figure 3: Assumed basement area and modelled cross-section (adapted from provided preliminary basement plan, Drawing 6 - Appendix A), Fitzpatrick & Partners drawing ref. 22501, DA-10001 issue 2.

The aquifer surrounding the proposed development was simulated as single layer numerical model to represent the subsurface conditions beneath the site and allow simulation of the vertical flow components. The model boundary was extended 140 m from the northern and southern site boundaries.

The SEEP/W results are based on a 2D model and therefore provide seepage rates per unit metre. Inflow volumes were calculated through use of a shape factor based on Kavvadas (1992). For the analysis, the excavation was assumed to have an approximately rectangular configuration with an effective width of 73 m (B) and a length of 45 m (L).

7.1.2 Model parameters

The adopted hydraulic properties (base case) are presented in Table 6. Parameters were selected based on the results of the hydraulic conductivity testing (Section 5.2), ranges of values documented in the available literature for similar lithologies (e.g. Fetter 1994, Hoek & Bray 1981, Pells et al 2019) and previous experience with similar materials.

Table 6: Model layers and adopted hydraulic properties

Layer	Material	Saturated Kh (m/s)	Anisotropy Ratio (Kv/Kh)	Porosity (%)	Material Model Adopted
1	Siltstone	1.0×10^{-8}	0.5	20	Unsaturated / saturated

The average annual rainfall in Sydney is 1.2 m/year, however for modelling purposes, the infiltration rate into the site was assumed to be negligible due to the urban setting and low permeability rock surrounding the excavation. Rainfall recharge is instead represented in the model through the constant upstream head boundary condition, calibrated to 95 m AHD to replicate the groundwater levels observed within the site as shown on Figure 4.

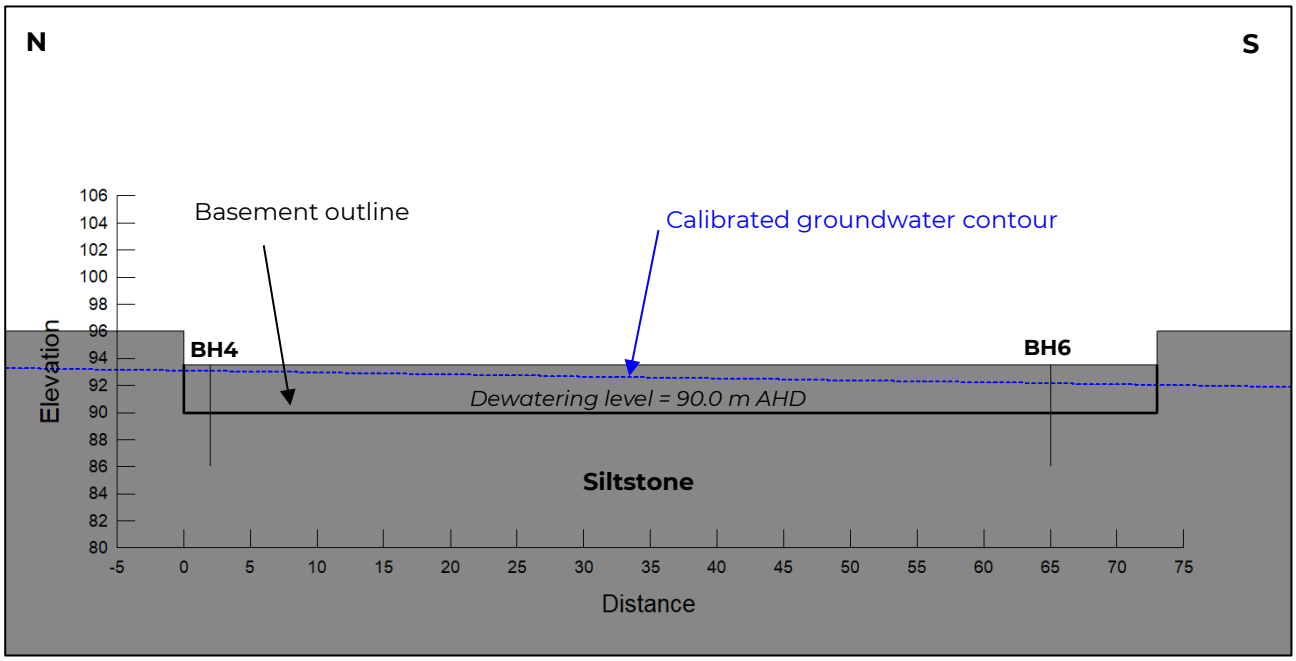

Figure 4: Model cross-section, showing calibrated groundwater contour

7.1.1 Basement design and dewatering

The basement walls and sub-floor drainage were simulated as 'Seepage Faces' in SEEP/W with zero hydraulic pressure head along the full perimeter. The proposed finished floor level for the basement is understood to vary from RL 93.5 to RL 90.5 m AHD. A dewatering level of 90.0 m AHD was used throughout the modelled basement area, which is considered conservative.

7.1.2 Simulation

To simulate the temporary dewatering required during construction, transient flow conditions were modelled in the analysis. For the purpose of the analysis, excavation was assumed to be undertaken in a single stage (i.e. instantaneously) and the subsequent temporary dewatering period was assumed to be up to one year, subdivided into multiple time intervals.

The analysis was also run under 'steady state' conditions to assess long term groundwater inflows (i.e. assuming permanent drained basement, after construction).

7.1.3 Sensitivity analyses

Sensitivity analyses were undertaken to assess the impact of intersecting more permeable ground conditions or shallower water table:

- **Sensitivity 1**: assuming the sandstone has a hydraulic conductivity one order of magnitude higher than under baseline conditions (i.e. 1.0×10^{-7} m/s).
- **Sensitivity 2**: assuming the water table is 1.0 to 1.5 m higher (at the existing basement surface level) than the calibrated baseline water table.

7.2 Modelling results

7.2.1 Groundwater inflow

The inflow rates obtained from the modelling represent the estimated total rate of groundwater flowing into the excavation and the volume (per unit time) requiring extraction via the dewatering system, in order to dewater the basement during and after construction.

The estimated inflows from the analysis for the first year (i.e. during construction) and long term are summarised in:

- Table 7, for the base case scenarios as detailed in previous sections; and
- Table 8, for the sensitivity analysis.

Table 7: Simulated Inflow Results for Baseline Cases

Elapsed Time	Baseline case – predicted inflow	
	kL/day	Cumulative (ML)
1 day	6.0	0.01
3 days	2.2	0.0.1
7 days	1.6	0.02
14 days	1.2	0.03
21 days	1.0	0.04
30 days	0.9	0.05
60 days	0.8	0.07
90 days	0.	0.10
180 days	0.6	0.20
365 days	0.5	0.26
Long term	kL/day	ML/year
	0.13	0.05

Table 8: Simulated Long Term Inflow Results for Sensitivity Cases

Long term inflow	Sensitivity 1 – higher k		Sensitivity 2 – higher GWL	
	kL/day	ML/year	kL/day	ML/year
	0.19	0.48	1.32	0.07

Notes: k: hydraulic conductivity; GWL: groundwater level

The results of the sensitivity cases for groundwater inflow analysis indicate that:

- Inflow increases will be minor if higher permeability siltstone is intersected by the excavation; and,
- Inflow increases will be minor in the event of heavy rain and elevated groundwater levels.

It is noted that the precision to which the results are presented does not represent the accuracy of the predictions, the level of precision is provided to allow comparison of scenarios, the accuracy will be lower because of the inherent variability in key parameters such as hydraulic conductivity and recharge and results could range up to an order of magnitude.

The inflow rates presented above are predictions only and may vary significantly to the assumptions presented. The actual flow rate will only be known once the excavation is completed, and the inflow can be observed and measured. Appropriate planning should be put in place to monitor and compensate for greater variations in actual inflows.

7.2.2 Drawdown and settlement

The simulated lowered groundwater levels, or impact to the water table, outside the basement footprint over the long term are summarised in Table 9. The model results indicate a maximum drawdown close to the excavation of about 3.1 m, reducing to 0.1 m at a distance of 80 m from the excavation. As the groundwater drawdown is expected to occur within the Ashfield Shale, settlements on adjacent structures due to dewatering are expected to be negligible.

Table 9: Predictive model simulated drawdown

	Distance from Excavation				
	0 m	10 m	20 m	40 m	80 m
Drawdown Depth (m) Upstream	3.1	0.7	0.4	0.2	0.1
Drawdown Depth (m) Downstream	2.1	0.6	0.2	0.2	0.1

8. Impact assessment

8.1 Aquifer interference policy considerations

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.

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 GDE or high priority culturally significant site;
- A cumulative pressure head decline of no 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.

8.2 Risk assessment

An assessment of the potential effects of dewatering on neighbouring properties and groundwater receptors has been summarised in Table 10.

Table 10: Assessment of potential effects of dewatering

Item	Comment
Impacts on potential GDEs	There are no listed groundwater dependent ecosystems within groundwater bores within 1 km of the site.
Water supply losses by neighbouring groundwater users	There are no registered groundwater bores within 1 km of the site.
Potential subsidence of neighbouring structures	Groundwater drawdown is predicted to occur within the siltstone. Therefore, risk of subsidence due to lowering of the water table is expected to be minimal.
Mounding of water upgradient of structure	As the basement is proposed to be drained, mounding of groundwater is not expected upgradient of the site.

9. Recommended groundwater management

A drained basement (i.e. non-hydrostatic) is considered manageable for this site due to the low inflows predicted, the site geology and the site topography. Drainage measures within the basement walls and below the basement slab will be required to collect and store water inflows for periodic discharge.

This section outlines the proposed management strategy based on the preferred methodology for dewatering and disposal.

9.1 Groundwater inflow control

Based on the inflow assessment (Section 7.2.1), seepage inflows are expected to be low. These flows, both in the short and long term, should be readily controllable by pumping from sumps for discharge to the stormwater. Standard subfloor drainage systems should be sufficient to direct the seepage water into the sumps. It should be noted that seepage may temporarily increase following high rainfall events.

Appropriate planning should be in place to monitor and compensate for possible variations in the actual inflow rate. If higher inflows are encountered, grouting may be required to reduce the inflows.

9.2 Water quality control

Seepage water quality must be tested prior to discharge to the stormwater to prevent contamination and adverse impacts during and after construction.

The recommended methodology for water quality testing is as follows:

- Collection of water samples and quality control samples from seepage water stored in the sumps;

- Measurement of general groundwater physical parameters (EC, pH and temperature) prior to sampling using a calibrated water quality meter;
- Analysis of the samples on site for the analytes presented in Table 11 below; and
- Review and update of this water quality testing methodology as required.

Water quality sampling should be conducted in accordance with Geoscience Australia's Groundwater Sampling and Analysis – A Field Guide (Geoscience Australia 2009).

Quality assurance/quality control (QA/QC) procedures should be used to establish accurate, reliable and precise results. QA/QC procedures included: calibration of equipment, analyses of samples within holding times, keeping samples chilled and wearing gloves during sampling.

Table 11: Proposed suite of analytes for water quality monitoring

Category	Analytes
Field parameters	T, EC, pH, turbidity
Physical properties	TDS, TSS
Major ions	Calcium, magnesium, sodium, potassium, chloride, sulphate and alkalinity (total, carbonate and bicarbonate)
Metals (total and dissolved)	Arsenic, aluminium, cadmium, chromium, copper, iron, mercury, manganese, nickel, lead and zinc
Nutrients	Total nitrogen, total Kjeldahl nitrogen, nitrite, nitrate, ammonia, total phosphorus and reactive phosphorus
Organics	TRH / TPH, BTEX, phenols, PAH, VOC, oil and grease
Other	PFAS

Notes: EC: electrical conductivity | TDS: total dissolved solids | TSS: total suspended solids
TRH: total recoverable hydrocarbons | TPH: total petroleum hydrocarbons
BTEX: benzene, toluene, ethylbenzene and xylenes
PAH: polycyclic aromatic hydrocarbons
VOC: volatile organic compounds
PFAS: per- and polyfluorinated substances

Water quality results should be compared to assessment criteria for each analytes. These assessment criteria would be selected based on baseline groundwater quality results and relevant guidelines.

9.3 Monitoring and reporting requirements

The following monitoring program and associated reporting is to be adopted until the end of excavation and construction works on-site. Groundwater level monitoring should be continued one month after construction.

Table 12: Monitoring and Reporting Requirements

Item	Monitoring requirements	Methodology
Visual inspection	No visible oil and grease, 'sheen' and / or no significant discolouration or odours. Inspections to be conducted from stored liquids in the intermediate flocculation tank.	Daily inspections (contractor). **HOLD POINT - If any of the visual inspection signs are noted, then any discharge will be suspended until further analytical testing is completed**.
Groundwater level monitoring	Groundwater level recording from the three monitoring wells to assess drawdown in the vicinity of the site. This requirement could be deleted if approved by relevant authorities given the expected minimal impact.	Continuous groundwater level monitoring using data logger recording at six-hourly intervals in monitoring wells in the vicinity of the site. Groundwater level monitoring is to be undertaken during construction and to be continued one month after cessation of dewatering. Quarterly manual groundwater level measurements in monitoring wells.
Water quality sampling and testing	Samples to be collected from the sumps for analysis of water parameters set out in Table 11.	Water quality testing is to be undertaken until the end of construction. Water quality testing should be conducted either monthly or at a minimum before each discharge to stormwater event. Sample analysis on site to be arranged by Silvernight (Crows Nest) Landowner Pty Ltd. Samples will be recorded using industry standard documentation, including the date, name and signature of sampler and sample ID. **HOLD POINT – If seepage water concentrations exceed assessment criteria, then discharge is to be halted. Contingency strategy to be adopted.** Physical parameters (temperature, pH, turbidity and electrical conductivity, oil and grease) may be monitored using suitable on-site probes / testing kits once correlations are established with analytical results. Inclusion of results in a final water quality monitoring report.

Item	Monitoring requirements	Methodology
Quality control sampling	Collection of replicate samples to verify quality of laboratory results. Testing suite to include: • Metals (dissolved); • TRH; • BTEX; and • PAH.	During each sampling event. Samples will be recorded using industry standard COC documentation, including the date, sample ID, name and signature of sampler, and transportation records to the NATA accredited laboratory. Inclusion of results in a final water quality monitoring report
Quantity of groundwater inflows	Measurements of groundwater volumes contained in the sumps.	Weekly monitoring and recording of dewatering volumes. **HOLD POINT - If dewatering volumes exceed 0.48 ML/year (i.e. the maximum inflow predicted from the groundwater modelling sensitivity scenario 1 presented in Section 7.2.1), construction will be halted to minimize inflows (e.g. grouting of exposed drained basement faces). Alternatively, approval for higher inflows up to 3ML/yr may be possible.** Weekly reporting of volumes to the Environmental Consultant. Inclusion of results in a final water monitoring report
Dewatering completion report	To be prepared by a suitably qualified consultant upon completion of all dewatering works. The summary report will incorporate the above information and: • Any on-site records kept by the contractor (e.g. visual observations, any unexpected finds records, etc.); • All analytical results (i.e. each batch of water disposed) compared to the adopted assessment criteria; • Quality control testing; • Record of dewatering volumes (i.e. for each discharge event); and • Comment on any unexpected finds or non-conformances, and / or otherwise if the dewatering works have complied with this DMP.	

Notes: Testing frequency, assessment criteria and analysis requirements may be reviewed in consultation with the Environmental Consultant based on ongoing results.

9.4 Personnel and responsibilities

Table 13 below outlines the proposed project personnel and relevant responsibilities as part of the management plan.

Table 13: Nominated Personnel and Responsibilities

Role	Organisation	Responsibilities
Site Manager / Contractor	Silvernight (Crows Nest) Landowner Pty Ltd	Routine visual inspection. Monitoring / recording of discharge volumes. Maintaining any unexpected / contingency records.
Dewatering Contractor	TBC	Design / specification and ongoing maintenance of the dewatering system.
Geotechnical Consultant	Douglas Partners – 02 9809 0666	Groundwater level monitoring and review of disposal volumes. Assist in preparation of the dewatering completion report.
Environmental Consultant	Douglas Partners – 02 9809 0666	Water quality sampling (analysis using NATA accredited laboratories). Interim advice for each sampling event to confirm (or otherwise) compliance with discharge requirements. Quality control sampling. Assist in preparation of the dewatering completion report.

9.5 Contingency plan

As per Section 9.3, at any hold point if any non-conformance is encountered then dewatering will be suspended. The following general contingency plan will be enacted:

- Should water quality be deemed unsuitable for disposal, suspend dewatering and treat water prior to discharge to the ground;
- Should dewatering volumes be higher than predicted, suspend construction and undertake grouting to reduce groundwater inflows;
- Notify the Site Manager / Contractor and Environmental Consultant;
- Environmental Consultant to inspect the site / unexpected finds and collect additional water quality samples as advised;
- Off-site tankering may be adopted to meet disposal requirements; and
- Written confirmation by the Environmental Consultant that disposal may resume (e.g. upon receipt of laboratory results).

9.6 Approvals and licensing

9.6.1 Water Access License (WAL) and entitlements

Dewatering of groundwater for construction purposes constitutes an aquifer interference activity under the *Water Management Act 2000* and may require a Water Access Licence (WAL) and appropriate water entitlement units (share and extraction components), depending on the water source and proposed take.

The site is located within the Sydney Basin Central Groundwater Source and is subject to the Greater Metropolitan Region Groundwater Sources 2023 water sharing plan.

Groundwater modelling undertaken for the project predicts that groundwater inflow rates will be low (less than 1 ML/year estimated under baseline conditions). Results of the sensitivity scenarios also suggest results below 1 ML/year although higher flow rates could occur during prolonged wetter periods. These predictions are estimates 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.

As of recent changes, any volume of groundwater taken in connection with the construction (but not ongoing maintenance) of buildings and infrastructure in designated coastal areas, is now eligible for a WAL exemption. All water extracted under the exemption must still be recorded and reported to the Natural Resources Access Regulator (NRAR).

Given that the long-term predicted inflow is less than 3 ML/year, the proposed drained basement may also be eligible for an ongoing Water Access Licence exemption from WaterNSW. However, this will be subject to review and approval by WaterNSW.

9.6.2 Water Supply Works Approval (WSWA)

An approval to construct and operate a water supply work (e.g., dewatering system) is typically required under the *Water Management Act 2000*, unless exempt. For major projects, the WSWA is usually granted as part of the SSD approvals and does not require separate application.

10. Conclusion

This hydrogeological assessment considers that the proposed drained basement is feasible without any significant impact to surrounding properties. In addition, the use of a drained basement is not considered likely to influence any GDEs or groundwater supply works in accordance with the AIP minimal impact considerations.

Groundwater quality results suggested that some background metal concentrations exceed the adopted guideline values. Disposal criteria should be selected prior to dewatering based on background concentrations and relevant guideline values. Should disposal criteria be exceeded, treatment may be required prior to disposal. Long term disposal options for drained water should be considered.

Construction of a drained basement will be subject to review and approval from the DCCEEW and other relevant authorities.

11. References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australia New Zealand Environment 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.

Douglas Partners. (2025a). *Report on Geotechnical Investigation – Proposed Mixed-Use Development* at 270 Pacific Hwy, Crows Nest, NSW. Prepared for Silvernight (Crows Nest) Landowner Pty Ltd. Reference 214296.02.R.001.Rev1.

Douglas Partners. (2025b). *Groundwater Monitoring Memorandum - Proposed Mixed-Use Development* at 270 Pacific Hwy, Crows Nest, NSW. Prepared for Silvernight (Crows Nest) Landowner Pty Ltd. Reference 214296.02.R.002.Rev0 and 214296.02.R.003.Rev0 .

Douglas Partners. (2025c). *Report on Detailed Site (Contamination) Investigation - Proposed Mixed-Use Development* at 270 Pacific Hwy, Crows Nest, NSW. Prepared for Silvernight (Crows Nest) Landowner Pty Ltd. Reference 214296.03.R.001.Rev2.

NSW DPE. (2021). *Minimum requirements for building site groundwater investigations and reporting*.

NSW DPE. (2022). *Guidelines for Groundwater documentation for SSD/SSI projects*. *Technical guideline*.

NSW DPI – Water. (2013). *Aquifer Interference Policy: NSW Policy for Managing the Impacts of Groundwater Extraction*.

12. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 270 Pacific Hwy, Crows Nest NSW in line with Douglas' proposal dated 16 December 2024 and acceptance received from Steven Papadopoulos of Silvernight (Crows Nest) Landowner Pty Ltd dated 17 December 2024. The work was carried out under the standing agreement between Silvernight Landowner Pty Ltd and Douglas. This report is provided for the exclusive use of Silvernight (Crows Nest) Landowner Pty Ltd 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 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 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, refer to the DSI (Douglas, 2025) for further details.

Appendix A

Drawings

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	07.03.2025	JM

SCALE: 0 6 12 18 24 30 m
1:600 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Silvernight (Crows Nest) Landowner Pty Ltd

NOTE:
1: Basemap from Metromap Dated (27.01.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MDA zone 56

PROJECT NAME:
Proposed Mixed-Use Development

PROJECT ADDRESS:
270-272 Pacific Hwy, Crows Nest

DRAWING TITLE:
Borehole Location Plan

PROJECT NO: **214296.02**

DRAWING NO: **1**

REVISION: **0**

C

C'

ELEVATION (AHD)

102
100
98
96
94
92
90
88
86
84
82
80
78
76
74
72

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BASEMENT WALL

CURRENT BASEMENT FFL

BH4

BH1

FILL & RESIDUAL SOIL

VL

VL - L

L

CLASS IV SHALE

PROPOSED 2 LEVEL BASEMENT FFL
RL 90.1 m AHD

SEAM

CLASS III SHALE

M

L - M

CLASS IV SANDSTONE

CLASS III SANDSTONE OR BETTER

0 10 20 30 40 50 60 70

DISTANCE ALONG PROFILE (m)

LEGEND

- CI-CH - Medium to High Plasticity CLAY
- CONCRETE
- NO CORE
- FILL
- SANDSTONE
- SILTSTONE
- Water Level

TESTS / OTHER

- ? – – - Interpreted geotechnical boundary

ROCK STRENGTH

VL- Very Low
L - Low
M - Medium
H - High

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	26.03.2025	EC

SCALE: 0 1 2 4 6 8 10 15

1:300 @ A3
Vertical Exaggeration = 2.0

Douglas PARTNERS

OFFICE: SYDNEY

96-98 Hermitage Rd, West Ryde NSW 2114

(02) 9809 0666

CLIENT:

Silvernight (Crows Nest) Landowner Pty Ltd

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 Mixed-Use Development

PROJECT ADDRESS:

270-272 Pacific Hwy, Crows Nest

DRAWING TITLE:

INTERPRETED GEOTECHNICAL CROSS SECTION C-C'

PROJECT No: **214296.02**

DRAWING No: **4**

REVISION: **0**

B

B'

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH4

BH5

BH6

CURRENT BASEMENT FFL

FILL & RESIDUAL SOIL

BRUCE STREET ENTRANCE

PROPOSED 2 LEVEL BASEMENT FFL
RL 90.1 m AHD

CLASS IV SHALE

CLASS III SHALE

CLASS III SHALE

CLASS V SANDSTONE

CLASS IV SANDSTONE

CLASS III SANDSTONE
OR BETTER

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

- CI-CH - Medium to High Plasticity CLAY
- FILL
- Water Level
- CONCRETE
- SANDSTONE
- NO CORE
- SILTSTONE

TESTS / OTHER

— ? — — - Interpreted geotechnical boundary

ROCK STRENGTH

VL- Very Low
L - Low
M - Medium
H - High

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	26.03.2025	EC

SCALE: 0 1 2 4 6 8 10 15

1:300 @ A3
Vertical Exaggeration = 2.0

Douglas PARTNERS
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(02) 9809 0666

CLIENT:
Silvernight (Crows Nest) Landowner Pty Ltd

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3. Horizontal and vertical scales are not equal.

PROJECT NAME:
Proposed Mixed-Use Development

PROJECT ADDRESS:
270-272 Pacific Hwy, Crows Nest

DRAWING TITLE:
INTERPRETED GEOTECHNICAL CROSS SECTION B-B'

PROJECT No: **214296.02**

DRAWING No: **3**

REVISION: **0**

A

A'

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH1

BH2

BH3

BH3A

CURRENT BASEMENT FFL

FILL & RESIDUAL SOIL

PROPOSED 2 LEVEL BASEMENT FFL
RL 90.1 m AHD

CLASS IV SHALE

CLASS III SHALE

CLASS III SHALE

CLASS V SANDSTONE

ELEVATION (AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

- CI-CH - Medium to High Plasticity CLAY
- CONCRETE
- NO CORE
- FILL
- SANDSTONE
- SILTSTONE
- Water Level

TESTS / OTHER

- ? - - - Interpreted geotechnical boundary

ROCK STRENGTH

VL - Very Low
L - Low
M - Medium
H - High

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	26.03.2025	EC

SCALE: 0 1 2 4 6 8 10 15
1:300 @ A3
Vertical Exaggeration = 2.0

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CLIENT:
Silvernight (Crows Nest) Landowner Pty Ltd

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3. Horizontal and vertical scales are not equal.

PROJECT NAME:
Proposed Mixed-Use Development
PROJECT ADDRESS:
270-272 Pacific Hwy, Crows Nest

DRAWING TITLE:
INTERPRETED GEOTECHNICAL CROSS SECTION A-A'

PROJECT No: **214296.02**
DRAWING No: **2**
REVISION: **0**

D

D'

ELEVATION (AHD)

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BASEMENT WALL

BH6

BH3

CURRENT BASEMENT FFL

FILL & RS SOIL

PROPOSED 2 LEVEL BASEMENT FFL
RL 90.1 m AHD

CLASS IV SHALE

CLASS III SHALE

CLASS V SANDSTONE

CLASS IV SANDSTONE

DISTANCE ALONG PROFILE (m)

LEGEND

- CI-CH - Medium to High Plasticity CLAY
- CONCRETE
- FILL
- SANDSTONE
- SILTSTONE
- Water Level

TESTS / OTHER

— ? — — - Interpreted geotechnical boundary

ROCK STRENGTH

VL- Very Low
L - Low
M - Medium
H - High

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	21.03.2025	EC

SCALE: 0 1 2 4 6 8 10 15

1:300 @ A3
Vertical Exaggeration = 2.0

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CLIENT:
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NOTES
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3. Horizontal and vertical scales are not equal.

PROJECT NAME:
Proposed Mixed-Use Development

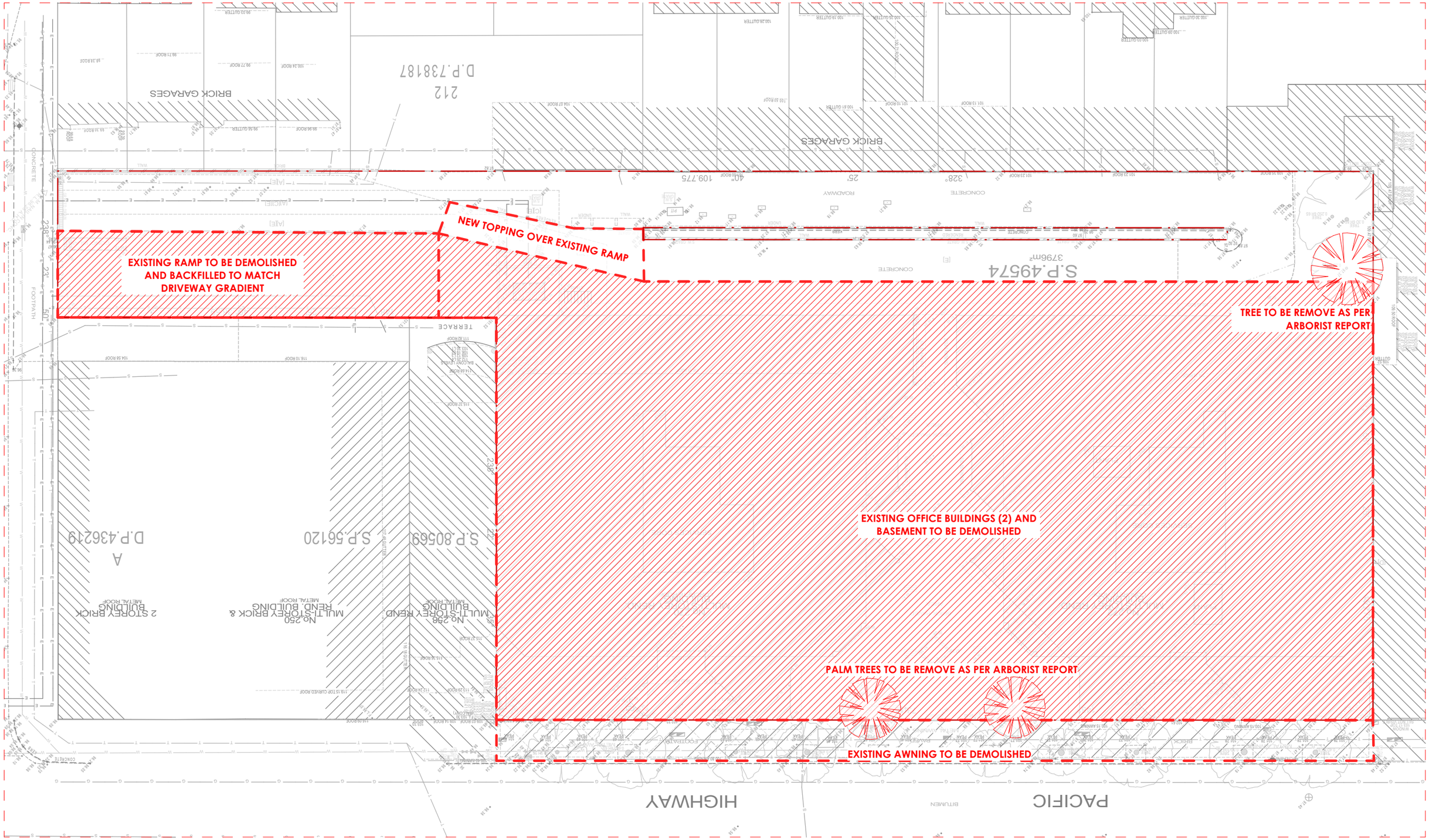
PROJECT ADDRESS:
270-272 Pacific Hwy, Crows Nest

DRAWING TITLE:
INTERPRETED GEOTECHNICAL CROSS SECTION D-D'

PROJECT No: **214296.02**

DRAWING No: **5**

REVISION: **0**



DEMOLITION PLAN
1:300

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	4/04/20 25		

PROJECT
270 PACIFIC HWY BTR
270 PACIFIC HIGHWAY
CROWS NEST NSW 2064
AUSTRALIA

PHASE: Development Application

PROJECT NORTH

CLIENT
SILVERNIGHT
Darling Park Tower 2, L16, 201 Sussex Street, Sydney NSW 2000 Australia

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DRAWING
DEMOLITION PLAN
DEMOLITION PLAN

PROJECT NUMBER	DRAWING NUMBER	ISSUE
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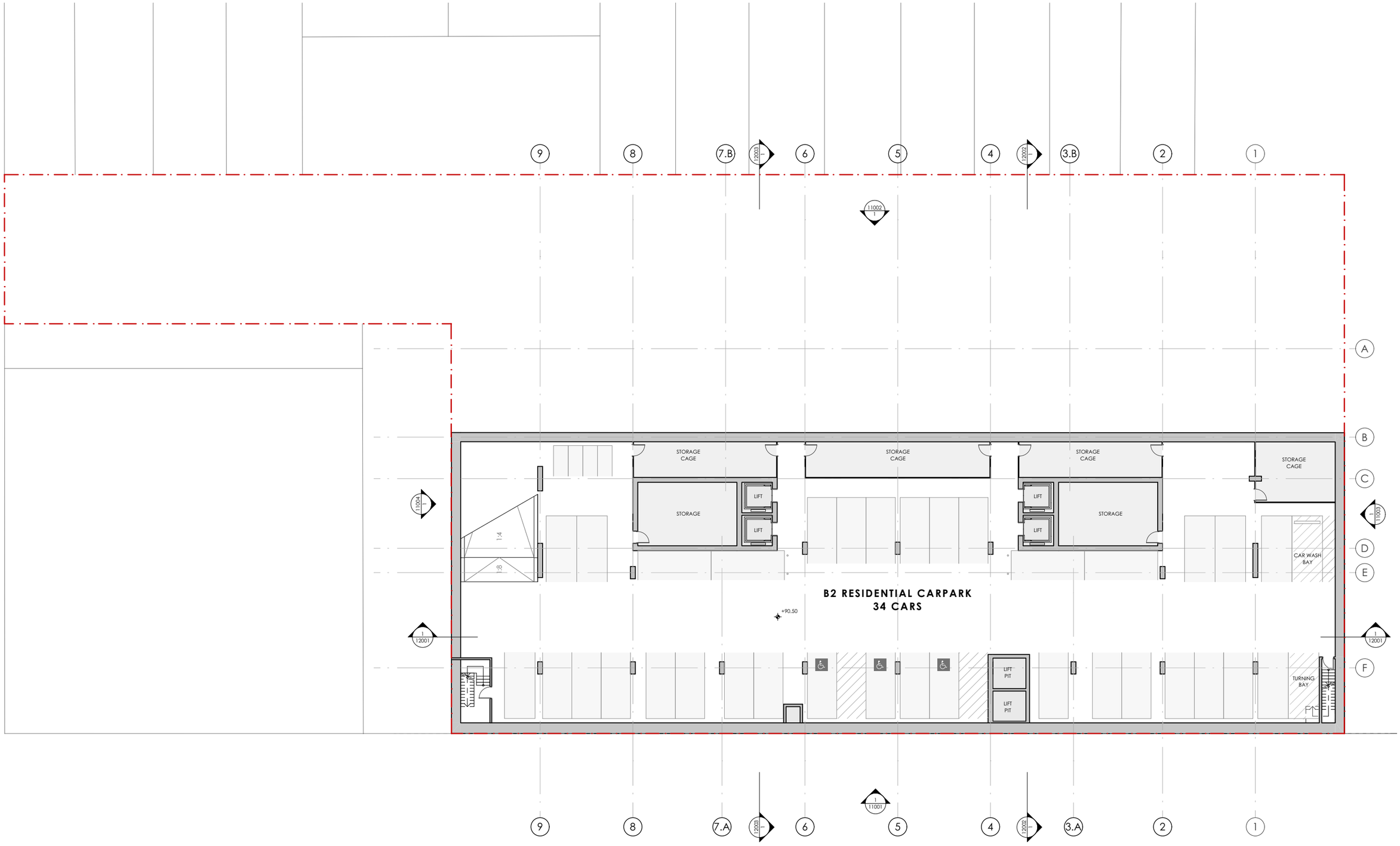

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02	4/04/20 25		

PROJECT
270 PACIFIC HWY BTR
270 PACIFIC HIGHWAY
CROWS NEST NSW 2064
AUSTRALIA

PHASE: Development Application

PROJECT NORTH

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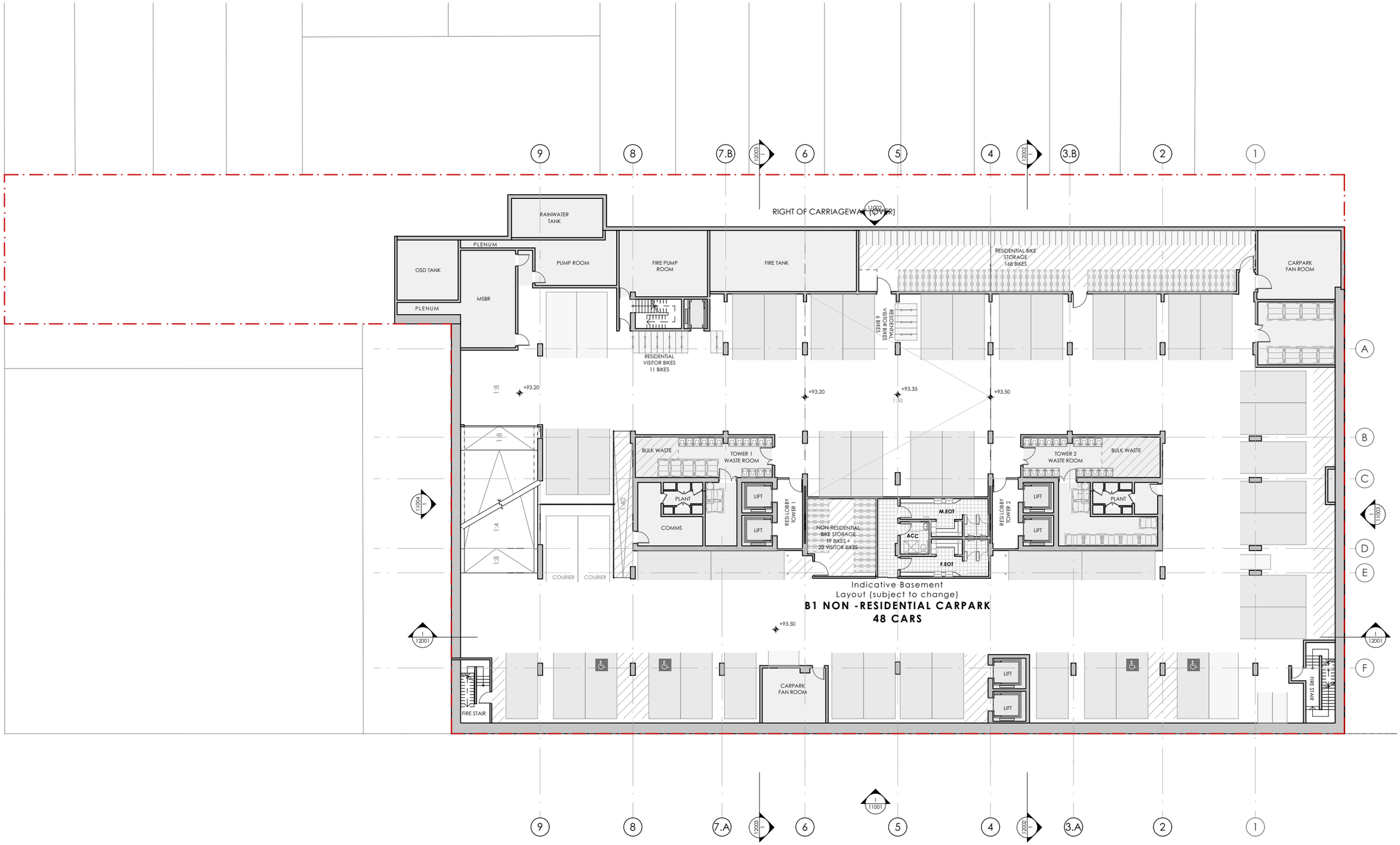
BASEMENT 02

PROJECT NUMBER **22501**
DRAWING NUMBER **DA-10001**
ISSUE **02**



BASEMENT 01
1:300

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INCONSISTENCIES ARE TO BE REPORTED TO fitzpatrick+partners.

AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	4/04/2025		

PROJECT
270 PACIFIC HWY BTR
270 PACIFIC HIGHWAY
CROWS NEST NSW 2064
AUSTRALIA

PHASE: Development Application

PROJECT NORTH

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BASEMENT 01

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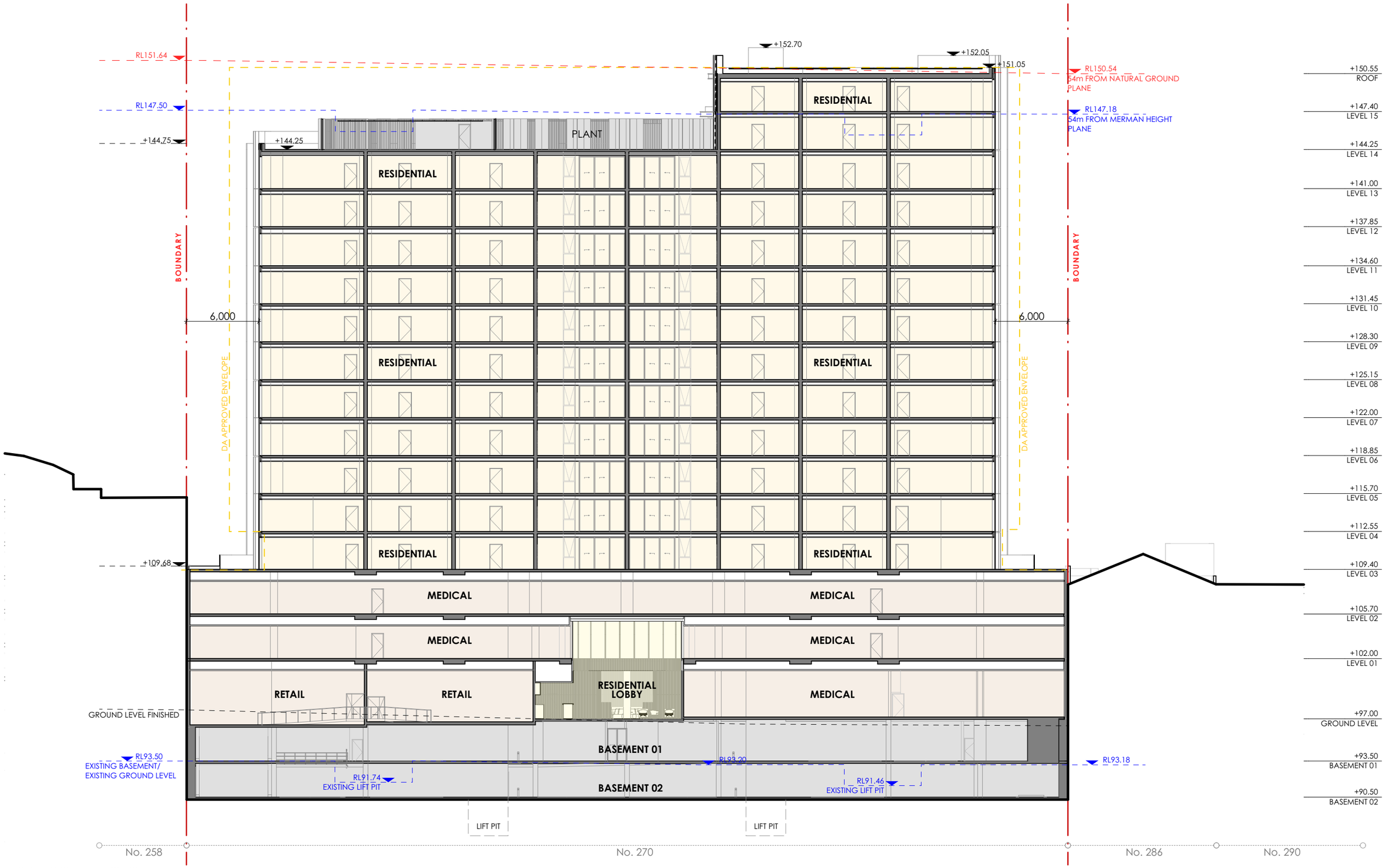

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AMENDMENTS

REV.	DATE	DESCRIPTION	CHK
02	4/04/2025		

PROJECT
270 PACIFIC HWY BTR
270 PACIFIC HIGHWAY
CROWS NEST NSW 2064
AUSTRALIA

PHASE: Development Application

PROJECT NORTH

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DRAWING
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SECTION - NS

PROJECT NUMBER	DRAWING NUMBER	ISSUE
22501	**DA-12001**	**02**

Appendix B

About this Report

Terminology, Symbols and Abbreviations

Soil & 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.

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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 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

Terminology
Symbols
Abbreviations

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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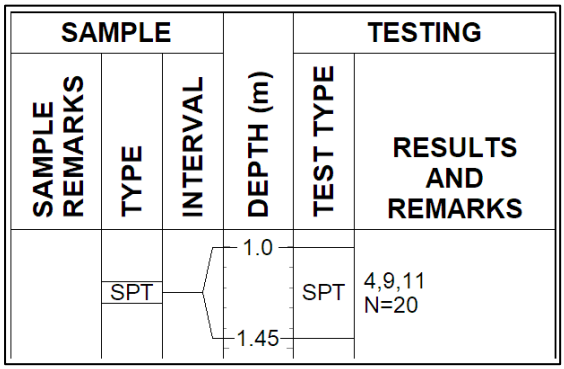
Sampling, Testing and Excavation Methodology

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 C

Engineering Logs

BOREHOLE LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.4 AHD
COORDINATE: E:333536.0, N:6255397.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH2
PROJECT No: 214296.02
DATE: 17/02/25
SHEET: 1 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
17/02/25 NFGWO whilst augering	93	0.20	CONCRETE SLAB:			NA	NA											0.20	PID	1.5ppm	Bentonite / Flush cover	
		0.30	FILL / SAND: brown; fine.		FILL	(VC)	M									A/ES		0.30	PID	1.7ppm	Gravel	
		0.40	FILL / Gravelly SAND: brown; fine; fine to coarse gravel; trace concrete fragments.		FILL	H	w<PL									A/ES		0.40	PID	1.7ppm		
		0.60	CLAY (CI-CH), trace sand: pale grey; medium to high plasticity.		RS				0.60					0.64m: B, 5°, PR, VNR Clay, SM,		A/ES		0.55				
	92	1	SILTSTONE: grey-brown; 5-10% fine sandstone laminations, distinct bedding at 0-5°. Ashfield Shale					MW			100	74		0.78m: DS, 5mm 0.91m: JT, 45°, IR, HE Fe 1.04m: DS, 5mm 1.57m: B, 0-5°, PR, VNR Clay 3mm, 1.35-1.81m: JT, 80-90°, UN, VNR Clay, SM				1	PLT	PL(A)=0.07MPa		
	91	2							2.00	VL - L	95	95		2.64m: B, 5°, PR, VNR Clay, RF, 2.64-2.72m: JT, 45-50°, ST, HE Fe 2.79m: B, 0°, PR, CN, SM 3.52m: JT, 90°, PR, VNR Clay, SM				2	PLT	PL(A)=0.07MPa		
	90	3							3.60	L								3	PLT	PL(A)=0.10MPa		
	89	4						SW			100	72						4	PLT	PL(A)=0.14MPa		
	88	5							4.60	VL				4.51-4.79m: JT, 70°, PR, VNR Clay, SM 4.80m: B, 0°, PR, CT Clay, SM, 5.07m: JT, 45°, UN, VNR Clay, SM, 5.35m: JT, 35°, UN, SN Fe, RF				5	PLT	PL(A)=0.04MPa		
									5.67	SEAM			SEAM	5.67-5.80m: DS, 130mm,								
									5.80	L	92	56		6.07m: B, 0°, PR, VNR Clay 5mm, SM,				6	PLT	PL(A)=0.14MPa		
	87	6.23	SILTSTONE: dark grey; indistinct bedding. Ashfield Shale						6.33					6.10m: JT, 70°, PR, VNR Clay, SM, 6.12m: DS, 10mm 6.23-6.28m: JT, 70°, CU, CN 6.33-6.44m: FG, 110mm									
		6.44																				
		6.53	CORE LOSS: 90 mm						6.53					6.60-6.76m: JT x2, 50-60°, ST, CN, SM,								
	86	7	SILTSTONE: dark grey; indistinct bedding. Ashfield Shale					FR		L	100	60		7.43-7.48m: JT x2, 40-50°, ST, CN, SM, 7.52m: B, 0°, PR, CT Clay, SM, 7.61m: JT, 70°, CU, CN, SM				7	PLT	PL(A)=0.23MPa		
																			PLT	PL(A)=0.17MPa		

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.

Generated with CORE-GS by Geroc - Combined Log

PLANT: Hand tools and proline
METHOD: 150 mm Ø DT to 0.20 m, HA to 0.60 m, NMLC to 12.37 m
REMARKS: 7.5 m monitoring well installed. Elevations interpolated from provided survey plan. Coordinates inferred from georeferenced aerial imagery.

OPERATOR: TightSite (ID)

LOGGED: D. Pham/J. Miller
CASING: PVC to 0.55m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.4 AHD
COORDINATE: E:333536.0, N:6255397.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH2
PROJECT No: 214296.02
DATE: 17/02/25
SHEET: 2 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL: ORIGIN(#)	SOIL: CONSIS.(*) DENSITY.(*)	SOIL: MOISTURE	ROCK: WEATH.	ROCK: DEPTH (m)	ROCK: STRENGTH (VL L M H VH EH)	ROCK: RECOVERY (%)	ROCK: RQD	ROCK: FRACTURE SPACING (m)	ROCK: DEFECTS & REMARKS	SAMPLE: SAMPLE REMARKS	SAMPLE: TYPE	SAMPLE: INTERVAL	DEPTH (m)	TESTING: TEST TYPE	TESTING: RESULTS AND REMARKS	BACKFILL	WELL PIPE
	85	9	[CONT] SILTSTONE: dark grey; indistinct bedding. Ashfield Shale					FR		L	100	60		7.75-7.86m: B x3, 10-30°, PR, CN, SM, 7.90m: B, 25°, CU, CN, RF, 8.07m: JT, 70°, CU, CN, SM, 8.24m: JT, 60°, CN, SM 8.40-8.68m: JT, 90°, SN, SM				9	PLT	PL(A)=0.18MPa	Gravel	
		9.23	CORE LOSS: 310 mm								77	55		8.90-9.15m: FG, 250mm 9.15-9.23m: DS, 88 mm								
	84	9.54	SILTSTONE: dark grey; indistinct bedding. Ashfield Shale						9.54					9.69m: B, 10°, CU, VNR Clay, SM 9.87m: B, 10°, PR, CT Clay 1mm, SM 9.90m: DS, 20mm 9.94-10.27m: JT x5, 40°, PR, CN, SM				10	PLT	PL(A)=0.08MPa		
		10								VL - L	100	56		10.15m: DS, 20mm 10.33-10.44m: JT, 90°, ST, CT Clay 5mm, SM 10.44m: DS, 20mm 10.54-10.90m: FG, 360mm								
	83	10.80	SANDSTONE: grey, fine to medium grained; indistinct to distinct bedding at 0-10°. Mittagong Formation					SW	10.80	L				10.67-10.77m: DS, 100mm				11	PLT	PL(A)=0.16MPa	Bentonite	
		11							11.55	VL	100	90		11.55m: B, 5°, PR, CT Clay 5mm, SM 11.90-11.91m: DS, 10mm								
	82	12							12.00	L				12.30-12.37m: DS, 70mm				12	PLT	PL(A)=0.06MPa		
			Borehole discontinued at 12.37m depth. Target depth reached.																			
		13																				
		14																				
		15																				

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 and proline
OPERATOR: TightSite (ID)
LOGGED: D. Pham/J. Miller
METHOD: 150 mm Ø DT to 0.20 m, HA to 0.60 m, NMLC to 12.37 m
CASING: PVC to 0.55m
REMARKS: 7.5 m monitoring well installed. Elevations interpolated from provided survey plan. Coordinates inferred from georeferenced aerial imagery.

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

CORE PHOTO LOG

CLIENT:	Silvernight (Crows Nest) Landowner Pty Ltd	**SURFACE LEVEL:**	93.4 AHD	**LOCATION ID:**	BH2
PROJECT:	Proposed Mixed-Use Development	**COORDINATE:**	E:333536.0, N:6255397.0	**PROJECT No:**	214296.02
LOCATION:	270-272 Pacific Hwy, Crows Nest, NSW	**DATUM/GRID:**	MGA2020 Zone 56	**DATE:**	17/02/25
		DIP/AZIMUTH:	90°/---°	**SHEET:**	1 of 2

0.60-5.00 m depth

5.00-10.00 m depth

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CORE PHOTO LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.4 AHD
COORDINATE: E:333536.0, N:6255397.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH2
PROJECT No: 214296.02
DATE: 17/02/25
SHEET: 2 of 2

10.00-12.37 m depth

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BOREHOLE LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.5 AHD
COORDINATE: E:333494.0, N:6255412.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH4
PROJECT No: 214296.02
DATE: 20/02/25
SHEET: 1 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
20/02/25 NFGWO whilst augering	93	0.11	CONCRETE SLAB			NA	NA											0.15	PID	0.1ppm	Bentonite	
		0.40	FILL / Gravelly SAND, with silt: grey-brown; fine to coarse; fine to medium, drainage gravel.		FILL	(VC)	M									A/ES		0.30	PID	0.3ppm	Flush cover	
		0.47	CLAY (CI-CH): dark grey; medium to high plasticity.		RS	H	w<PL	MW	0.47							A/ES		0.45				
	92	1	SILTSTONE: grey-brown; 5-10% fine sandstone laminations, distinct bedding at 0-5°. Ashfield Shale					SW	0.90	VL	100	28		0.60-0.66m: B, 5°, PR, SN Fe, RF, x4 1.08m: JT, 45°, PR, CT Clay 1mm, SM 1.27-1.45m: JT, 70°, PR, VNR Clay, SM 1.52-1.61m: JT, 60°, IR, VNR Clay, SM				1	PLT	PL(A)=0.07MPa		
	91	2							1.60					1.89m: B, 0°, PR, CT Clay 3mm, SM 2.13m: JT, 20°, CU, VNR Clay, SM				2	PLT	PL(A)=0.17MPa		
		3	3.10m: becoming dark grey							L	100	98		2.56m: B, 5°, PR, CT Clay 1mm, SM 3.04m: JT, 45°, PR, CN, SM 3.14m: JT, 40°, PR, CN, SM 3.16m: JT, 30°, PR, CN, SM 3.27m: B, 0-5°, PR, CT Clay 1mm, SM 3.37m: FG, 10mm 3.51m: JT, 10°, PR, CN, SM				3	PLT	PL(A)=0.18MPa		
	90	4						FR	3.50	VL - L								4	PLT	PL(A)=0.09MPa		
	89	4.90							4.18		100	95		4.18m: JT, 40°, PR, CT Clay 1mm, SM							Gravel	
	88	5	SILTSTONE: dark grey; indistinct bedding. Ashfield Shale											4.79-4.86m: JT, 70-80°, CU, CN, SM 4.87m: JT, 30°, PR, CN, SM				5	PLT	PL(A)=0.12MPa		
		6							5.60		100	79		5.29-5.53m: JT, 70-90°, CU, CN, SM 5.55m: JT, 30°, PR, CN, SM 5.62m: JT, 30°, PR, CN, SM 5.66m: DS, 10mm 5.82m: FG, 20mm 5.86m: JT, 20°, PR, CN, SM 5.89m: FG, 50mm 6.14m: JT, 45°, PR, CN, SM 6.17-6.21m: JT, 70°, PR, VNR Clay, SM 6.22m: DS, 10mm 6.24m: DS, 10mm 6.29m: DS, 10mm 6.61m: JT, 45°, PR, CN, SM 6.79m: JT, 45°, PR, CN, SM 6.87-7.10m: JT, 80°, PR, CN, SM 7.10m: B, 5°, PR, CT Clay 3mm, SM 7.27m: FG, 30mm 7.35-7.42m: JT, 90°, ST, CN, SM 7.57m: B, 0°, PR,				6	PLT	PL(A)=0.14MPa		
	87	7						SW		L	100	64						7	PLT	PL(A)=0.15MPa		
	86								7.70		100	84									entonite	
								FR			100	100							PLT	PL(A)=0.15MPa		

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.

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PLANT: Hand tools and proline
OPERATOR: TightSite (ID)
LOGGED: J. Miller
METHOD: 150 mm Ø DT to 0.11 m, HA to 0.47 m, NMLC to 15.00 m
CASING: PVC to 0.47m
REMARKS: 7.5 m monitoring well installed. Elevations interpolated from provided survey plan.. Coordinates inferred from georeferenced aerial imagery.

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.5 AHD
COORDINATE: E:333494.0, N:6255412.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH4
PROJECT No: 214296.02
DATE: 20/02/25
SHEET: 2 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL: ORIGIN(#)	SOIL: CONSIS.(*) DENSITY.(*)	SOIL: MOISTURE	ROCK: WEATH.	ROCK: DEPTH (m)	ROCK: STRENGTH	ROCK: RECOVERY (%)	ROCK: RQD	ROCK: FRACTURE SPACING (m)	ROCK: DEFECTS & REMARKS	SAMPLE: SAMPLE REMARKS	SAMPLE: TYPE	SAMPLE: INTERVAL	DEPTH (m)	TESTING: TEST TYPE	TESTING: RESULTS AND REMARKS	BACKFILL	WELL PIPE
	85		[CONT] SILTSTONE: dark grey; indistinct bedding. Ashfield Shale											CT Clay 3mm, SM 7.64m: DS, 10mm								
		9												8.37m: JT, 50°, PR, CN, SM				9				
											100	100		8.64m: JT, 20°, PR, CN, SM								
														8.86m: JT, 20°, PR, CN, SM								
														8.96m: B, 0-5 °, PR, CT Clay 2mm, SM								
	84													9.07m: JT, 30°, PR, CN, SM								
								FR						9.38m: JT, 30°, PR, CN, SM								
														9.47m: JT, 40°, PR, CN, SM								
														9.48-9.50m: JT, 80°, PR, CN, SM								
		10								L	100	86		9.66m: JT, 40°, PR, CN, SM				10	PLT	PL(A)=0.15MPa		
														9.78m: JT, 20°, PR, CN, SM					PLT	PL(A)=0.11MPa		
	83													10.36m: JT, 45°, PR, CN, SM								
		10.79							10.79					10.39m: B, 0°, PR, VNR Clay, SM								
														10.45-10.51m: JT, 90°, IR, CT Clay 5mm, SM								
		11	SANDSTONE: grey, fine to medium grained; 5-10 % brown siltstone clasts and laminations, indistinct to distinct bedding at 0-10°. Mittagong Formation															11	PLT	PL(A)=0.11MPa	Bentonite	
	82										100	92		11.39m: B, 0°, PR, VNR Clay, RF								
														11.41m: B, 5°, PR, VNR Clay, RF								
									11.80					11.70m: DS, 10mm								
		12												12.19m: B, 0°, PR, SN Fe, RF				12	PLT	PL(A)=0.42MPa		
	81													12.70m: DS, 10mm								
														12.75m: DS, 20mm								
								SW		M	100	91		12.79m: DS, 10mm								
		13												12.91m: DS, 10mm				13	PLT	PL(A)=0.46MPa		
	80																					
		14							13.95									14	PLT	PL(A)=0.26MPa		
										L - M	100	100										
	79	14.50	SANDSTONE: grey and pale grey, fine to coarse grained; 5-10 % siltstone clasts and laminations, indistinct to distinct bedding at 0-10°. Hawkesbury Sandstone						14.50													
		15								M									PLT	PL(A)=0.63MPa		
			Borehole discontinued at 15.00m depth. Target depth reached.																			

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 and proline
OPERATOR: TightSite (ID)
LOGGED: J. Miller
METHOD: 150 mm Ø DT to 0.11 m, HA to 0.47 m, NMLC to 15.00 m
CASING: PVC to 0.47m
REMARKS: 7.5 m monitoring well installed. Elevations interpolated from provided survey plan.. Coordinates inferred from georeferenced aerial imagery.

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Combined Log

CORE PHOTO LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.5 AHD
COORDINATE: E:333494.0, N:6255412.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH4
PROJECT No: 214296.02
DATE: 20/02/25
SHEET: 1 of 2

0.47-5.00 m depth

5.00-10.00 m depth

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CORE PHOTO LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.5 AHD
COORDINATE: E:333494.0, N:6255412.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH4
PROJECT No: 214296.02
DATE: 20/02/25
SHEET: 2 of 2

10.00-15.00 m depth

Generated with CORE-GS by Geroc - Combined Log - 14/03/2025 2:40:06 PM

BOREHOLE LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.3 AHD
COORDINATE: E:333521.0, N:6255365.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH6
PROJECT No: 214296.02
DATE: 19/02/25
SHEET: 1 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK STRENGTH	ROCK RECOVERY (%)	ROCK RQD	ROCK FRACTURE SPACING (m)	ROCK DEFECTS & REMARKS	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
18/02/25 NFGWO whilst augering	93	0.20	CONCRETE SLAB			NA	NA															
		0.37	CLAY (CI-CH): purple-brown; medium to high plasticity.		RS	VSt	w<PL									A/ES A		0.30	PID DCP 5/150	0.2ppm	Bentonite Flush cover	
	92	1	SILTSTONE: grey-brown; 5-10% fine sandstone laminations, distinct bedding at 0-5°. Ashfield Shale					MW	0.37 0.91 1.13	VL SEAM	100	0	SEAM	0.47m: DS, 10mm 0.62m: B, 5-10°, PR, CT Clay 5mm, SM 0.64m: DS, 50mm 0.91-1.13m: DS, 220mm				1	PLT	PL(A)=0.05MPa		
	91	2	2.25m: becoming dark grey						2.25		100	0		1.38-1.52m: JT, 70°, IR, CT Clay 2mm, SM 2.24m: B, 5°, PR, CT Clay, SM 2.36m: B, 5°, PR, CT Clay 1mm, SM				2	PLT	PL(A)=0.08MPa		
	90	3								VL				2.92m: B, 10°, PR, CN Clay 1mm, SM 3.39m: DS, 10mm				3	PLT	PL(A)=0.07MPa		
	89	4									100	0						4	PLT	PL(A)=0.07MPa	Gravel	
	88	5.00	SILTSTONE: dark grey; indistinct bedding. Ashfield Shale					SW	4.83	VL - L	100	8		4.83-4.93m: JT, 60°, PR, CN, SM 5.28m: B, 0°, PR, CT Clay 2mm, SM 5.29m: B, 0°, PR, CT Clay 2mm, SM 5.30m: B, 0°, PR, CT Clay 2mm, SM 5.78m: JT, 45°, PR, CT Clay 3mm, SM				5	PLT	PL(A)=0.09MPa		
	87	6							6.40 6.48	SEAM L	100	99	SEAM	6.35m: DS, 50mm 6.40m: FG, 80mm 7.11-7.66m: JT, 60°, PR, CN, SM				6	PLT	PL(A)=0.09MPa		
	86	7												7.59m: DS, 10mm				7	PLT	PL(A)=0.15MPa		
											100	97							PLT	PL(A)=0.16MPa	Bentonite	

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 and proline
OPERATOR: TightSite (ID)
LOGGED: J. Miller
METHOD: 150 mm Ø DT to 0.20 m, HA to 0.37 m, NMLC to 10.00 m
CASING: PVC to 0.37m
REMARKS: 7.5 m monitoring well installed. Elevations interpolated from provided survey plan. Coordinates inferred from georeferenced aerial imagery.

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Combined Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.3 AHD
COORDINATE: E:333521.0, N:6255365.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH6
PROJECT No: 214296.02
DATE: 19/02/25
SHEET: 2 of 2

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL: ORIGIN(#)	SOIL: CONSIS.(*) DENSITY.(*)	SOIL: MOISTURE	ROCK: WEATH.	ROCK: DEPTH (m)	ROCK: STRENGTH	ROCK: RECOVERY (%)	ROCK: RQD	ROCK: FRACTURE SPACING (m)	ROCK: DEFECTS & REMARKS	SAMPLE: SAMPLE REMARKS	SAMPLE: TYPE	SAMPLE: INTERVAL	DEPTH (m)	TESTING: TEST TYPE	TESTING: RESULTS AND REMARKS	BACKFILL	WELL PIPE
	85		[CONT] SILTSTONE: dark grey; indistinct bedding. Ashfield Shale					SW		L	100	97		8.68m: JT, 45°, PR, CN, SM								
		9																9	PLT	PL(A)=0.13MPa	Bentonite	
	84								9.18	SEAM			SEAM	9.18m: DS, 90mm								
								HW	9.27	L												
									9.48	VL	100	70		9.50m: DS, 50mm								
		9.65	SANDSTONE: grey, fine to medium grained; indistinct to distinct bedding at 0-10°. Mittagong Formation						9.62m: DS, 30mm													
		10						MW	9.65	L				9.85m: DS, 20mm					PLT	PL(A)=0.16MPa		
			Borehole discontinued at 10.00m depth. Target depth reached.																			
		11																				
		12																				
		13																				
		14																				
		15																				

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 and proline
OPERATOR: TightSite (ID)
LOGGED: J. Miller
METHOD: 150 mm Ø DT to 0.20 m, HA to 0.37 m, NMLC to 10.00 m
CASING: PVC to 0.37m
REMARKS: 7.5 m monitoring well installed. Elevations interpolated from provided survey plan. Coordinates inferred from georeferenced aerial imagery.

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Combined Log

CORE PHOTO LOG

CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd
PROJECT: Proposed Mixed-Use Development
LOCATION: 270-272 Pacific Hwy, Crows Nest, NSW

SURFACE LEVEL: 93.3 AHD
COORDINATE: E:333521.0, N:6255365.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH6
PROJECT No: 214296.02
DATE: 19/02/25
SHEET: 1 of 1

0.37-5.00 m depth

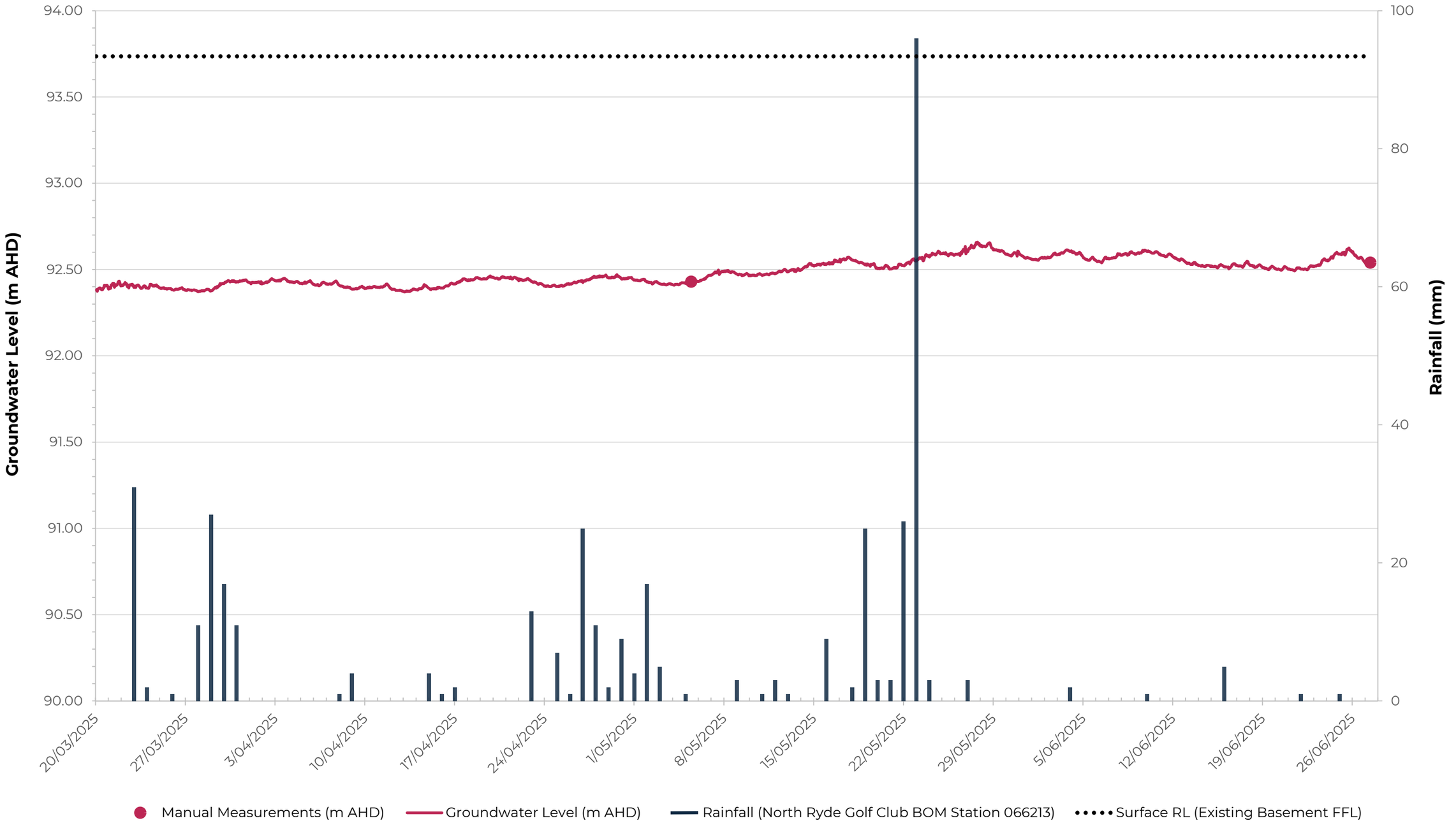
5.00-10.00 m depth

Generated with CORE-GS by Geroc - Combined Log - 14/03/2025 2:40:13 PM

Appendix D

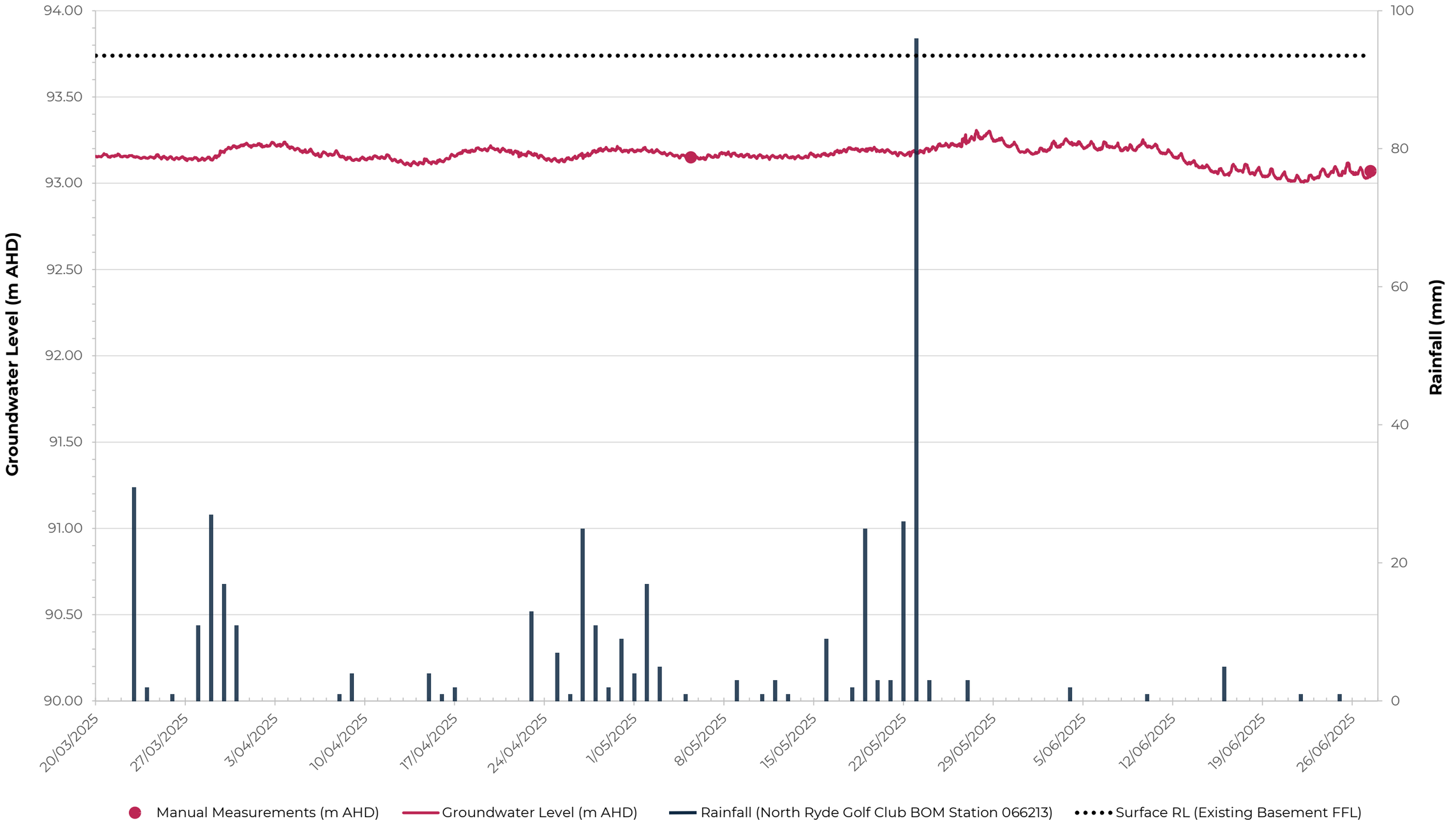
Groundwater Monitoring Hydrographs

BH2



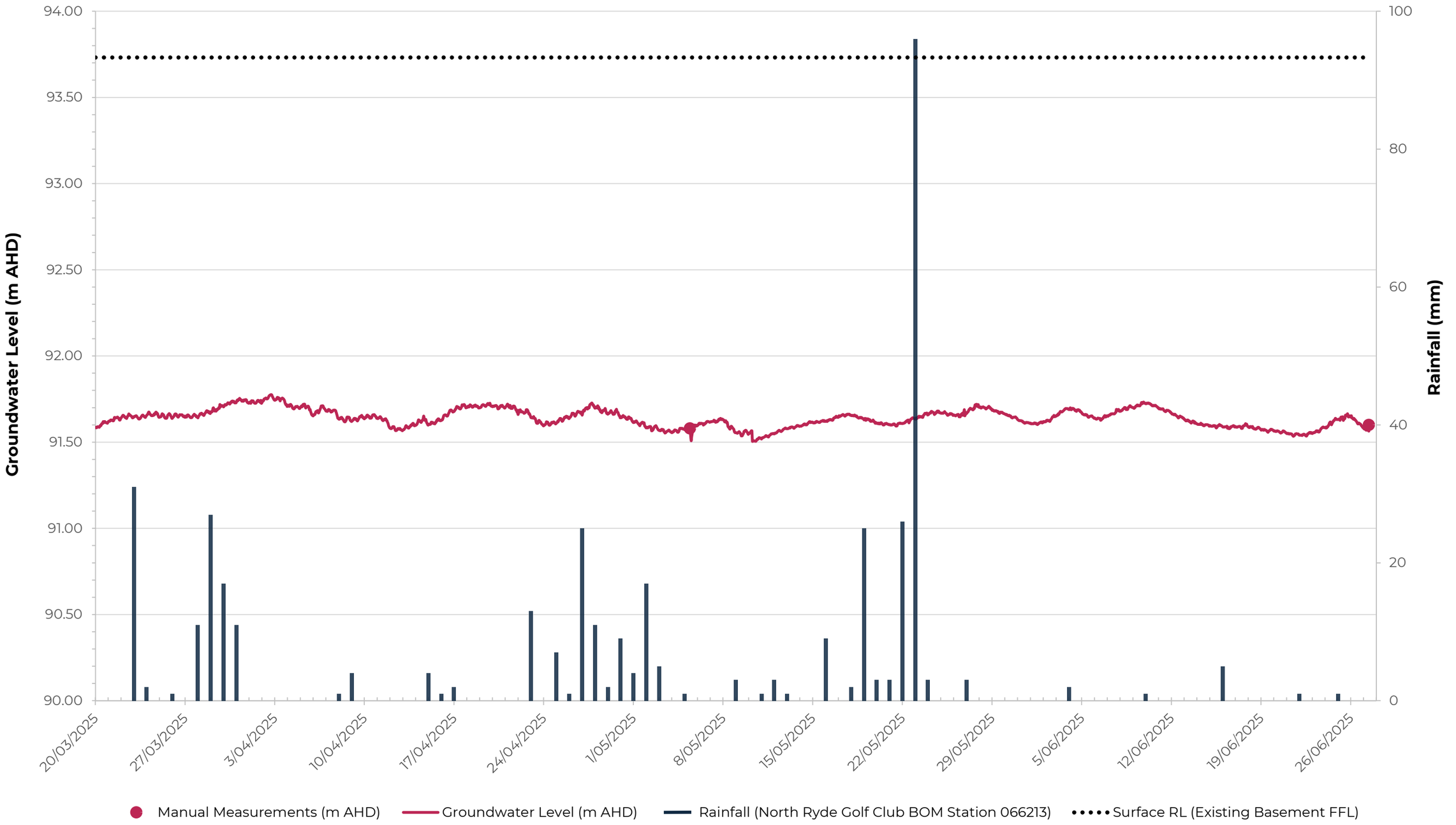
Douglas PARTNERS	CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd	**Groundwater Monitoring 20/03/2025 to 27/06/2025**	PROJECT NO: 214296.02
	OFFICE: Sydney / DRAWN BY: MAB	**Proposed Mixed-Use Development**	FIGURE NO: 1 of 3
	SURFACE LEVEL: 93.4 m AHD / DATE: 27 June 2025	**270 Pacific Hwy, Crows Nest, NSW**	REVISION: Rev1

BH4



Douglas PARTNERS	CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd	**Groundwater Monitoring 20/03/2025 to 27/06/2025**	PROJECT NO: 214296.02
	OFFICE: Sydney / DRAWN BY: MAB	**Proposed Mixed-Use Development**	FIGURE NO: 2 of 3
	SURFACE LEVEL: 93.5 m AHD / DATE: 27 June 2025	**270 Pacific Hwy, Crows Nest, NSW**	REVISION: Rev1

BH6



Douglas PARTNERS	CLIENT: Silvernight (Crows Nest) Landowner Pty Ltd	**Groundwater Monitoring 20/03/2025 to 27/06/2025**	PROJECT NO: 214296.02
	OFFICE: Sydney / DRAWN BY: MAB	**Proposed Mixed-Use Development**	FIGURE NO: 3 of 3
	SURFACE LEVEL: 93.3 m AHD / DATE: 27 June 2025	**270 Pacific Hwy, Crows Nest, NSW**	REVISION: Rev1

Appendix E

Hydraulic Conductivity Testing

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	21-Feb-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

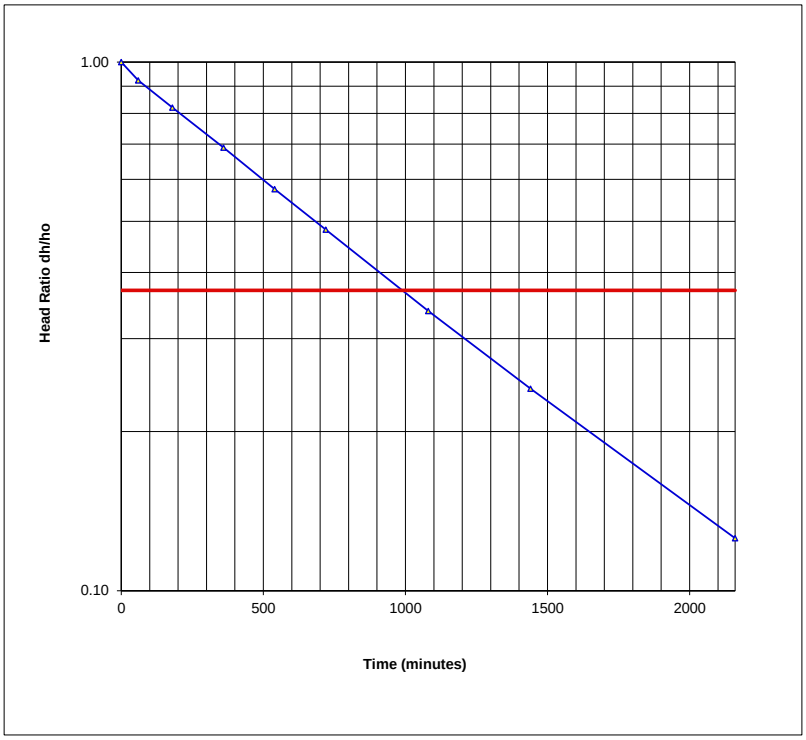
Test Location	BH2	**Test No.**	1	
Description:	Standpipe in borehole	Easting:	333536	m
Material type:	Siltstone	Northing	6255397	m
		Surface Level:	93.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	1.14	m
Borehole diameter (2R)	76	mm	Depth to water at start of test	9.89	m
Effective well screen length (Le)	9.36	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	10.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	9.89	8.75	1.000
60.0	9.22	8.08	0.923
180.0	8.32	7.18	0.821
360.0	7.17	6.03	0.689
540.0	6.17	5.03	0.575
720.0	5.36	4.22	0.482
1080.0	4.10	2.96	0.338
1440.0	3.25	2.11	0.241
2160.0	2.24	1.10	0.126



To = 980 min
58800 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 =**	**7.2E-09**	m/sec
	=	**0.00062**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	25-Feb-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

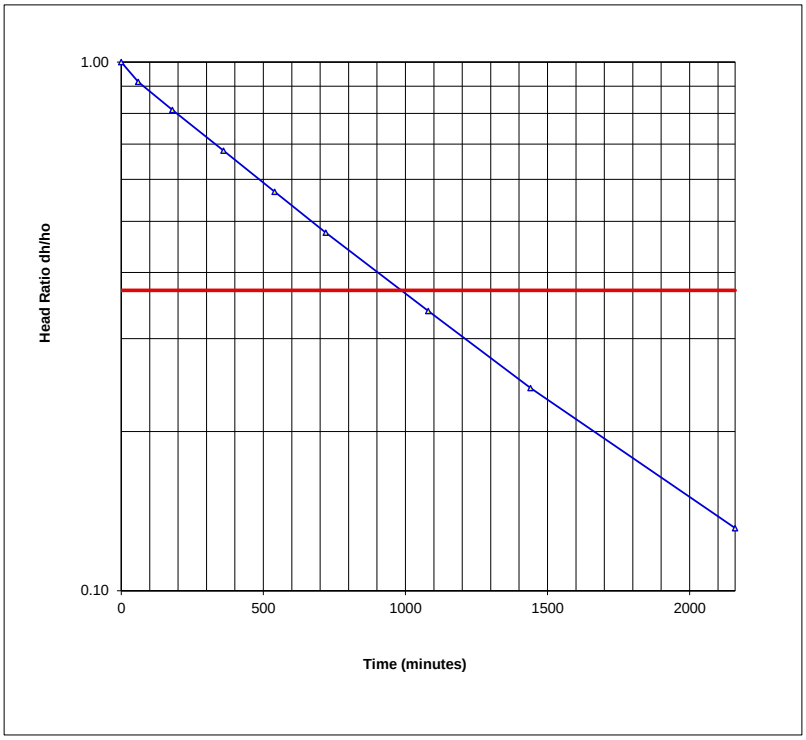
Test Location	BH2	**Test No.**	2	
Description:	Standpipe in borehole	Easting:	333536	m
Material type:	Siltstone	Northing	6255397	m
		Surface Level:	93.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	1.14	m
Borehole diameter (2R)	76	mm	Depth to water at start of test	9.74	m
Effective well screen length (Le)	9.36	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	10.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	9.74	8.60	1.000
60.0	9.03	7.89	0.917
180.0	8.12	6.98	0.812
360.0	6.99	5.85	0.680
540.0	6.03	4.89	0.569
720.0	5.23	4.09	0.476
1080.0	4.05	2.91	0.338
1440.0	3.22	2.08	0.242
2160.0	2.27	1.13	0.131



To = 980 min
58800 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 =**	**7.2E-09**	m/sec
	=	**0.00062**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	5-Mar-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

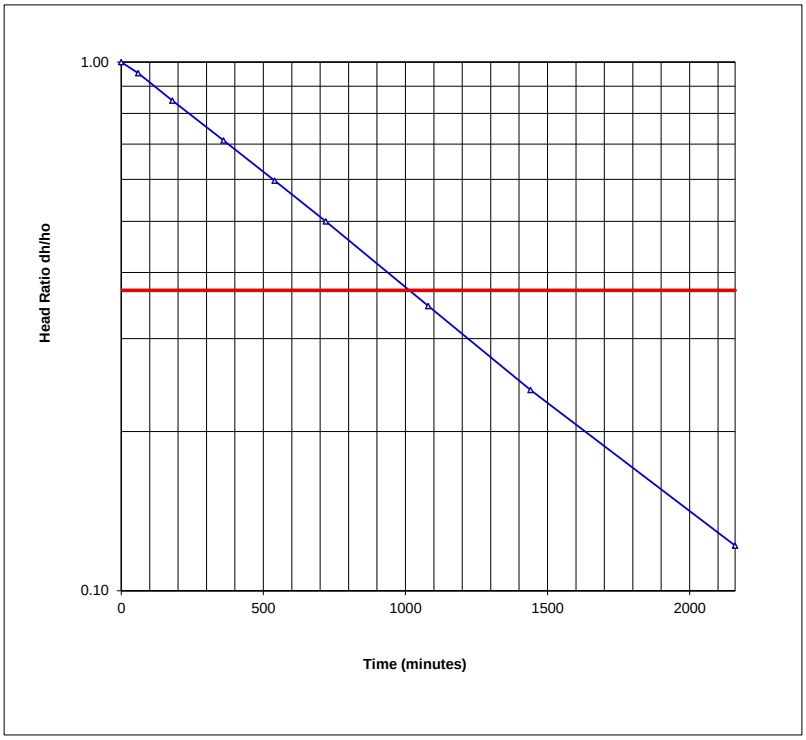
Test Location	BH2	**Test No.**	3	
Description:	Standpipe in borehole	Easting:	333536	m
Material type:	Siltstone	Northing	6255397	m
		Surface Level:	93.4	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	0.97	m
borehole diameter (2R)	76	mm	Depth to water at start of test	10.19	m
Effective well screen length (Le)	9.50	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	10.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	10.19	9.22	1.000
60.0	9.75	8.78	0.953
180.0	8.77	7.80	0.846
360.0	7.52	6.55	0.711
540.0	6.47	5.50	0.597
720.0	5.58	4.61	0.500
1080.0	4.16	3.19	0.346
1440.0	3.18	2.21	0.240
2160.0	2.09	1.12	0.122



To = 1015 min
60900 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 =**	**6.9E-09**	m/sec
	=	**0.001**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	21-Feb-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

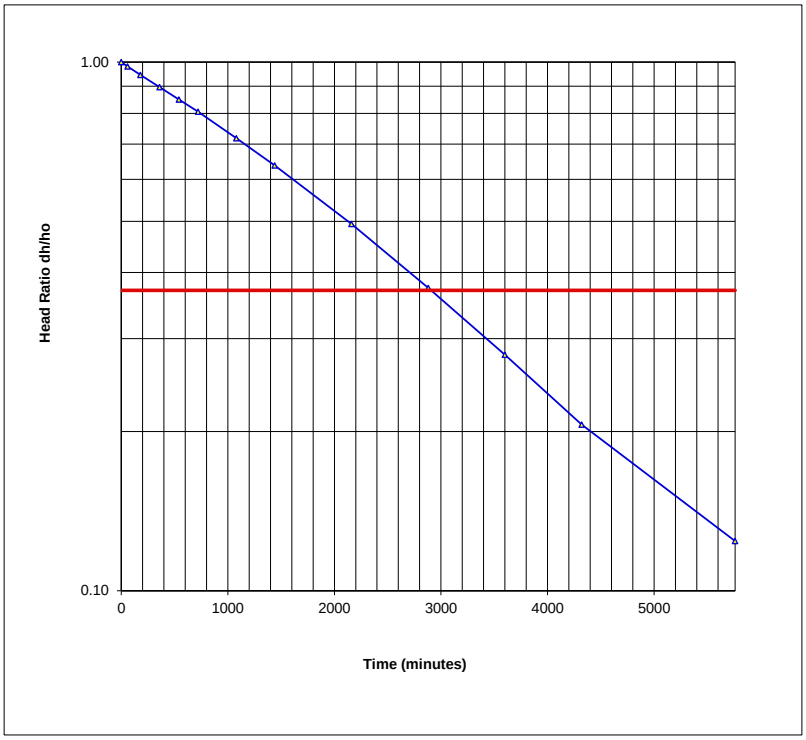
Test Location	BH4	**Test No.**	1	
Description:	Standpipe in borehole	Easting:	333494	m
Material type:	Siltstone	Northing	6255412	m
		Surface Level:	93.5	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	0.41	m
borehole diameter (2R)	76	mm	Depth to water at start of test	7.18	m
Effective well screen length (Le)	6.50	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	7.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	7.18	6.77	1.000
60.0	7.05	6.64	0.981
180.0	6.81	6.40	0.946
360.0	6.48	6.07	0.897
540.0	6.16	5.75	0.850
720.0	5.86	5.45	0.806
1080.0	5.27	4.86	0.718
1440.0	4.73	4.32	0.638
2160.0	3.75	3.34	0.494
2880	2.94	2.53	0.374
3600	2.30	1.89	0.280
4320	1.80	1.39	0.206
5760	1.25	0.84	0.124



To = 2900 min
1.7E+05 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 =**	**3.3E-09**	m/sec
	=	**0.00028**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	25-Feb-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

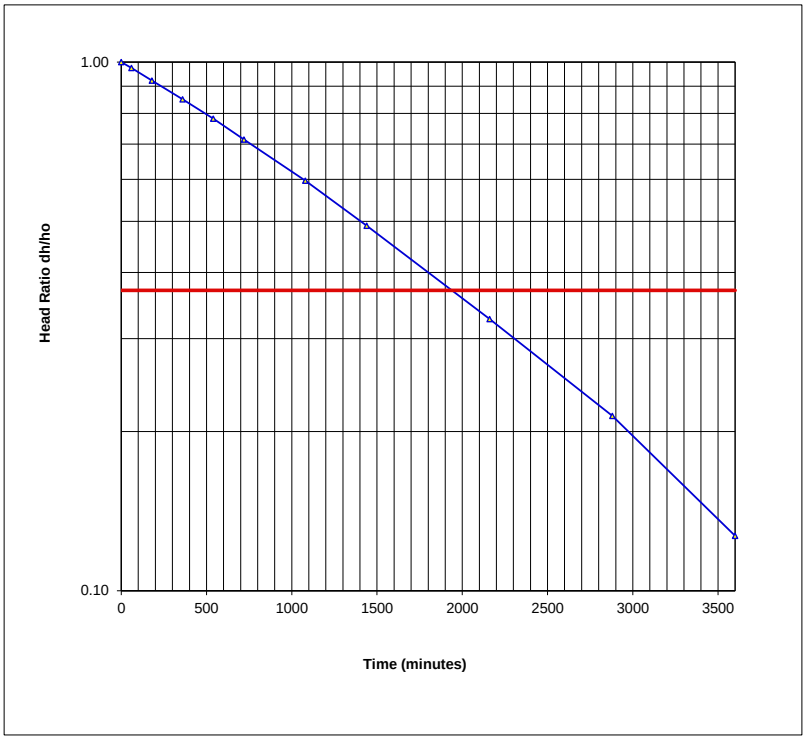
Test Location	BH4	**Test No.**	2	
Description:	Standpipe in borehole	Easting:	333494	m
Material type:	Siltstone	Northing	6255412	m
		Surface Level:	93.5	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	0.41	m
borehole diameter (2R)	76	mm	Depth to water at start of test	7.18	m
Effective well screen length (Le)	6.50	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	7.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	7.18	6.77	1.000
60.0	7.01	6.60	0.975
180.0	6.66	6.25	0.923
360.0	6.17	5.76	0.851
540.0	5.70	5.29	0.781
720.0	5.24	4.83	0.713
1080.0	4.45	4.04	0.597
1440.0	3.73	3.32	0.490
2160.0	2.62	2.21	0.326
2880	1.86	1.45	0.214
3600	1.27	0.86	0.127



To = 1920 min
115200 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 =**	**5.0E-09**	m/sec
	=	**0.00043**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	5-Mar-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

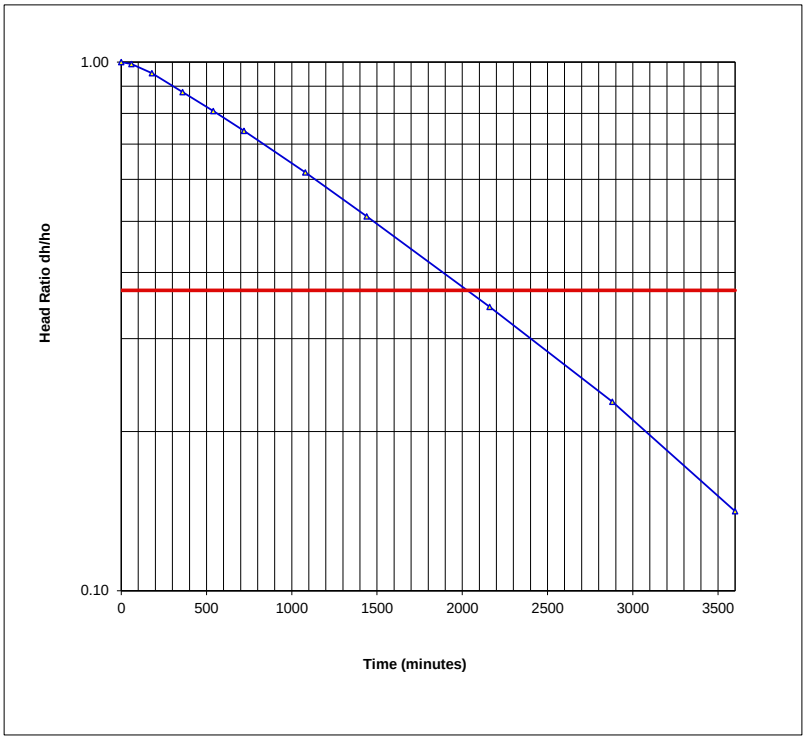
Test Location	BH4	**Test No.**	3	
Description:	Standpipe in borehole	Easting:	333494	m
Material type:	Siltstone	Northing	6255412	m
		Surface Level:	93.5	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	0.35	m
borehole diameter (2R)	76	mm	Depth to water at start of test	7.19	m
Effective well screen length (Le)	6.50	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	7.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	7.19	6.84	1.000
60.0	7.13	6.78	0.992
180.0	6.86	6.51	0.953
360.0	6.35	6.00	0.877
540.0	5.87	5.52	0.808
720.0	5.42	5.07	0.742
1080.0	4.58	4.23	0.619
1440.0	3.84	3.49	0.511
2160.0	2.70	2.35	0.344
2880	1.91	1.56	0.228
3600	1.32	0.97	0.141



To = 2030 min
121800 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 =**	**4.7E-09**	m/sec
	=	**0.000**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	21-Feb-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

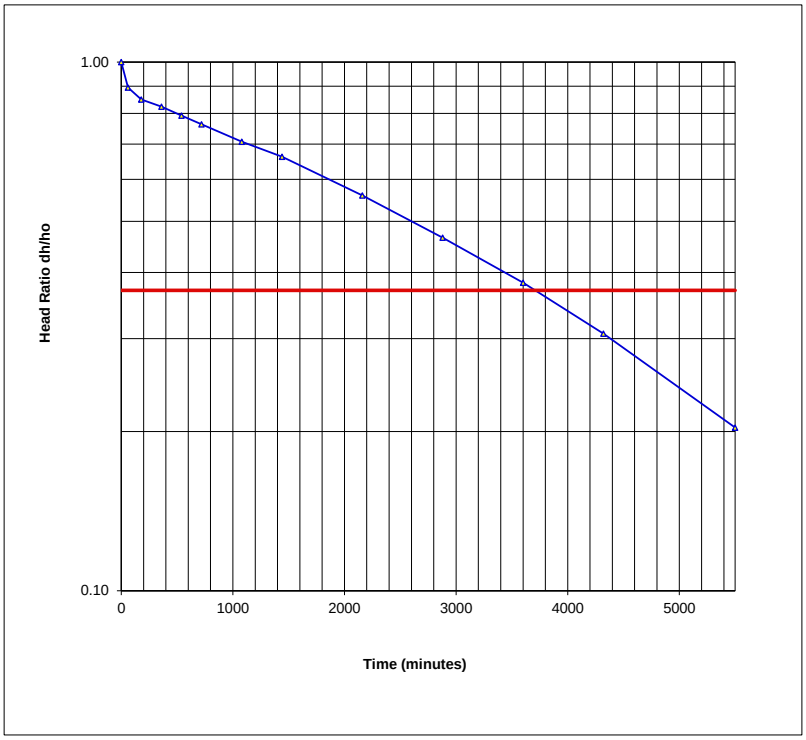
Test Location	BH6	**Test No.**	1	
Description:	Standpipe in borehole	Easting:	333521	m
Material type:	Siltstone	Northing	6255365	m
		Surface Level:	93.3	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	2.37	m
borehole diameter (2R)	76	mm	Depth to water at start of test	6.84	m
Effective well screen length (Le)	5.13	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	7.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	6.84	4.47	1.000
60.0	6.37	4.00	0.895
180.0	6.17	3.80	0.850
360.0	6.05	3.68	0.823
540.0	5.91	3.54	0.792
720.0	5.78	3.41	0.763
1080.0	5.53	3.16	0.707
1440.0	5.33	2.96	0.662
2160.0	4.87	2.50	0.559
2880	4.45	2.08	0.465
3600	4.08	1.71	0.383
4320	3.74	1.37	0.306
5500	3.28	0.91	0.204



To = 3700 min
222000 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 =**	**3.1E-09**	m/sec
	=	**0.00027**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	25-Feb-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

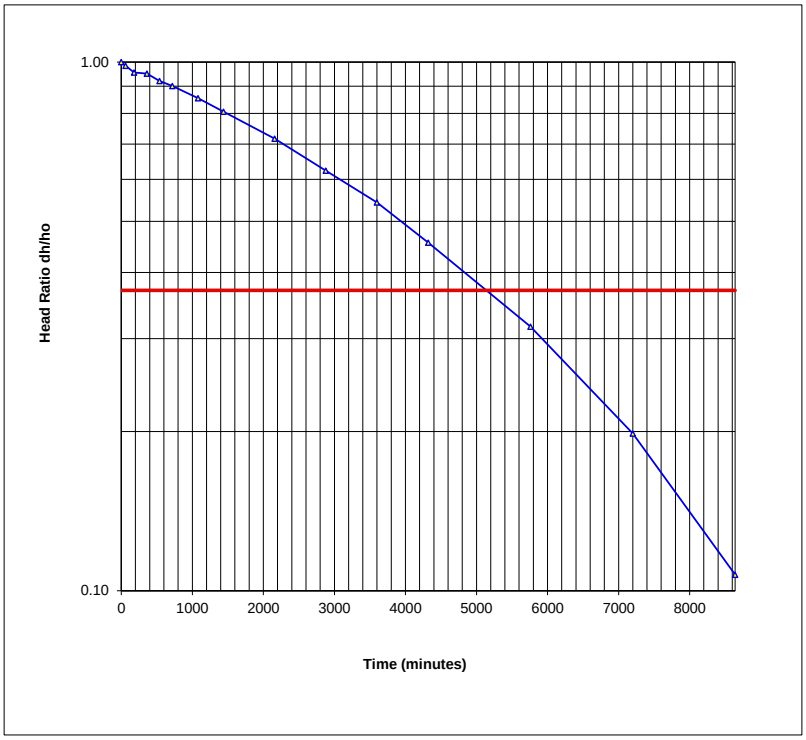
Test Location	BH6	**Test No.**	2	
Description:	Standpipe in borehole	Easting:	333521	m
Material type:	Siltstone	Northing	6255365	m
		Surface Level:	93.3	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	2.37	m
borehole diameter (2R)	76	mm	Depth to water at start of test	7.31	m
Effective well screen length (Le)	5.13	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	7.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	7.31	4.94	1.000
60.0	7.23	4.86	0.984
180.0	7.09	4.72	0.955
360.0	7.07	4.70	0.951
540.0	6.92	4.55	0.921
720.0	6.82	4.45	0.901
1080.0	6.59	4.22	0.854
1440.0	6.35	3.98	0.806
2160.0	5.91	3.54	0.717
2880	5.45	3.08	0.623
3600	5.05	2.68	0.543
4320	4.62	2.25	0.455
5760	3.93	1.56	0.316
7200	3.35	0.98	0.198
8640	2.90	0.53	0.107



To = 5150 min
309000 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 =**	**2.2E-09**	m/sec
	=	**0.00019**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising Head Test Report

Client:	Silvernight (Crows Nest) Landowner Pty Ltd	Project No:	214296.02
Project:	Proposed Mixed-Use Development	Test date:	5-Mar-25
Location:	270-272 Pacific Hwy, Crows Nest NSW	Tested by:	JM

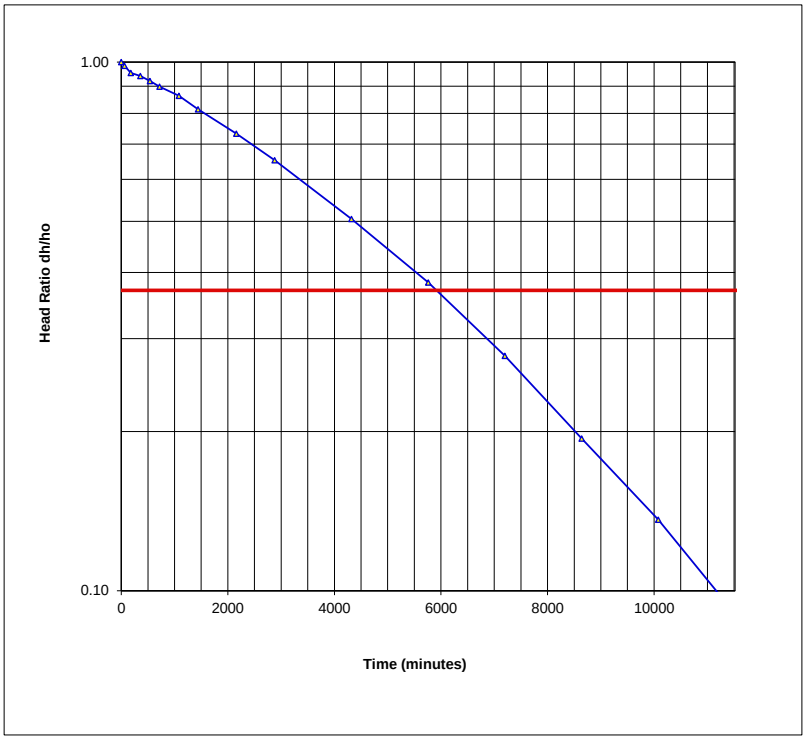
Test Location	BH6	**Test No.**	3	
Description:	Standpipe in borehole	Easting:	333521	m
Material type:	Siltstone	Northing	6255365	m
		Surface Level:	93.3	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	1.72	m
borehole diameter (2R)	76	mm	Depth to water at start of test	7.10	m
Effective well screen length (Le)	5.78	m	Depth of top of gravel pack	1.00	m
			Depth of base of PVC standpipe	7.50	m

Test Results

Time (min)	Depth (m)	Change in Head dH (m)	dH/Ho
0.0	7.10	5.38	1.000
60.0	7.01	5.29	0.984
180.0	6.85	5.13	0.954
360.0	6.78	5.06	0.941
540.0	6.67	4.95	0.921
720.0	6.55	4.83	0.899
1080.0	6.36	4.64	0.863
1440.0	6.10	4.38	0.814
2160.0	5.66	3.94	0.732
2880	5.23	3.51	0.652
4320	4.44	2.72	0.505
5760	3.78	2.06	0.383
7200	3.22	1.50	0.278
8640	2.76	1.04	0.194
10080	2.45	0.73	0.136
11520	2.21	0.49	0.090
12960	2.04	0.32	0.060
14400	1.94	0.22	0.041
15840	1.85	0.13	0.024
17280	1.79	0.07	0.014



To = 5900 min
354000 seconds (4.1 days)

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 =**	**1.8E-09**	m/sec
	=	**0.00015**	m/day

Appendix F

Summary of Laboratory Results

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Table G2: Summary of Laboratory Results – Groundwater

		Metals - Dissolved								TRH				BTEX						PAH															
		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	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Naphthalene	Benzo(a)pyrene (BaP)	Benzo(b+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene	Sum of detected PAH
	PQL	1	0.1	1	1	1	0.05	1	1	10	50	100	100	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
NEPC (2013) HSL B (2-4m)										NL	NL			5000	NL	NL			NL					NL											
NEPC (2013) HSL D (2-4m)										NL	NL			30 000	NL	NL			NL					NL											
ANZG (2018) 95% LOP Fresh (Hardness adjusted)		13	0.7	10.6	1.4	20.8	0.06	36.9	26.8					950	180	80	350	75				0.01		16	0.1					1			0.6		
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	µg/L
BH2	5/03/2025	<1	**1.4**	<1	**49**	<1	<0.05	**17**	**160**	<10	<50	<100	<100	<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
BH4	5/03/2025	**2**	**4.7**	<1	**640**	**1**	<0.05	**110**	**670**	<10	<50	<100	<100	<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
BH6	5/03/2025	**1**	**7.9**	<1	**1,100**	**1**	<0.05	**330**	**930**	<10	<50	<100	<100	<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	5/03/2025	**1**	**6.6**	<1	**1000**	<1	<0.05	**280**	**750**	<10	<50	<100	<100	<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
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 Clay 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.

270 Pacific Hwy, crows nest, NSW, 2065

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Table G2: Summary of Labora

		OCP																					OPP																			
		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	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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.02	0.05	0.009	0.05	0.01	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.004	0.05	0.05	0.05	0.004
NEPC (2013) HSL B (2-4m)																																									
NEPC (2013) HSL D (2-4m)																																									
ANZG (2018) 95% LOP Fresh (Hardness adjusted)			0.006		0.001	0.01							0.01		0.01			0.005								0.01		0.01		0.15			0.2		0.05	0.004					
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	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
BH2	5/03/2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.05	<0.009	<0.05	<0.01	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.004	<0.05	<0.05	<0.05	<0.004
BH4	5/03/2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.05	<0.009	<0.05	<0.01	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.004	<0.05	<0.05	<0.05	<0.004
BH6	5/03/2025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.05	<0.009	<0.05	<0.01	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.004	<0.05	<0.05	<0.05	<0.004
BD1	5/03/2025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- No criterion / not defined / not test
* QA/QC replicate of sample listed di
NL Not limiting
PQL Practical quantitation limit
Shaded cell is exceedance of guide
Where one or more guideline value
NEPC (2013) National Environment
ANZG (2018) Australian and New Ze
ANZG (2018) Australian and New Ze
Underlining of ANZG (2018) criteria
ANZG (2018) DGV adopted for most
ANZG (2018) DGV adopted for alum
ANZG (2018) Ammonia DGV is pH a

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Table G2: Summary of Labora

		PCB								VOC			
		Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Sum of detected PCB	Bromodichloromethane	Chloroform	All other VOC	Sum of detected VOC
	PQL	2	2	2	2	2	2	2	2	1	1		1
NEPC (2013) HSL B (2-4m)													
NEPC (2013) HSL D (2-4m)													
ANZG (2018) 95% LOP Fresh (Hardness adjusted)					0.3		0.01				770		
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
BH2	5/03/2025	<2	<2	<2	<2	<2	<2	<2	<2	<1	**1**	<PQL	**1**
BH4	5/03/2025	<2	<2	<2	<2	<2	<2	<2	<2	<1	**1**	<PQL	**1**
BH6	5/03/2025	<2	<2	<2	<2	<2	<2	<2	<2	**1**	**5**	<PQL	**6**
BD1	5/03/2025	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

- No criterion / not defined / not test
- * QA/QC replicate of sample listed di
- NL Not limiting
- PQL Practical quantitation limit
- Shaded cell is exceedance of guide
- Where one or more guideline value
- NEPC (2013) National Environment
- ANZG (2018) Australian and New Ze
- ANZG (2018) Australian and New Ze
- Underlining of ANZG (2018) criteria
- ANZG (2018) DGV adopted for most
- ANZG (2018) DGV adopted for alum
- ANZG (2018) Ammonia DGV is pH a

Appendix G

Lab Documentation

Envirolab Services Pty Ltd
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CERTIFICATE OF ANALYSIS 374754

Client Details

Client	Douglas Partners Pty Ltd
Attention	Wen-Fei Yuan
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**214296.03, Crows Nest**
Number of Samples	6 Water
Date samples received	05/03/2025
Date completed instructions received	05/03/2025

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	12/03/2025
Date of Issue	11/03/2025

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Giovanni Agosti, Group Technical Manager
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

VOCs in water				
Our Reference		374754-1	374754-2	374754-3
Your Reference	UNITS	BH2	BH4	BH6
Type of sample		Water	Water	Water
Date Extracted	-	09/03/2025	09/03/2025	09/03/2025
Date Analysed	-	10/03/2025	10/03/2025	10/03/2025
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	1	1	5
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	<1	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
Bromoform	µg/L	<1	<1	<1

VOCs in water				
Our Reference		374754-1	374754-2	374754-3
Your Reference	UNITS	BH2	BH4	BH6
Type of sample		Water	Water	Water
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	%	103	101	102
Surrogate Toluene-d8	%	101	100	101
Surrogate 4-Bromofluorobenzene	%	100	97	98

vTRH(C6-C10)/BTEXN in Water						
Our Reference		374754-1	374754-2	374754-3	374754-4	374754-5
Your Reference	UNITS	BH2	BH4	BH6	BD1	TB
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/03/2025	09/03/2025	09/03/2025	09/03/2025	09/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025	10/03/2025	10/03/2025
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	103	101	102	102	102
Surrogate Toluene-d8	%	101	100	101	101	101
Surrogate 4-Bromofluorobenzene	%	100	97	98	98	100

vTRH(C6-C10)/BTEXN in Water		
Our Reference		374754-6
Your Reference	UNITS	TS
Type of sample		Water
Date extracted	-	09/03/2025
Date analysed	-	10/03/2025
Benzene	µg/L	103%
Toluene	µg/L	101%
Ethylbenzene	µg/L	104%
m+p-xylene	µg/L	106%
o-xylene	µg/L	107%
Surrogate Dibromofluoromethane	%	101
Surrogate Toluene-d8	%	99
Surrogate 4-Bromofluorobenzene	%	99

svTRH (C10-C40) in Water					
Our Reference		374754-1	374754-2	374754-3	374754-4
Your Reference	UNITS	BH2	BH4	BH6	BD1
Type of sample		Water	Water	Water	Water
Date extracted	-	06/03/2025	06/03/2025	06/03/2025	06/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025
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	%	92	92	66	91

PAHs in Water					
Our Reference		374754-1	374754-2	374754-3	374754-4
Your Reference	UNITS	BH2	BH4	BH6	BD1
Type of sample		Water	Water	Water	Water
Date extracted	-	06/03/2025	06/03/2025	06/03/2025	06/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025	07/03/2025
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	%	118	109	118	97

OCPs in Water - Trace Level				
Our Reference	UNITS	374754-1	374754-2	374754-3
Your Reference		BH2	BH4	BH6
Type of sample		Water	Water	Water
Date extracted	-	06/03/2025	06/03/2025	06/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025
alpha-BHC	µg/L	<0.001	<0.001	<0.001
HCB	µg/L	<0.001	<0.001	<0.001
beta-BHC	µg/L	<0.001	<0.001	<0.001
gamma-BHC	µg/L	<0.001	<0.001	<0.001
Heptachlor	µg/L	<0.001	<0.001	<0.001
delta-BHC	µg/L	<0.001	<0.001	<0.001
Aldrin	µg/L	<0.001	<0.001	<0.001
Heptachlor Epoxide	µg/L	<0.001	<0.001	<0.001
gamma-Chlordane	µg/L	<0.001	<0.001	<0.001
alpha-Chlordane	µg/L	<0.001	<0.001	<0.001
Endosulfan I	µg/L	<0.002	<0.002	<0.002
pp-DDE	µg/L	<0.001	<0.001	<0.001
Dieldrin	µg/L	<0.001	<0.001	<0.001
Endrin	µg/L	<0.001	<0.001	<0.001
Endosulfan II	µg/L	<0.002	<0.002	<0.002
pp-DDD	µg/L	<0.001	<0.001	<0.001
Endrin Aldehyde	µg/L	<0.001	<0.001	<0.001
pp-DDT	µg/L	<0.001	<0.001	<0.001
Endosulfan Sulphate	µg/L	<0.001	<0.001	<0.001
Methoxychlor	µg/L	<0.001	<0.001	<0.001
Surrogate 4-Chloro-3-NBTF	%	113	118	104

OP in water LL ANZECCF/ADWG				
Our Reference	UNITS	374754-1	374754-2	374754-3
Your Reference		BH2	BH4	BH6
Type of sample		Water	Water	Water
Date extracted	-	06/03/2025	06/03/2025	06/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025
Dichlorvos	µg/L	<0.05	<0.05	<0.05
Mevinphos	µg/L	<0.05	<0.05	<0.05
Phorate	µg/L	<0.05	<0.05	<0.05
Dimethoate	µg/L	<0.1	<0.1	<0.1
Diazinon	µg/L	<0.01	<0.01	<0.01
Disulfoton	µg/L	<0.05	<0.05	<0.05
Chlorpyriphos-methyl	µg/L	<0.05	<0.05	<0.05
Parathion-Methyl	µg/L	<0.05	<0.05	<0.05
Ronnel	µg/L	<0.05	<0.05	<0.05
Fenitrothion	µg/L	<0.05	<0.05	<0.05
Malathion	µg/L	<0.05	<0.05	<0.05
Chlorpyriphos	µg/L	<0.009	<0.009	<0.009
Fenthion	µg/L	<0.05	<0.05	<0.05
Parathion	µg/L	<0.004	<0.004	<0.004
Bromophos ethyl	µg/L	<0.05	<0.05	<0.05
Methidathion	µg/L	<0.05	<0.05	<0.05
Fenamiphos	µg/L	<0.05	<0.05	<0.05
Ethion	µg/L	<0.05	<0.05	<0.05
Phosalone	µg/L	<0.05	<0.05	<0.05
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02	<0.02
Coumaphos	µg/L	<0.05	<0.05	<0.05
Surrogate 4-Chloro-3-NBTF	%	113	118	104

PCBs in Water				
Our Reference		374754-1	374754-2	374754-3
Your Reference	UNITS	BH2	BH4	BH6
Type of sample		Water	Water	Water
Date extracted	-	06/03/2025	06/03/2025	06/03/2025
Date analysed	-	10/03/2025	10/03/2025	10/03/2025
Aroclor 1016	µg/L	<2	<2	<2
Aroclor 1221	µg/L	<2	<2	<2
Aroclor 1232	µg/L	<2	<2	<2
Aroclor 1242	µg/L	<2	<2	<2
Aroclor 1248	µg/L	<2	<2	<2
Aroclor 1254	µg/L	<2	<2	<2
Aroclor 1260	µg/L	<2	<2	<2
Surrogate 2-Fluorobiphenyl	%	103	98	95

Total Phenolics in Water				
Our Reference		374754-1	374754-2	374754-3
Your Reference	UNITS	BH2	BH4	BH6
Type of sample		Water	Water	Water
Date extracted	-	07/03/2025	07/03/2025	07/03/2025
Date analysed	-	07/03/2025	07/03/2025	07/03/2025
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

HM in water - dissolved					
Our Reference		374754-1	374754-2	374754-3	374754-4
Your Reference	UNITS	BH2	BH4	BH6	BD1
Type of sample		Water	Water	Water	Water
Date prepared	-	06/03/2025	06/03/2025	06/03/2025	06/03/2025
Date analysed	-	06/03/2025	06/03/2025	06/03/2025	06/03/2025
Arsenic-Dissolved	µg/L	<1	2	1	1
Cadmium-Dissolved	µg/L	1.4	4.7	7.9	6.6
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	49	640	1,100	1,000
Lead-Dissolved	µg/L	<1	1	1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	17	110	330	280
Zinc-Dissolved	µg/L	160	670	930	750

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-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.
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-W1	[NT]
Date Extracted	-			09/03/2025	3	09/03/2025	10/03/2025		09/03/2025	[NT]
Date Analysed	-			10/03/2025	3	10/03/2025	11/03/2025		10/03/2025	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	3	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	3	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	3	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	3	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	3	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	3	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	3	<1	<1	0	106	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	3	5	5	0	103	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	3	<1	<1	0	100	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	3	<1	<1	0	104	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	3	<1	<1	0	104	[NT]
Dibromomethane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	3	<1	<1	0	97	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	3	1	1	0	102	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	3	<1	<1	0	102	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	3	<1	<1	0	97	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	3	<1	<1	0	100	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	3	<1	<1	0	99	[NT]
Bromoform	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	3	<2	<2	0	99	[NT]
Styrene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
o-xylene	µg/L	1	Org-023	<1	3	<1	<1	0	98	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	101	3	102	100	2	102	[NT]
Surrogate Toluene-d8	%		Org-023	101	3	101	99	2	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	100	3	98	97	1	102	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/03/2025	3	09/03/2025	10/03/2025		09/03/2025	[NT]
Date analysed	-			10/03/2025	3	10/03/2025	11/03/2025		10/03/2025	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	3	<10	<10	0	101	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	3	<10	<10	0	101	[NT]
Benzene	µg/L	1	Org-023	<1	3	<1	<1	0	104	[NT]
Toluene	µg/L	1	Org-023	<1	3	<1	<1	0	102	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	3	<1	<1	0	99	[NT]
m+p-xylene	µg/L	2	Org-023	<2	3	<2	<2	0	99	[NT]
o-xylene	µg/L	1	Org-023	<1	3	<1	<1	0	98	[NT]
Naphthalene	µg/L	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	101	3	102	100	2	102	[NT]
Surrogate Toluene-d8	%		Org-023	101	3	101	99	2	102	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-023	100	3	98	97	1	102	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			06/03/2025	[NT]	[NT]	[NT]	[NT]	06/03/2025	[NT]
Date analysed	-			07/03/2025	[NT]	[NT]	[NT]	[NT]	07/03/2025	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	113	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	127	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	113	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	127	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	116	[NT]
Surrogate o-Terphenyl	%		Org-020	67	[NT]	[NT]	[NT]	[NT]	122	[NT]

QUALITY CONTROL: PAHs in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			06/03/2025	[NT]	[NT]	[NT]	[NT]	06/03/2025	[NT]
Date analysed	-			07/03/2025	[NT]	[NT]	[NT]	[NT]	07/03/2025	[NT]
Naphthalene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	88	[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]	89	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	85	[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]	87	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	96	[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]	77	[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]	78	[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	97	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: OCPs in Water - Trace Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/03/2025	[NT]	[NT]	[NT]	[NT]	06/03/2025	[NT]
Date analysed	-			10/03/2025	[NT]	[NT]	[NT]	[NT]	10/03/2025	[NT]
alpha-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	98	[NT]
HCB	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	96	[NT]
gamma-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	104	[NT]
delta-BHC	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	108	[NT]
Heptachlor Epoxide	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	134	[NT]
gamma-Chlordane	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	108	[NT]
Dieldrin	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	124	[NT]
Endrin	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	112	[NT]
Endosulfan II	µg/L	0.002	Org-022/025	<0.002	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endrin Aldehyde	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	106	[NT]
pp-DDT	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methoxychlor	µg/L	0.001	Org-022/025	<0.001	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	122	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: OP in water LL ANZECCF/ADWG						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/03/2025	[NT]	[NT]	[NT]	[NT]	06/03/2025	[NT]
Date analysed	-			07/03/2025	[NT]	[NT]	[NT]	[NT]	07/03/2025	[NT]
Dichlorvos	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	105	[NT]
Mevinphos	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Phorate	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dimethoate	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Disulfoton	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion-Methyl	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	105	[NT]
Fenitrothion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	101	[NT]
Malathion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	127	[NT]
Chlorpyriphos	µg/L	0.009	Org-022/025	<0.009	[NT]	[NT]	[NT]	[NT]	120	[NT]
Fenthion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Parathion	µg/L	0.004	Org-022/025	<0.004	[NT]	[NT]	[NT]	[NT]	108	[NT]
Bromophos ethyl	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methidathion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fenamiphos	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	109	[NT]
Phosalone	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Azinphos-methyl (Guthion)	µg/L	0.02	Org-022/025	<0.02	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Coumaphos	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	122	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: PCBs in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			06/03/2025	[NT]	[NT]	[NT]	[NT]	06/03/2025	[NT]
Date analysed	-			07/03/2025	[NT]	[NT]	[NT]	[NT]	07/03/2025	[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]	134	[NT]
Aroclor 1260	µg/L	2	Org-021/022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	109	[NT]	[NT]	[NT]	[NT]	88	[NT]

QUALITY CONTROL: Total Phenolics in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			07/03/2025	[NT]	[NT]	[NT]	[NT]	07/03/2025	[NT]
Date analysed	-			07/03/2025	[NT]	[NT]	[NT]	[NT]	07/03/2025	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	105	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	374754-2
Date prepared	-			06/03/2025	1	06/03/2025	06/03/2025		06/03/2025	06/03/2025
Date analysed	-			06/03/2025	1	06/03/2025	06/03/2025		06/03/2025	06/03/2025
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		106	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	1.4	[NT]		102	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		100	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	49	[NT]		101	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	[NT]		99	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	103	81
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	17	[NT]		101	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	160	[NT]		99	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	374754-4
Date prepared	-			[NT]	3	06/03/2025	06/03/2025		[NT]	06/03/2025
Date analysed	-			[NT]	3	06/03/2025	06/03/2025		[NT]	06/03/2025
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	3	1	1	0	[NT]	99
Cadmium-Dissolved	µg/L	0.1	Metals-022	[NT]	3	7.9	7.5	5	[NT]	100
Chromium-Dissolved	µg/L	1	Metals-022	[NT]	3	<1	<1	0	[NT]	108
Copper-Dissolved	µg/L	1	Metals-022	[NT]	3	1100	1100	0	[NT]	#
Lead-Dissolved	µg/L	1	Metals-022	[NT]	3	1	1	0	[NT]	89
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	3	<0.05	[NT]		[NT]	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	[NT]	3	330	330	0	[NT]	#
Zinc-Dissolved	µg/L	1	Metals-022	[NT]	3	930	920	1	[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

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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.
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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.

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Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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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.

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Report Comments

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Envirolab Services Pty Ltd
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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 374754-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Irha Riaz
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**214296.03, Crows Nest**
Number of Samples	Additional analysis
Date samples received	05/03/2025
Date completed instructions received	11/03/2025

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	12/03/2025
Date of Issue	12/03/2025

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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

Cations in water Dissolved				
Our Reference		374754-A-1	374754-A-2	374754-A-3
Your Reference	UNITS	BH2	BH4	BH6
Type of sample		Water	Water	Water
Date digested	-	12/03/2025	12/03/2025	12/03/2025
Date analysed	-	12/03/2025	12/03/2025	12/03/2025
Calcium - Dissolved	mg/L	6.6	23	12
Magnesium - Dissolved	mg/L	14	32	20
Hardness (calc) equivalent $CaCO_3$	mg/L	74	190	110

Method ID	Methodology Summary
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.

QUALITY CONTROL: Cations in water Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			12/03/2025	[NT]	[NT]	[NT]	[NT]	12/03/2025	[NT]
Date analysed	-			12/03/2025	[NT]	[NT]	[NT]	[NT]	12/03/2025	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	96	[NT]

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COC: 05/03/25, 1205

Douglas PARTNERS | GROUNDED EXPERTISE

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	214296.03	**Suburb:**	crows nest	**To:**	Lab name
Project Manager:	Wen-Fei Yuan	**Order Number:**		**Sampler:** IR	Lab address
Email:	WenFei.Yuan@douglaspartners.com.au, irha.riaz			**Attn:**	Name
Turnaround time:	☑ Standard ☐ 72 hour ☐ 48 hour ~~☑ 24 hour~~ SP ☐ Same day				Lab phone Lab email
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: Voc suite	combo 8 dissolved	combo 3 dissolved	BTEX							Notes/ Preservation/ Additional Requirements
1	BH2				W	G/P	x	x									pah (low level), ocp opp trace level
2	BH4				W	G/P	x	x									pah (low level), ocp opp trace level
3	BH6				W	G/P	x	x									pah (low level), ocp opp trace level
4	BD1				W	G/P			x								
5	TB				W	G				x							
6	TS				W	G				x							

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 374754
Date Received: 5/3/25
Time Received: 1120
Received By: KC
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Metals to analyse:		**LAB RECEIPT**
Number of samples in container:	**Transported to laboratory by:**	**Lab Ref. No:** 374754
Send results to: Douglas Partners Pty Ltd		**Received by:** KC
Address:	**Phone:**	**Date & Tim** 5/3/25 1120